





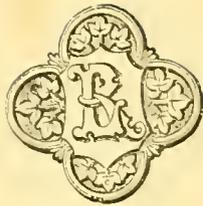








THE  
LEPIDOPTERA  
OF THE  
BRITISH ISLANDS  
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THE  
LEPIDOPTERA  
OF THE  
BRITISH ISLANDS

A DESCRIPTIVE ACCOUNT OF THE FAMILIES, GENERA, AND  
SPECIES INDIGENOUS TO GREAT BRITAIN AND  
IRELAND, THEIR PREPARATORY STATES,  
HABITS, AND LOCALITIES

BY  
CHARLES G. BARRETT, F.E.S.  
ONE OF THE EDITORS OF THE "ENTOMOLOGIST'S MONTHLY MAGAZINE"

VOL. IX.

HETEROCERA  
GEOMETRINA—PYRALIDINA

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# LEPIDOPTERA.

## DIVISION 2. HETEROCERA.

Group 4. *GEOMETRINA*.

Family 4. **LARENTIDÆ**.

Genus 27. **MESOTYPE**.

ANTENNÆ simple, ciliated; palpi very short; head flattened and rough in front; thorax smooth; abdomen short, cylindrical, slender and smooth; fore wings trigonate, bluntly pointed, the base very narrow; hind wings long, rounded behind, vein 1 normal; veins 7 and 8 united more than half way down the cell. Female smaller, with more pointed fore wings.

We have but one species.

1. **M. lineolata**, *Schiff.*; **virgata**, *Staud. Cat.*—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings narrow, rather pointed, pale grey, or pale grey-brown; central band very oblique, rather straight, striped. Hind wings pale smoky-grey barred with smoky-brown and white.

Antennæ of the male rather thick, simple, ciliated, light brown, darker at the back; palpi minute, pale chocolate; face prominent, rather rough, pale brown dusted with red-

brown; top of the head and neck-ridge reddish-brown; thorax greyish-white, dappled with brown; abdomen short and slender, brown dusted with white, anal tuft very short. Fore wings trigonate; costa very straight; apex rounded; hind margin oblique and very little curved; dorsal margin slightly rounded up; colour pale grey abundantly dusted with grey-brown; no basal *line*, but its place occupied by a basal cloud of grey-brown atoms; first line very oblique and straight outwards from the dorsal margin, umbreous or reddish-brown, preceded by a white stripe, and shading off outwardly; second line rather more oblique, faintly curved, yet not in the least bent back, umbreous or black-brown, shaded off inwardly; the space between these forms an oblique, unusually straight, central band, sometimes darkened, but the margins always broadly dark, and containing the black discal dot and two very slender parallel brown lines; outside is a contiguous white line or stripe margined again by one of reddish-brown dusting; from this a slender oblique dark brown or black streak runs into the apex of the wing; extreme margin edged with slender dark brown streaks; cilia silky ash-grey, clouded with grey-brown. Hind wings elongated, rounded behind, moderately broad; pale smoky grey dusted with white, or else smoky-white; usually crossed by two whiter stripes alternating with brown ones; margin distinctly edged by a brown line; cilia white, shaded with grey-brown. Female smaller, the body shorter but hardly thicker; fore wings smaller, sharply pointed at the apex, the markings more definite, and the central band often more uniform in colour; hind wings narrower, but equally long, often *distinctly* banded with brown and white.

Undersides of all the wings purplish-red, shading off to pale grey along the hind margins; the white stripe outside the second line of the fore wings distinctly reproduced, and continued, with a considerable angle, across the hind, but of a yellowish-white colour. Body purplish-red; legs dark purple-brown.

Variable in both sexes, but more particularly in the female, in the tint of ground colour of the fore wings, and in the colour and intensity of the central band; the ground colour varies to white or creamy-white in one direction, and to dark grey, grey-brown, and purple-brown in the other; where it is some full or dark shade of grey the central band is usually of the same colour, and the conspicuous markings are the white stripes at the margins of the band, with sometimes a slender one also *in* the band; where it is a lighter shade of grey the band often becomes itself conspicuous by the darkness of its margins; when the ground is brownish-white the band varies, sometimes almost equally pale with margins only a little darker, sometimes wholly filled up with dark grey-brown, or showing every intermediate shade; when it is creamy white—especially in the female—the band is apt to be conspicuous and very pretty; more rarely specimens occur in which the ground colour is dull brownish-purple and the band yellowish-white, or ground and band purple-brown, and the stripes white; or the ground colour is grey, with the usual dark margins to the band, but its middle area pale yellow; indeed, it is far from easy to indicate in words the variations and transpositions of colour in its oblique bands.

On the wing from April till the beginning of June, and as a second generation in July and August.

LARVA slender, uniform in bulk when viewed from above, but when seen sideways tapering to each extremity; head nearly as wide as the second segment, somewhat flattened, but the lobes having a rounded outline, yellow, freckled with brown; general colour variable above, the back being dull pink, lighter or deeper in tint, warm brown or olive-brown; dorsal line dark brown or blackish-green, sometimes bordered with yellowish-pink; subdorsal line thin, yellowish on segments two, three, eleven, twelve, and thirteen, on the rest of a paler tint of the ground colour; space between the sub-

dorsal line and the spiracles filled up by two dark stripes of even width, sometimes separated by a very fine pale thread, the upper being dull purplish-pink, pinkish-brown or olive-brown, the lower dull blackish-green or almost dull black; just on the lower edge of this dark stripe are the black spiracles; all the undersurface is pale yellow, palest immediately below the spiracles and having a paler central line; legs pale yellow, prolegs tinged with dull pink or purplish-pink; usual raised dots small and black, and bearing fine black bristles.

A variety has the yellow lines on the back and sides so much widened, and the darker lines so narrowed that the general effect is as though the back were greenish yellow.

Another is brown with the subdorsal lines bordered above by dark brown patches at the beginning of each segment, thus presenting the appearance of a dorsal pattern. (Rev. J. Hellins.)

May and June, and the second generation in August and September, on *Galium verum* (yellow bedstraw), but in confinement it will eat *G. saxatile*.

PUPA rather short and stout, the thoracic portion full and much rounded and the wing-covers thickened, glossy, and hardly sculptured; limb covers also shining and tightly packed; dorsal and abdominal segments a little less glossy, minutely punctured, the latter rapidly tapering; anal segment a little thickened behind; cremaster rather flattened, tapering to a strong spike, finely forked at the apex; dark red-brown, the abdominal divisions bright light brown.

In a slight cocoon in the earth.

The winter is passed in this state.

The moth sits during the day on a grass stem, or on that of its food plant, close to the ground, almost only frequenting the patches of yellow *Galium* which occupy the level spaces and sheltered slopes of sea-sandhills. From these resting places it starts up on the approach of a footstep, and flits sharply

away, to settle in another part of the same patch of bedstraw. Here it sits with wings erect, and closely pressed to each other over the back; and will even lie down upon its side on the sand to escape observation. Late in the afternoon and about sunset it flies about of its own accord, but never seems to leave the neighbourhood of its food plant. It is one of the coast-frequenting species which are still to be found on the Breck-sands of Norfolk and Suffolk, and may possibly have inhabited this locality from the time when it formed a portion of the coast of a post-glacial sea. Yet this seems scarcely so evident as in the cases of some of the coast *Noctua* previously mentioned, since this species is not wholly a seaside insect, but is known to frequent some of the spots upon the South Downs in which the *Galium* is abundant, has formerly been taken in a similar manner on Cambridgeshire chalk hills, and quite recently by Mr. W. E. Butler on a chalk hill at Streatly, on the borders of Berkshire. But these cases are quite exceptional, and the coast sandhills are its chosen home; on them it is found in plenty at Folkestone, Deal, and elsewhere in Kent; in Sussex; at Freshwater, Isle of Wight; at Exmouth and Dawlish Warrens, Devon; on Burnham Sandhills, Somerset; on the sandhills between Yarmouth and Caistor, Norfolk; the coasts of Cheshire, Lancashire, and Cumberland; and apparently in very far smaller numbers in Dorset and Wilts. In Wales it is found freely upon the Glamorganshire coast, but is, I think, quite absent from the extensive sandhills of the further West. In the Northern portion it is common on those of Flintshire. In Scotland, according to Dr. F. B. White, it has once been taken in the "Tay" district—probably Perthshire—but this seems to require confirmation. In Ireland it has been found on the extensive sands near Newcastle, co. Down; and nearly forty years ago I well remember that the late Mr. Edwin Birchall found specimens, to his great surprise, upon Mangerton Mountain, Kerry, at an elevation of 800 feet above sea level.

Abroad it inhabits most parts of Central Europe, South Sweden, Northern Italy, Sicily, Livonia, South Eastern Russia, South Eastern Turkey, Bithynia, Pontus, and Tартary.

Genus 28. **EUBOLIA.**

Antennæ of the male pectinated; palpi blunt; head rough with raised scales which project forward; thorax rough; abdomen smooth; fore wings broadly trigonate, pointed, narrow at the base; hind wings elongated, ample, vein 1 complete, veins 7 and 8 joined more than half way down the cell.

LARVÆ elongate, cylindrical but a little swollen behind; the head round. Feeding on low-growing plants.

PUPÆ subterranean.

We have four species, readily discriminated.

A. Fore wings light brown with deep brown central band.

B. Basal blotch of the colour of the band; discal spot absent. *E. cervinata.*

B<sup>2</sup>. Basal blotch of the ground colour; discal spot a black dot. *E. mensuraria.*

A<sup>2</sup>. Fore wings whitish-grey.

C. Central band rather deeper grey, toothed outwardly. *E. bipunctaria.*

C<sup>2</sup>. Central band straight, oblique, formed of two red-brown stripes. *E. palumbaria.*

1. **E. palumbaria**, *Schiff.*; **plumbaria**, *Staud. Cat.*  
—Expanse  $1\frac{1}{4}$  inch. Fore wings trigonate, pointed, pale slate-grey, with two or three slender transverse red-brown stripes, the third shaded inwardly; a red-brown streak runs into the apex. Hind wings smoky-white.

Antennæ of the male pectinated throughout with slender, oblique, ciliated teeth, grey, the shaft glossy; palpi porrected,

pointed, pale brown; head and face white; thorax slate-grey; abdomen ashy-grey faintly barred at the edges of the segments with white; lateral and anal tufts rather spreading. Fore wings trigonate, pointed, the base narrow; costa very faintly arched at the base and apex, flattened between; apex angulated; hind margin below it almost straight to the middle, more rounded off below; dorsal margin rather full; colour shining slate-grey, sometimes tinged behind with brown, and somewhat glistening; basal line a very slender red-brown thread; first line rather thicker and more distinct, straight and erect, red-brown; second line of the same colour or very slightly darker, more oblique and very direct; shaded broadly inside throughout except at the costa; beyond it is an indistinct, much rippled, whitish-grey sub-terminal line, sometimes shaded at the back with slightly darker grey than the ground colour; from it, above the middle, a slender red-brown line runs obliquely into the apex of the wing; discal spot minute, black; extreme hind margin edged with a slender red-brown line; cilia shining slate-grey. Hind wings rather long, but ample, rounded behind, pale smoky-grey or smoky-white, indistinctly barred with a white shade, and occasionally at the back of this with a faint smoky line; cilia shining pale grey. Female a little smaller, the abdomen stouter, the fore wings narrower and more pointed, and paler in colour, often whitish-grey; the markings brighter and more distinct; hind wings very pale, often white.

Underside of the fore wings smoke-colour, tinged with rufous along the costa and apex; discal spot smoky-black. Hind wings smoky-grey, tinged all over with rufous. Body and legs grey.

There is considerable variation in both sexes in the depth of the ground colour, to dull brownish-slate colour in one direction and to bright shining white-grey in the other; also in the depth of colour and breadth of shading of the oblique second line, with proportionately greater or less distinctness.

of the other lines; but perhaps the most remarkable range of difference is in the breadth of the space between the first and second lines, this being in some specimens more than one third of the length of the wing, in others greatly diminished and tapering toward the costa, till in a specimen in the collection of Mr. S. J. Capper these two lines coalesce.

On the wing from the end of May till July, apparently in only one generation.

LARVA. The head is slightly narrower than the second segment, and notched on the crown, it is opaque, rough, and emits a few bristles, yellow-brown; body dilated at the sides by a very conspicuous skinfold; it emits from various parts of its body, more particularly the two extremities, a few scattered stiff and short bristles; anal segment blunt; yellow-brown or putty colour, varying much in tint, some specimens being very light and almost unicolorous, while others are traversed throughout by interrupted stripes of dingy smoky-brown, either broken into spots or exhibiting a considerable amount of continuity, but the dorsal surface is generally decidedly darker than the ventral; spiracles small, black; there is a pale medio-ventral stripe, rather broad, and intersected throughout by an indistinct but slightly darker stripe; it is bordered on each side by a very distinct darker stripe; these two darker stripes unite at the base of the third pair of legs and also between the anal prolegs, thus enclosing the paler ventral space.

It rests in a perfectly straight and stick-like position on the twigs of its food-plants, the entire ventral surface being appressed to the twig; when removed it retains exactly the same position, appearing rigid and lifeless, the head prone and the mouth brought into contact with the legs which are crowded together; but if only [disturbed and [not forcibly removed it will gradually raise its anterior extremity, arch its back, and bend its head beneath its body until it comes into contact with the eighth ventral segment. (E. Newman.)

August till April or May, on broom (*Cytisus scoparius*) furze or gorse (*Ulex europæus*) and according to Hofmann on *Genista*; hybernating when very small and feeding up in the spring.

PUPA shining reddish-brown, the wing-covers with darker veins. Not further described. In a silken cocoon among rubbish or the twigs of the food-plant.

The moth hides during the day in furze bushes, or among long grass, or thick herbage, near the ground, but is readily disturbed by the beating stick, or by a passing footstep, when it will fly to some distance before again hiding itself; it then settles head downwards among grass or some similar shelter. Its natural flight is at dusk, and also at night, when it will come to a strong light. It is common on heaths, cliffs, downs, moors, mosses, and even fields where any furze is allowed to grow among the rough herbage, and in such situations is to be found throughout England, though less commonly in the Midland Counties, and throughout Wales, and most parts of Ireland. In Scotland it is common in Wigtownshire, Dumbartonshire and elsewhere, so far as the Clyde Valley, in the west; in Roxburghshire and Perthshire and extends in the east to Moray, which seems to be its northern boundary. Abroad common throughout Central Europe, Central and Northern Italy, Corsica, Roumania, Southern Russia, Bithynia, and Pontus.

2. **E. bipunctaria**, *Schiff.*—Expanse  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inch. Fore wings broad, whitish-grey, much rippled with darker grey fine scolloped lines and dots; central band darker grey. Hind wings smoky-white.

Antennæ of the male densely pectinated with short oblique teeth, thickly ciliated but lying very close to the shaft, brownish-grey; palpi porrected and pointed but rather conical, purplish-grey; face full and oblique, and with the

head and neck-ridge greyish-white, dusted with pale brown; thorax rather robust, of the same colour and dusting but whiter behind; abdomen similar, with a white edge to each segment; lateral and anal tufts broad and rather conspicuous. Fore wings very broad but pointed; costa arched at the base, thence very nearly straight; apex sharply angulated; hind margin oblique, gently curved, and a little expanded; dorsal margin very slightly rounded; greyish-white minutely stippled in oblique lines with grey atoms; basal line grey, slender, a little curved but indistinct; first line oblique, straight to near the costa, where it is bent back; second line somewhat parallel, but more sinuous and indented, and twice or thrice toothed outwardly; the space between these two lines, which are grey, forms a central band of darker grey than the ground colour, yet not very dark, and rather divided by internal lines parallel to the first and second, also enclosing two black dots as a discal spot; hind marginal region clouded with grey, which is divided into stripes by the whiter rippled subterminal lines; of this the hollows are, in some specimens, filled with darker grey; from this an oblique shade, often dotted with brown or reddish-brown, runs into the apex of the wing; cilia grey shaded with white. Hind wings long, moderately broad, rounded behind; smoky-white or pale smoky-grey, whiter toward the base, and very faintly banded with alternate whiter bands and greyer curved lines; cilia greyish-white. Female very similar, but with the body a little shorter and thicker and much more pointed.

Underside of the fore wings shining smoke-colour; costa tinged with light brown. Hind wings of the same smoky tinge. Body greyish-white; legs grey; tarsi darker grey.

Usually very constant in colour and markings, except that local variation takes place according to the geological formation of the locality, specimens from the chalk districts being usually much whiter than those from the greyer mountain limestone of western districts. There is occasional

but very rare variation of a more striking character—Mr. Robert Adkin possesses a magnificent specimen in which the ground colour is slate-black, the basal blotch and the narrow central band being the only portions of its fore wings remaining grey; it was taken at Box Hill, Surrey; another, also from the South of England, in Mr. H. J. Turner's collection, has the central band very dark, the ground colour being almost white; and others are on record having the ground colour quite white,—in one case the central band also extremely pale.

On the wing from the end of June to August, in a single generation.

LARVA stout, rather flattened, bristly, the sides puckered; head small, rather squared in front, brownish ochreous; body putty-coloured or dull whitish-ochreous, sometimes with a pinkish or yellowish tinge; dorsal and subdorsal lines grey, distinct; between them is a very fine grey line, and below the subdorsal are two lines, side by side and almost confluent; usual raised dots and spiracles black; undersurface having two conspicuous stripes, which are dark grey in the middle of each segment and pale at the incisions, thus seeming to be a series of pairs of dark grey dashes; these stripes have an outside accompanying pale yellow or pale brown stripe, paler than the ground colour. (Chas. Fenn.) Varieties figured by Mr. W. Buckler have the dorsal region slate-grey or almost greenish-slate; and the undersurface, with a broad spiracular stripe, pale creamy-buff or pinkish-white.

September till June; on *Medicago lupulina*, *Hippocrepis comosa*, *Lotus corniculatus*, *Trifolium repens*, *T. pratense*, and other clovers and trefoils; feeding at night, and hiding in the ground at the roots of these plants, by day; hibernating while rather small.

PUPA elongate, smooth, dull, but the segmental divisions shining; head slightly projecting; anal extremity with a

hooked spike; colour dull red. Spun up by a few threads, loosely, beneath its food plant, on the surface of the ground. (C. Fenn.)

The moth loves to sit on the earth of grassy slopes, and on all sorts of rough ground, or the bases of rocks, often sheltering close to a grass tuft; here it remains quite still till approached, when it starts up and flies wildly to a similar spot at a few dozen yards distance, and if again disturbed removes to a greater distance. At dusk it flies of its own accord. Its favourite haunts are hills and coast cliffs of chalk, oolite, and limestone, as well as hills of any considerable mixture of calcareous substances. In such situations it is abundant on the coasts of Kent, Sussex, Hants, Dorset, and Devon, and also inland in these counties and in Somerset, Gloucestershire, and Wilts; more locally or less plentifully found in East Cornwall, Berks, Oxfordshire, Bucks, Herts, Surrey, and Essex; rare in Suffolk, and excessively local in Norfolk and Cambridgeshire; found also in Herefordshire; Dovedale, Derbyshire; said to have been taken in the year 1845 in Cheshire; still rather common on the coast cliffs and limestone hills of Yorkshire, Durham, and Northumberland. In Wales it is common on mountain limestone on and near the coasts of Glamorganshire and Pembrokeshire; but I find no records for Scotland nor Ireland. Abroad it is found over many parts of Central Europe, in Spain, Central and Northern Italy, Corsica, the Balkan States, Turkey, the Ural Mountain district, Bithynia, Armenia, and Persia.

3. **E. Cervinata.** *Schiff.*—Expanse  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inch. Fore wings large, pointed, light red-brown, dusted with darker; basal blotch and central band red-brown, darker at the edges. Hind wings long, smoky white, more red-brown at the hind margin.

Antennæ of the male not very long, pectinated with short oblique ciliated teeth, brown, the shaft shining; palpi short,

purple-brown; face and head pale chocolate; thorax light purplish-brown, faintly dusted with white, flatly tufted at the back; abdomen tapering, whitish-brown; lateral and anal tufts small. Fore wings very broad but pointed and trigonate; costa arched at the base and apex, otherwise nearly straight; apex sharply angulated and produced; hind margin hollowed close below it, then very oblique, long and slightly crenulated; dorsal margin very full; colour light red-brown; basal space occupied by a deeper red-brown blotch, the outer margin of which is the basal line, and is faintly edged with a slender white thread; first line bluntly and repeatedly angulated, leaden-brown, inwardly edged with white, and forming the inner margin of a broad liver-brown or red-brown central band, by far the broadest on the costa, and inwardly rippled with parallel darker and paler lines; its outer margin is the second line, oblique, undulating, leaden-brown, edged outwardly with white; hind marginal region and apex broadly shaded with red-brown, intersecting which are traces of an indistinct rippled white subterminal line often, however, consisting only of pale cloudy dots; extreme hind margin edged by an undulating white line; at the apex is a small clouded black spot; cilia whitish-brown, intersected and clouded with dark brown. Hind wings very long, broad behind; hind margin rounded and bluntly crenulated, smoky brownish-white; beyond the middle is a faint transverse darker line; hind margin broadly clouded with purple-brown, and edged with an undulating white line; cilia brown, dusted with white. Female smaller, but the body stouter; fore wings more sharply pointed; the hind margins of all the wings more distinctly crenulated.

Undersides of all the wings light red-brown; beyond the middle of each is a darker transverse line edging a paler band which shades darker toward the hind margin; body and legs red-brown.

A little variable in colour, from reddish-brown to purplish-brown, rather more so in the darkness of the margins of the

central band, and of the sub-marginal shading. The central band also differs greatly in width, in some specimens being nearly or quite double the breadth of it in others. A very remarkable specimen in the collection of the Rev. C. F. Thorne-will has this band very narrow and unusually pale, while the ground colour is reddish-white, darkening a little to the hind margin, but the whole surface having a noticeably silky gloss.

On the wing from the end of September till November.

LARVA elongate, sides puckered; head rounded, green or pale bone-colour, the mouth brown; general colour dull yellowish-green, the segmental divisions tinged with yellow; there are faint traces of darker dorsal and spiracular lines; raised dots whitish, emitting short pale bristles; spiracles conspicuous, black; undersurface green with an indistinct paler central band; legs pale bone-colour. (Chas. Fenn.)

Of those figured by Mr. W. Buckler, one is dark green with a faint pink dorsal line, and the anal flap dull purple; another of the yellow-green already described, but also having a slender pink dorsal line.

March or April till June, on mallow (*Malva sylvestris*), and sometimes on hollyhock (*Althaea rosea*), but Hofmann says on all the species of *Malva*, *Lavatera* and *Aleca*; and that when shaken off or disturbed it rolls itself up into the exact resemblance of a mallow-seed upon the ground. Plants of our common mallow, growing near the sea, although of large size, are sometimes defoliated by it.

The winter is passed in the egg-state.

PUPA rather short and plump; shining red-brown; close to the surface of the earth, underneath the plant upon which the larva has fed, indeed easily brought to light by means of the fingers.

The moth is rather sluggish in the daytime and unwilling to be disturbed, but hides among its food plants and neighbouring herbage rather close to the ground, and may there

sometimes be found and secured; at late dusk and through the early portion of the night it flies pretty vigorously, and if a gas-lamp is at hand flutters and flaps wildly round it for some time, but ultimately settles down to sit upon the frame with wings erected over its back. Much attached to waste spots near public roads, or the suburbs of towns, where mallows are apt to flourish; also to the edges of sea sandhills and sea cliffs; common in all the Southern, Eastern, and Western Counties of England and existing, apparently in smaller numbers, throughout the Midlands and Northern Counties. In Wales it must surely be rather scarce, but is recorded from Anglesey by Lord Boston, in Glamorganshire by Mr. H. W. Vivian; and I took it occasionally at Pembroke. In Scotland it is said to be common in Berwickshire, scarce in the Edinburgh district, and to be found in Ayrshire and occasionally in Perthshire, but Dr. Buchannan White gave its range as extending to the Clyde and to Aberdeenshire. In Ireland I met with it long ago commonly in the suburbs of Dublin, and in great abundance at Howth and Sutton on the neighbouring coast; also it is known to occur in Wicklow, Cork, Kerry, Lowth, and Sligo.

Abroad it ranges through France, Holland, Germany, the South of Spain, the North of Italy, Livonia, Finland, Southern Russia, Syria, and Bithynia.

[*E. mæniata*, Scop.—In the Entomologists Annual for 1855 occurs the following entry: “A specimen of this is in the collection of Mr. C. S. Gregson, who obtained it from Mr. Reeves of Carlisle many years ago. Mr. Reeves told Mr. Gregson himself that he took it on one of the high hills near Barron Wood.” In consequence of this statement the species was included as British in Mr. Stainton’s “Manual.” In the year 1866 Mr. W. Prest of York stated that he took on August 19th of that year, by beating broom, a specimen which had since been found to be of this species. These are, I believe, the only instances in which the

insect has been reported to be taken in these islands. The first-named specimen is in the collection of Mr. Sydney Webb, but I am not aware what has become of the other. No further evidence of the existence of the species in these islands has been forthcoming, and the conclusion seems inevitable that the specimens in question, if taken here, must have been in some way introduced. However this may be I feel certain that the insect has no claim to be considered a British species. It could not well be overlooked, since it is a striking and conspicuous insect, almost as large as *E. eervinata*, but more like *E. mensuraria*, except that the outer edge of the central band of its fore-wings has a very strong angle, almost a rectangle. It is a common species in most parts of Central Europe.]

4. **E. mensuraria**, *Schiff.*; **limitata**, *Staud. Cat.*—  
 Expanse  $1\frac{1}{2}$  inch. Fore wings rich pale yellow-brown or purplish-brown with a broad red-brown central band, darkest at its margins, and enclosing a minute round discal dot. Hind wings smoky white.

Antennæ of the male pectinated with short oblique ciliated teeth, brown, the shaft whitish-brown; palpi rather prominent, purple-brown; face strongly tufted with raised scales, purple-brown; head of the same colour; thorax yellow-brown; abdomen rather long, light brown, barred faintly with white; lateral and anal tufts distinct, the latter dark brown. Fore wings broad; the costa gently rounded, more arched at the base and apex, which last is bluntly angulated; hind margin below it perpendicular, then expanded and rounded off; dorsal margin also rather full; colour rich pale yellow-brown; basal line an indistinct curved purplish-brown stripe; first line also a gently curved red-brown stripe shaded off outwardly; second line more oblique and waved, forming the outer edge of a broad, rich red-brown stripe; these two stripes form the margins of a broad central band, often almost uniform in colour, but

commonly having a paler shade, varying even to the ground colour, in the middle portion; discal spot a small round black dot; beyond the central band is a slender red-brown line, quite parallel; beyond this a red-brown cloud runs obliquely into the apex of the wing; cilia shining yellow-brown. Hind wings long, not very broad, rounded behind, pale smoky yellowish-brown; beyond the middle is a narrow curved stripe, or line, of a deeper smoky shade, usually followed by a shaded white or smoky-white line or stripe, sometimes broad; hind-marginal area clouded with a more smoky tint; cilia concolorous. Female very similar but rather larger and having the fore wings a little more pointed; hind wings decidedly whiter; body shorter, more pointed and a little thicker.

Undersides of all the wings golden brown; more ochreous along the costa of the fore wings, and, just outside, a faint central darker line on all the wings. Body and legs yellow-brown.

Variable in the ground colour to a whiter brown on the one hand, and to pale purple-brown on the other; more so in the depth and uniformity of colour in the central band, as already remarked upon, but seldom going to any great extreme. Specimens from the north of Scotland are often dark, but there is less local variation in this species than might have been expected; there is, however, in the collection of Mr. S. J. Capper an extraordinary, and so far as I know, unique, female specimen in which the basal purplish-brown line is closely followed by a similar line or narrow stripe, and this by the first line, which thus is placed far nearer the base than usual; while the second line is shifted out from its usual position and forms a narrow purple-brown stripe very near the hind margin and parallel therewith; the greater portion of the area of the fore wings is thus placed as a central band, of great breadth, and of a very pale tawny-brown; its hind wings are almost white, but have also a narrow brown stripe near the hind margin, which margin is purple-brown. This specimen was taken near Liverpool many years ago.

On the wing in July and August.

LARVA rather stout; head of the same width as the second, but narrower than the third segment, lobes rounded, but the face flat and square, there is a slight notch on the crown. pinkish-grey freckled with black; the body has the sides swollen into a puckered spiracular ridge, which gives it a rather flattened appearance, both above and below; the middle segments are the widest and it tapers a little at each extremity; segments overlapping so that the divisions are distinct; skin tough, pinkish-grey tinged with pale slate-blue; dorsal line slate-blue; subdorsal lines pale ochreous-yellow, narrowly edged above and below with pale brown; the swollen ridge along the spiracles pinkish; spiracles and dorsal dots black; ventral surface pale slate-grey; down its middle is a pale ochreous stripe, throughout which extends a narrow pink line, and between this ventral stripe and the spiracular region is another pale ochreous stripe, edged on each side with black, the outer line being broader and more distinct than the inner; legs and prolegs pinkish-grey. (G. T. Porritt.)

September to June, on vetches, clover, and grasses. Curtis says on *Bromus arvensis*. Hofmann gives, as food, *Lathyrus pratensis*, *Trifolium repens*, *Lotus corniculatus*, and *Viola hirsuta*; feeding at night. It is stated by Mr. J. Arkle, in the *Entomologist*, that it may be beaten out of nettles, also that it spins a whitish silken cocoon among their leaves; but he does not say that the larva actually feeds on nettle.

PUPA apparently undescribed.

The moth frequents grassy places in and near woods, hills, banks, and fields, wherever rough herbage is allowed to grow, and often is exceedingly plentiful about road-sides and hedge-banks. Here it sits during the day among the tall grasses and coarse herbage, head down, but always on the alert, ready at the approach of any intruder to spring up

and flutter about, yet not at all timid, since it keeps very nearly about the same spot, just out of reach, "flopping" about with upraised wings, and far more noticeable for its fastidiousness as to the stem upon which it shall next alight, than for any uneasiness about its own safety; indeed, a rough flowery bank, with a dozen or more of these moths, all disturbed at once, fluttering about within a few yards extent, all quite unable to decide where they shall next settle down, is rather a lively picture. Its natural time of flight is in the late dusk and the night, and it will sometimes come to a light, and to the blossoms of knapweed, ragwort, and other plants. Late and worn specimens have even been taken upon ivy-bloom. Found in all parts of England and Wales, though in Norfolk and some other eastern districts it is local and rather uncommon; otherwise, it is one of our most abundant species. In Scotland it is not so generally distributed, yet is found in suitable places to the Clyde valley in the west, but apparently throughout the more eastern and middle districts, even to Ross and Sutherlandshire, yet I find no record of its presence in the Isles. In Ireland it is everywhere common, and in some of the hilly districts of the north of that country excessively abundant. Abroad it inhabits the whole of Europe except the extreme south, being rare in Portugal, and is found in Asia Minor, Armenia, Tartary, and the mountainous regions of Central Asia.

#### Genus 29. **COLLIX.**

Antennæ simple; palpi blunt, head rather smooth; thorax provided with a thick crest-like tuft at the back; abdomen furnished with one or two obscure prostrate tufts; fore wings ovate, crenulated behind; the discal cell less than one-half the length of the wing; hind wings rounded, scalloped at the hind margin.

We have but one species.

1. **C. sparsata**, *Hüb.*—Expanse 1 inch. Fore wings short and much rounded; glossy dark umbreous with rippled blackish lines and black dots toward the base and the hind margin; discal spot black. Hind wings scalloped and crenulated behind, of the same colour.

Antennæ of the male rather thick, simple, ciliated, dark brown; palpi thickly tufted, black; head dark brown dusted with white; thorax very similar, small and rounded; abdomen brown, slender, but of even thickness; lateral tufts minute; anal tuft short and very blunt. Fore wings short and blunt; costa gently rounded to beyond the middle, thence strongly arched; apex bluntly rounded; hind margin curved, very little oblique, but the curve running round to the dorsal margin, on which it is continued; colour glossy umbreous dusted with black; basal line curved, obscurely black, most marked upon the nervures; first line very obscure, curved, duplicated, and consisting of a series of two or three black dots on each nervure faintly connected by black dusting, and enclosing an obscure white line; second line indistinct, indicated by a row of small black wedge-shaped dots, in a curved series, on the nervures, followed by a parallel similar row, and these closely succeeded by faint clouds of white dusting: immediately following is the subterminal line, irregular and indented, formed of white atoms and faintly edged on either side with black clouding on the nervures: above the anal angle this subterminal line forms a more definite curved whitish streak; costa spotted with black, especially so at the origin of each line; discal spot black with a whitish edging, placed before the middle of the wing, at the apex of the very short discal cell; extreme hind margin edged with short thick black streaks; cilia pale umbreous, clouded with white. Hind wings short, rounded, the hind margin scalloped, and having a deeper hollow just below the apex; umbreous, crossed by numerous rippled whitish-brown lines, and near the dorsal margin by intermediate black strigæ; nervures dotted with black; hind

margin edged with black streaks; cilia whitish-brown. Female very similar, but a little larger, and slightly paler; the markings rather more distinct.

Underside of the fore wings very pale yellow-brown, shaded upon the nervures with smoky-black; discal spot black, followed by a distinct elbowed smoky-black stripe, and this by another, more clouded but less angulated; hind margin smoky-brown. Hind wings of the same colour; central spot very conspicuous, black, placed rather high up; beyond the middle are smoky-black stripes as in the fore wings. Body and legs yellow-brown, shaded with umbre.

Only a very little variable in the tone of the ground colour—brownier or more tinged with smoky-black—and in the distinctness of the markings.

On the wing in June and July.

LARVA. Length nearly an inch, and of average proportionate bulk; head rather flattened above but rounded at the sides, slightly narrower than the second segment, into which it can be partially withdrawn; body cylindrical and of almost uniform width throughout, tapering only a little in the first and last three segments; skin smooth and soft, having a few short and almost imperceptible hairs; head pale brown; body bright pale green; a green pulsating vessel is visible between two whitish lines, forming a dorsal stripe; subdorsal lines also white, and there is another whitish line below them, but some distance above the spiracles; spiracular stripe broad, whitish with a very faint blue tinge; segmental divisions yellowish; spiracles black; ventral surface almost uniformly pale green. (G. T. Perritt.)

July and August, sometimes in September, on *Lysimachia vulgaris* (yellow loosestrife), feeding upon the buds, blossoms, and leaves, hiding during the day on the undersides of the leaves, and greatly preferring those plants which are sheltered under sallow or other bushes.

PUPA polished,  $\frac{3}{8}$  inch long, and tolerably plump; thickest at the ends of the wing cases, and having the eye, antenna, and wing-covers well defined; tapering rather suddenly to the anal tip; head, thorax, and wing-cases green; abdominal segments rather pale brown. (G. T. Porritt.) In a tolerably firm cocoon of silk and earth, in the ground or among dead leaves.

The moth is a creature of very quiet habits, spending the day hidden among the coarse rank grasses, sedges, and other plants which grow into dense masses in, and under, the sallow bushes, in its favourite fenny haunts. By stooping down and separating these plants it is possible to disturb it and induce it to come crawling up into the light, but it is sluggish, and hardly cares to fly further than to plunge again into obscurity. At dusk it flies over and around the same bushes, especially those which shelter its food plant, but is then by no means easy to see. It is, however, said to be procurable at the flowers of the buckthorn. The larva is readily found, and it naturally follows that the vast majority of specimens in collections have been reared in confinement. Found only in the deepest, wettest fens, or the most marshy portions of wet woods. Fifty years ago the late Mr. Frederick Bond found it, pretty commonly, in Burwell, Hornsey, and Wicken Fens, Cambridgeshire; and although the other two fens have long been destroyed, it is still frequent at Wicken. Also pretty common in the extensive ranges of fens bordering the rivers Yare, Bure, Thurn, and Ant in Norfolk, and in wet woods near Kings Lynn in the same county. Also to be found in the wettest portions of the New Forest, Hants; in similar spots in Dorset; rarely in one locality in Cheshire, and more frequently on some bogs near York, where in 1891 it was even abundant. This appears to be the extent of its range in these islands.

Abroad it is widely distributed through Central Europe, Middle and Northern Italy, Dalmatia, Livonia, Finland, and

South-east Russia ; and it is one of the species which extend to Japan.

Genus 30. **EUPITHECIA.**

Antennæ simple ; palpi blunt ; head smooth ; thorax usually furnished with a minute tuft or crest at the back ; abdomen slender and smooth, rather short ; fore wings blunt, the apex rounded, the discal cell one half the length of the wings ; hind wings broad, rounded behind, even at the edges, veins 7 and 8 joined far down their length.

LARVÆ usually rather short, without humps or excrescences, the vast majority feeding on flowers, seed-vessels, or seeds.

PUPÆ short, evenly rounded, not acutely pointed ; in rather tough earthen cocoons.

A table of this large genus of closely allied species is difficult of accomplishment, but that probably is no reason why it should not be attempted.

- A. Fore wings silvery grey or pale grey.
- B. Surface much divided by slender sinuous black lines.  
*E. venosata.*
- B<sup>2</sup>. Costa spotted, four times, with red-brown.  
*E. consignata.*
- B<sup>3</sup>. Surface obliquely striped with darker grey.
- C. Wings narrow, the stripes oblique, much angulated, dark and sharply defined.  
*E. nanata.*
- C<sup>2</sup>. Wings broad, trigonate, the stripes numerous, as rippled lines, oblique, not sharply angulated.  
*E. lariciata.*
- C<sup>3</sup>. Wings blunt, the stripes or lines more erect but ill-defined.  
*E. castigata.*
- A<sup>2</sup>. Fore wings having the ground colour white.
- D. Having a large blue-black discal blotch.  
*E. centaureata.*

- D<sup>2</sup>. Having a broad dark grey border. *E. succenturiata*.  
 D<sup>3</sup>. Cloudily bordered with brownish-grey. *E. subumbrata*.  
 D<sup>4</sup>. Having the costa and hind margin blotched with reddish-brown. *E. irriguata*.  
 D<sup>5</sup>. Having three very oblique broad black-brown or reddish-brown stripes. *E. cetersaria*.  
 A<sup>3</sup>. Fore wings with the ground colour green.  
 E. The green pale glaucous, the lines dotted with black. *E. debiliata*.  
 E<sup>2</sup>. Yellow-green, having a black > beyond the discal cell. *E. coronata*.  
 E<sup>3</sup>. Dark green or green-black, with a darker central band. *E. rectangularata*.  
 A<sup>4</sup>. Fore wings orange-tawny with a dark brown border. *E. subfulvata*.  
 A<sup>5</sup>. Fore wings whitish tawny.  
 F. Central band blue-black, complete. *E. linariata*.  
 F<sup>2</sup>. Central band grey-black much mottled with paler. *E. pulchellata*.  
 A<sup>6</sup>. Fore wings pale brownish buff. *E. subnotata*.  
 A<sup>7</sup>. Fore wings shining whitish drab, discal and two costal spots black. *E. expallidata*.  
 A<sup>8</sup>. Fore wings with ground colour whitish brown.  
 G. Wings ample; discal spot large, deep black; lines black and tawny. *E. togata*.  
 G<sup>2</sup>. Wings narrow, apex acutely rounded, discal spot very small.  
 H. Two red-brown clouds lie close to the apex. *E. pumilata*.  
 H<sup>2</sup>. Whole area having obscure, very oblique, parallel pale brown stripes. *E. subciliata*.  
 H<sup>3</sup>. Usual lines more erect and distinct, blackened, and showing black wedges. *E. dodoneata*.  
 A<sup>9</sup>. Fore wings reddish umbreous.  
 I. The transverse dark markings very obscure or absent.

- J. Discal spot deep black, other markings very faint.  
*E. campanulata.*
- J<sup>2</sup>. Discal spot sharply black, lines obscure, costal region suffused with grey.  
*E. pimpinellata.*
- J<sup>3</sup>. Discal spot obscure; markings dark, much mottled; a double white spot above the anal angle.  
*E. vulgata*
- J<sup>4</sup>. Discal spot a black streak, between two black costal spots.
- K. Fore wings rather ample. *E. absinthiata.*
- K.<sup>2</sup> Fore wings rather narrow and pointed. *E. minutata.*
- K<sup>3</sup>. Fore wings rather broadly ovate. *E. assimillata.*
- I<sup>2</sup>. Transverse markings conspicuous, streaked and dotted, wings long.  
*E. abbreviata.*
- A<sup>10</sup>. Fore wings dark umbreous or blackish-umbreous.
- L. Fore wings short, trigonate, without the discal spot.  
*E. pygmaea.*
- L<sup>2</sup>. Fore wings long and narrow, with very obscure markings.  
*E. jasioncata.*
- L<sup>3</sup>. Fore wings moderately ample; discal spot black, in a dotted central band.  
*E. helveticata.*
- A<sup>11</sup>. Fore wings pale brown.
- M. Base of the abdomen ochreous; fore wings small, ovate.  
*E. isogrammata.*
- N. Fore wings rippled with faint brown lines; discal spot absent.  
*E. plumbeolata.*
- N<sup>2</sup> Discal spot present, black; other markings obscure.
- O. Fore wings much elongated and narrow.  
*E. fraxinata.*
- O<sup>2</sup> Rather broader; a whitish double loop beyond the discal spot.  
*E. innotata.*
- O<sup>3</sup> Moderately broad; nervures dotted with black and white.  
*E. virgaureata.*
- O<sup>4</sup> Variable in breadth, having numerous oblique brown transverse lines.  
*E. satyrata.*
- A<sup>12</sup>. Fore wings grey-brown, thin and shining.

- P. The black discal spot is the only distinct marking.  
*E. indigata.*
- P<sup>2</sup>. Costa also spotted, transverse lines excessively slender.  
*E. constrictata.*
- P<sup>3</sup>. The transverse lines thick, dark brown, thickened on the costa.  
*E. pusillata.*
- P<sup>4</sup>. Discal spot absent.  
*E. calerianata.*
- P<sup>5</sup>. Discal spot obscure ; indicating, with two costal spots, a sort of triangle.  
*E. trisignata.*
- P<sup>6</sup>. Fore wings ovate, costa clouded with reddish brown.  
*E. tenuiata.*
- A<sup>13</sup>. Fore wings dull grey-brown, not thinly scaled.
- Q. A round white spot above anal angle, often others in subterminal line.  
*E. albipunctata.*
- Q<sup>2</sup>. The first of two oblique black transverse lines crosses the central spot.  
*E. sobrinata.*
- Q<sup>3</sup>. Three dull umbreous clouds lie along the hind margin.  
*E. exigua.*

*E. abbreviata* and *E. dodonata* are much alike, but the fore wings of the latter are decidedly shorter than in the other.

The moths in this genus sit when at rest with fore and hind wings spread to their utmost width, and laid very flat upon the surface on which they are reposing ; often when disturbed they will merely lift the wings a little, run to another spot, and after a few alternate liftings and depressions of the wings, settle down again.

1. **E. togata**, *Fab.*—Expanse 1 to 1½ inch. Fore wings ample, whitish brown, the discal spot, costal spots and first and second lines black ; with basal and subterminal red-brown stripes. Hind wings somewhat similar.

Antennæ of the male short, thick, very minutely ciliated, black-brown, the back silvery white ; palpi cleaver-shaped and rather prominent, black-brown ; head brownish-white ; neck ridge and thorax pale umbreous shaded with white ; abdomen shining whitish-brown with faint fulvous bars on the anterior

segments; dorsal ridge with a minute black tuft on the edge of each segment except the last; lateral and anal tufts rather compressed. Fore wings broad, ample, and rather blunt; costa arched throughout, but especially at the apex, which is almost angulated; hind margin not very oblique, curved and slightly uneven; anal angle rather prominent; dorsal margin straight; colour whitish-brown, shaded with fulvous or red-brown; basal line black, bluntly angulated outwards, and followed at a short distance by a faint red-brown band; first line slender, obscurely black, much angulated on the nervures; immediately beyond it is a black-brown central stripe, broadest and blackest at the costa and enclosing the large deep black discal spot, below this very much more slender; second line rather erect, black-brown, blackened at the costa and on every nervure, followed by a sinuous rivulet of the whitish ground colour, which is intersected throughout by a faint brown thread; beyond this is a broad shaded reddish-brown or purplish-brown stripe, and then the hind marginal area dusted and clouded with tawny and grey-brown, through which runs a much angulated white subterminal line; extreme hind margin edged by thick black streaks which are separated by whitish dots; cilia pale brown with darker clouding and dashes. Hind wings rather broad; the hind margin sinuous and somewhat angulated at the apex, middle, and anal corner, white shaded with brown; central spot small, black; from the base to the anal angle, arising on the dorsal margin, is a succession of partial rippled brown lines and stripes, that one which coincides with the second line of the fore wings being thicker, blacker, and more complete than the rest, but those following, though fainter, are nearly complete; extreme hind margin edged with thick black streaks; cilia brownish-white. Female larger, often whiter, but the markings more emphasised, and the red-brown or purplish-brown tints more decided, otherwise similar.

Underside of the fore wings white, shaded in the middle with smoky-grey; discal spot large, black; second line

black and distinct, followed by a parallel smoky-brown line. Hind wings white; central spot black; followed by two complete, equidistant, smoky-brown transverse lines. Body and legs whitish-brown.

Rather variable in the degree in which the ground colour is obscured by purplish-brown or red-brown clouding, and in the distinctness, or faintness, of the transverse lines; this last is probably a climatal distinction, Scottish specimens being more strongly marked than those from the South of England. There is also great disparity in size, some specimens from the north, occurring in company with those of full dimensions, being of less than one-half, or even one-third of that size, but corresponding in a singular manner, in that respect, with a closely allied species, known as *E. abietaria*, which occurs on the Continent. But for the far longer, more drooping palpi in the latter species, it would be difficult to find a distinguishing character.

On the wing in June and July, but occasionally at the end of May.

LARVA very sluggish, short and thick, the skin wrinkled; dirty white or dull pink, clouded above with black; raised spots black, each with a distinct bristle; head black; dorsal plate very dark brown; dorsal, subdorsal, and spiracular lines slender, white, very indistinct, sometimes hardly perceptible. When younger more of a dirty brown colour.

July and August in the cones of spruce fir, feeding upon the unripe seeds; extruding its excrement through a hole in the surface of the cone. In the absence of cones it will feed in the pith of the shoots or in a damaged shoot, and when young hollows out the buds.

PUPA bright red-brown, in a tough cocoon in the earth.

An exceedingly local species, only to be found in any reliable manner, or in any number, about large spruce firs; but apparently of a migratory habit, since single casual speci-

mens have been taken in many unexpected places. Usually it sits during the day in the branches of its food-tree, and may then be beaten out and secured, but its usual natural flight is at night about the trees. In Scotland it is reported to hide by day among the lichens upon these trees.

First noticed in this country in the year 1845 at Black Park, Bucks, and for some years this continued to be its only known locality with us. This may have arisen from want of observation elsewhere, but there is good reason for the belief that it has greatly extended its range in these islands within a very recent period. Now it is tolerably common in the New Forest, Hants; has been taken near Devizes, Wilts, and once at Savernake Forest in the same county. One specimen was secured by the Rev. C. T. Cruttwell by beating a hedge close to the coast at Southwold, Suffolk; and it has been taken at Brandon, and at Dovercourt, Essex; one specimen at Wisbech, Cambs; one in Yorkshire, and one at Darlington, Durham. In Scotland it is not scarce in Roxburghshire, where it was found by Mr. Adam Elliot; rather frequent at Aviemore, in Inverness-shire; plentiful at Moncrieffe Hill and elsewhere in Perthshire; and to be found in other places in the districts of the Tweed, Clyde, and Tay. In Ireland Mr. Kane considers it to be an introduced species, and says that it is spreading over an extensive area as a result of the planting of spruce firs; Captain Donovan finds it commonly in the County Cork, and it is frequent near Mullingar, Westmeath; found also in Monaghan, Kings County, Meath, Sligo, Galway, Kerry, Roscommon, and Fermanagh, in some cases only—as in England—singly.

Abroad it ranges over the greater portion of Central and Northern Europe.

2. **E. venosata**, *Fab.*—Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch. Fore wings pale brownish-grey, silvery-grey, or leaden-grey, laced with numerous slender black transverse lines which curve,

and bend, and join slender lines on the nervures. Hind wings smoky whitish-brown.

Antennæ of the male short, thick, densely ciliated, grey; palpi short and blunt, dark brown; face flattened, whitish-grey; head and neck-ridge tinged with fulvous; thorax smooth, pale grey; abdomen pointed, brownish-grey, with slender black bars across the first two segments; anal tuft small. Fore wings elongated, the costa a little arched at the base and apex, otherwise nearly straight; apex bluntly rounded; hind margin long and evenly curved; dorsal margin also a little rounded; colour pale silvery-grey, leaden-grey, or brownish-grey; basal line black, slender but distinct, once angulated outwards; first line triple, black, sinuous, and sharply angulated below the middle; second line also triple, sinuous, very oblique, angulated at every nervure; the interspaces between each of these triple lines paler than the ground colour; between the first and second is an equally black, slender single line, more direct, yet bent outwards, so as to touch the elongated perpendicular black discal spot; all these lines are thickened and very black on the costa: the nervures of the middle area and also beyond the second line blackened;—these markings, which are clear and sharp, give the wings a beautifully laced aspect—extreme margin edged by a black line; cilia whitish-grey. Hind wings not elongated, rounded behind, greyish-white; the base and the nervures faintly dusted with grey or black; from the dorsal margin arise partial, black, much angulated, transverse lines; the outer two of which proceed farthest yet do not fully cross the wing; extreme hind margin edged by a black line; cilia white. Female similar.

Underside of the fore wings pale grey-brown, with the costa more ashy-grey; all the black beginnings of the lines on the costa distinct, and their continuation faintly traced; discal spot long, black. Hind wings greyish-white; central spot visible, black, the lines of the upper side more definite.

Extremely liable to local variation. A race found com-

monly near Llangollen, and elsewhere on mountainous portions of North Wales, has lost the grey or silver-grey tone of ground colour, and has become pale brown of a peculiar soft tone, but with the black transverse lines rather less distinct, while the whitish stripes of the triple first and second lines are clearer. In the Isle of Man a rather pale tone of the normal ground colour obtains. In the Hebrides, with an intermediate pale grey-brown ground colour, the delicate black lines become thickened, and of a deeper black, and very striking; in the Orkneys the colour is lighter, brighter brown, even yellow-brown or olive-brown, but the lines not more than usually black; and in Shetland, along with a paler, more drab-brown tone of ground colour, the delicate transverse lines and even their costal commencements become more and more indistinct, until, in some specimens, they are quite obliterated, the whole wing is soft smooth pale brown, the discal spot itself, and the blackening of the nervures, being hardly observable. Others from the same islands have the lines blue-black and thickened with black clouding; while others again, are of a smoky slate colour with obscure markings. In the West of Ireland there is a similar tendency to brown colouring, but without the whitish interstripes; and Mr. Kane has reared a specimen of a blackish-brown colour, with the lines obsolete, from a larva found in Galway.

On the wing in May and June.

LARVA short and thick. hinder segments rather the stouter; head rounded, black or black-brown; whole dorsal region dull leaden-grey, grey-brown, or pale smoky-brown; dorsal and subdorsal lines visible in the paler specimens and of a darker brown, thickened in the middle of each segment; spiracular region and undersurface dusky greenish-white or yellowish-white; legs black. When very young entirely black.

June till the beginning of August on the seeds of *Silene inflata*, *S. maritima*, and other species of catchfly; possibly

also, rarely on those of *Lychnis dioica*; feeding within the large capsule, and apparently making this its constant residence.

PUPA bright red, or shining yellow-brown, the cremaster darker and furnished with numerous fine bristles; in a slight cocoon in the earth. Not more particularly described. In this condition through the winter, sometimes through two winters.

The moth hides during the day among, or close to, its food-plant, always among herbage, and is difficult to find at that time, refusing to fly, and merely hiding more closely among the herbage. It is scarcely ever seen while at rest. It flies at late dusk, but from its obscure tints is difficult to see, so that although not at all scarce, it is rarely taken in any plenty. Its larva, however, is collected with perfect ease in the seed capsules; and although much infested with ichneumons, is the principal means by which the series in our cabinets are supplied. Its favourite haunts are on the chalk, and other cretaceous soils, on which its food-plant, *Silene inflata*, is plentiful; and on the coast rocks, where *Silene maritima* occurs in its great masses; but the former plant having a wide though more sparing distribution on other soils, allows the insect to be widely distributed, so that it seems to occur in almost every English county to Yorkshire and Westmoreland. In South Wales it is found not uncommonly to Pembrokeshire, and in North Wales on the mountains, as well as along the coast; and it seems to be common in the Isle of Man. In Scotland it is found on the coast in Kirkcudbright, and in Aberdeenshire, Inverness-shire, and Moray, doubtless wherever there is suitable *Silene*-clad coast, and certainly in the Hebrides, Orkneys, and Shetland Isles. In Ireland it is widely distributed—probably everywhere in suitable spots. Abroad it is found over the greater portion of the Continent of Europe, and in Syria, Pontus, and Bithynia.

3. **E. consignata**, *Blk.*; **insigniata**, *Staud. Cat.*—  
 Expanse  $\frac{7}{8}$  inch (22 mm.). Fore wings whitish-grey, faintly  
 laced with slender lines; discal spot large, black; on the  
 costa are four red-brown blotches. Hind wings brownish-  
 white.

Antennæ short, slender, simple, light brown; palpi short  
 and thick, black-brown; head smooth, silvery-grey; thorax  
 dark reddish-brown, with silvery dusting; abdomen red-  
 brown, with a silvery-grey line down the back and minute  
 raised tufts at the edges of the segments; lateral tufts paler;  
 anal tuft thick but compressed. Fore wings long, costa very  
 gently curved; apex bluntly angulated; hind margin oblique  
 and gently rounded, the curve extending to the dorsal margin,  
 which also is a little full; colour pale silvery-grey; basal  
 line erect, black, but obscure, enclosing a basal tawny cloud;  
 first line very faint, yet double or triple—a mere indication  
 of reddish-brown lines enclosing an erect white faint stripe;  
 before this is a distinct costal tawny or red-brown cloud;  
 discal spot an erect deep black streak joined to a reddish-  
 brown cloud or double blotch, which lies along the middle  
 area of the costa; second line double, faint, reddish-brown,  
 much curved outwardly toward the hind margin; beyond it  
 is a conspicuous trigonate red-brown spot on the costa, and  
 below a dot or two of the same colour; nervures and dorsal  
 margin faintly dusted with reddish-brown; hind margin  
 shaded with faint grey-brown, and edged by a joined, parallel,  
 black and white line; cilia silvery-grey, dashed with brown.  
 Hind wings small, the hind margin flatly rounded, white  
 dusted with brown; central spot black; beyond the middle  
 is a rippled brown double transverse line; hind margin  
 edged with black streaks; cilia greyish-white. Female  
 quite similar.

Underside of the fore wings silvery-grey with the discal  
 spot and costal blotches repeated in dull black, and the  
 nervures and lines faintly indicated. Hind wings white,  
 shaded with grey, especially around the hind margin; central

spot black. Body and legs brownish-grey, the tarsi black-brown, barred with white.

Very constant in colour and markings.

On the wing in April and May.

LARVA long, slender, tapering slightly towards the head, which is somewhat broad, green, very slightly marked with purplish-red; body somewhat wrinkled, studded with a very few short whitish hairs; ground colour grass-green, slightly tinged with yellow; segmental divisions yellowish; dorsal line very slender, dark purplish-red, enlarged at the base of each segment into a spear-head shaped blotch; these dorsal blotches are bordered with yellow, and become confluent on the capital and caudal segments; spiracular line puffed and rather paler green than the rest of the body, blotched into purplish-red on a few of the middle segments of the body, and more or less bordered with straw-colour; central ventral line whitish.

End of May and June; on apple, feeding on the blossoms and also upon the leaves. It has been known to feed on whitethorn; and Hofmann adds blackthorn and raspberry. When young it bears a close resemblance to a stamen of an apple blossom. (Rev. H. H. Crewe.)

PUPA apparently undescribed. The Rev. Joseph Greene says that it is quite unlike that of any other *Eupithecia* with which he is acquainted, but much more like that of a *Tortrix*, very long and slender, and twisting the abdominal portion in a very active manner. It has been found under apple bark.

The winter is passed in this state.

The moth frequents orchards, keeping apparently about the upper branches of apple trees, and is very rarely seen in the daytime—or even at night, except when, as occasionally happens, it visits a neighbouring lamp, attracted by the light. It had long been known as a rare species in this country, when, in 1874, Mrs. Hutchinson, of Grantsfield, near

Leominster, Herefordshire, had the good fortune to see a specimen sitting in the upper part of one of the apple trees in her orchard, which was cleverly secured by her youngest daughter. It proved most fortunately to be a female, and began the same day to lay eggs. This occurred on May 4th, and continued slowly till the 20th, by which date thirty had been laid, and some of the first laid had hatched. From this small beginning resulted not only the larvæ from which the above description was made, but also nearly all the specimens which now ornament our collections; the race having been carried on by Mrs. Hutchinson from year to year, with but one opportunity for the introduction of a fresh strain for twenty-two years at least, and probably till the present time. This large amount of success has been in part obtained by feeding the larvæ, in gauze sleeves or bags, on the trees. During all this time the specimens so reared have emerged from pupa earlier in the spring than the wild race. With this exception always a rarity in these Islands, yet found—besides Herefordshire—in Surrey once; twice each in Sussex and Kent; once in Wilts; also in Berks, Somerset, Gloucestershire, Bucks, Worcestershire, Huntingdonshire, Cambridgeshire, Suffolk, and Norfolk, generally singly. This apparent rarity doubtless arises from its habit of keeping about the tops of the apple-trees; it *may* also account for the absence of any indication of a wider range in these Islands. Abroad it is known to occur in Belgium, France, Germany, Switzerland, Northern Italy, Corsica, Dalmatia, and Central Russia.

4. **E. extensaria**, *Err.*—Expanse  $\frac{3}{4}$  to  $1\frac{1}{8}$  inch. Fore wings very long, the apex extended; white, with three very oblique parallel broad brown stripes dusted with black, pointing in the direction of the apex; costa streaked with black. Hind wings greyish-white.

Antennæ of the male rather thick, simple, densely ciliated, brown, the back whiter; palpi short, whitish-brown; head

and neck-ridge white; thorax smooth, mixed pale brown and white; abdomen short, rather thick, ashy-white with a series of minute brown tufts down the dorsal ridge, and on each side of these a line of brown clouds; lateral and anal tufts small and compressed. Fore wings long, the apical portion much produced; costa nearly straight; apex bluntly rounded; hind margin very long and oblique, gently curved; dorsal margin rather short, also curved; colour white shaded with light brown; all the markings so extremely oblique as to be with difficulty allotted in the usual formula—near the base are two, closely following, pale brown lines lying obliquely outwards but merging into a brown cloud on the costa; first line parallel with these, double, and forming a brown stripe, arising on the dorsal margin as two black streaks, again blackened on the median nervure, and a little so where bent up to the costa; beyond is another brown stripe, almost parallel, of the same width, and blackened on the nervures; and beyond this a third, not far from the hind margin, each of these making a more or less distinct bend back at the subcostal nervure to meet dashes of brown from the costa; the second line *seems* to be represented by the white inter-stripe between the second and third last mentioned, but it cuts through the third and throws a white dash into the apex of the wing; hind margin clouded with brown, in which is the subterminal line, white and edged inwardly by smoky-black clouding; cilia white or greyish-white, spotted with smoky-black. Hind wings rather elongated, rounded behind, white faintly clouded with grey but having beyond the middle a clear white transverse stripe, distinct in the grey clouding, or even preceded and followed by dark grey-brown shades; cilia white, spotted with brown-black. Female very similar, but often having the markings and hind wings darker.

Underside of the fore wings light umbreous, with the nervures darker; some costal dashes, a very oblique straight stripe beyond the middle, and the hind margin nearly white;

cilia spotted with brown. Hind wings rather darker brown, with a curved and elbowed transverse white stripe beyond the middle, and a fainter one close to the hind margin; cilia white with brown spots.

A striking and unusually handsome species; not very variable, but the stripes ranging from very pale brown almost without black dots or dashes, to slate-grey with strong black accentuations. Occasional specimens are quite strikingly white; others having darker stripes, also have those of the middle of the fore wings drawn nearer together, so as to form a rather definite central band, rendered more conspicuous by the paler tint of the remaining markings.

On the wing in June and July.

LARVA elongated and not very slender; head rounded, green, the mouth pinkish-brown; body bright green; dorsal line faintly darker; subdorsal lines broad, white or greyish-white; spiracular line also broad, white, edged beneath with pinkish-brown; undersurface green, with a slender middle white longitudinal line; legs pinkish-brown; prolegs green, swollen and glassy.

End of July till September; on *Artemisia maritima* (sea-wormwood), eating the buds, blossoms, and leaves; feeding principally at night; remaining during the day closely twisted in the flower spike among the leaves and blossoms. Here its colour and markings exhibit a wonderfully close mimicry of those of its food plant, the white longitudinal stripe on a green ground exactly resembling the grooves filled with silky white hairs down the green sprays and foot stalks of the *Artemisia*, while the pinkish-brown colour of the mouth and feet is exactly that of the opening buds of the plant. In connection with this a curious observation has been made by Mr. G. T. Porritt. Larvæ which he found on the Norfolk coast, upon this plant, were as described—green with white lines and pinkish-brown mouth and legs—these were reared, and from the resulting moths eggs were

obtained in large numbers ; the produced larvæ were fed upon *Artemisia abrotanum*, the Southernwood, so commonly grown in gardens, which does not produce bud or blossom in this country ; and the larvæ—400 in number—showed *no trace* of the pinkish-brown markings of their predecessors. This change in no way affected the appearance of the moths.

PUPA short and compact, rather truncate in front, wing- and limb-covers smooth and shining ; dorsal and abdominal segments well marked but not pitted, glossy, the hinder edges rather more dull ; spiracles distinct, anal segment swollen ; cremaster very short, flattened and lunate, furnished with a few strong bristles ; colour chestnut-brown ; cremaster darker brown ; wing-covers bright green. In a small, compact, ovate cocoon of silk and earth, at the surface of the ground.

The moth hides during the day among its food plant, but may be disturbed by the beating stick or by the foot, and will then fly sharply a short distance, to hide in a similar place. Its natural flight is doubtless at night, but has not, I think, been noticed. It has only been known as an inhabitant of these Islands for the last few years. The first specimen was captured in Yorkshire about the year 1874, and was recognised and recorded by the late Mr. H. Doubleday. About the same time another was taken at Spurn Point in the same county, but was not recognised till eight or ten years later. These appear to have been the only known British examples until 1887, when on July 19th Mr. E. A. Atmore, of King's Lynn, and my eldest son, being at a spot on the Norfolk coast in which *Artemisia maritima* is abundant, had the good fortune to disturb and capture several specimens. This was followed by search for larvæ later in the season, and these being fortunately found in some plenty, quite unmolested by Ichneumon parasites, and extremely docile in feeding up in confinement, specimens of the moth soon

found their way into many collections. Subsequently the larva was found to exist on various parts of the Norfolk coast, though always confined to very limited areas, usually of but a few yards extent, although the food plant might be in plenty for miles. So far as I *know*, the coasts of these two counties, Norfolk and Yorkshire, constitute its range in the British Isles, yet a rumour has been heard of captures on the shores of the estuary of the Thames, and its discovery on any part of our eastern coasts would cause little surprise. There is scarcely any doubt in my own mind that it is a recent immigrant to our coasts, and its extensive spread is reasonably probable.

Abroad it is understood to inhabit Lapland, some parts of Russia, Siberia, Armenia, and the mountainous regions of Central Asia.

5. **E. pulchellata**, *Steph.*—Expanse  $\frac{7}{8}$  inch (23 mm.). Fore wings elongated, brownish-white shaded with chestnut; central band mottled grey and black; discal spot distinct, black; cilia chequered. Hind wings smoky-white with grey bands.

Antennæ of the male slender, short, simple, hardly ciliated, brown; palpi small and slender, black-brown; face smooth, orange-brown; head, neck-ridge and thorax tawny or yellow-brown; abdomen of the same colour, small and tapering, the segments edged with dull black; anal tuft small and pointed. Fore wings elongate; costa nearly straight to beyond the middle, thence the curve runs round the apex and hind margin; dorsal margin straighter; colour brownish-white or yellowish-buff, clouded with fulvous; basal line irregular, curved, black, edged outside with white; the basal space dusted with black; first line slender, much angulated and curved, black; immediately beyond, only separated by a whitish line, is a broad central band of dark smoky brown, pointed up on the costa and nervures with black or blue-black, also on the latter with intermediate dots of white; discal spot, placed in this

band, deep black, elongated and erect; just beyond this and still within the band is a slender whitish rivulet line; second line composed of dusky atoms placed just beyond the band, parallel with it and only separated by a white line; hind marginal region dusted with grey-black in blotches above and below the middle, and broadly and beautifully clouded and blotched with rich fulvous or chestnut, through which runs a slender irregular yellowish-white subterminal line; extreme hind margin edged by short parallel black and white streaks; cilia brownish-white chequered with black spots clouded outwardly. Hind wings smoky-white, with a series of partial smoky-brown transverse stripes arising on the dorsal margin, that at the middle of the wing continued as a line of smoky-black dots; those beyond it massed into a marginal smoky band, interrupted by white dots; central spot black; cilia white spotted with black. Female similar.

Undersides of all the wings glossy smoke-colour; costa of the fore wings spotted with black; discal spot and two following curved lines smoky-black. Hind wings very similar. Body and legs whitish-brown, the latter darker in front.

Variable in the width of the central band of the fore wings, and in the depth of its colour, it sometimes being partially broken or clouded with tawny and dusted with white; there is also some diversity in the shade of tawny clouding; in Wales both are sometimes very pale. In Scotland the ground colour alone is sometimes very white, but, on the other hand, Shetland specimens are greatly darkened, the central band much shaded with blue-black, and narrow bands near the base and hind margin similarly dark.

On the wing at the end of May and in June.

LARVA. Head brown, marked with lines of a dingy shade; on the collar is a blackish spot; general colour dull yellowish-green; dorsal line broad, continuous, dull, dingy purple;

subdorsal lines of the same colour, narrow, interrupted on the anal segment; spiracular line narrow, broken, also dingy purple; undersurface whitish-green with a white central line; whole body thickly studded with whitish hairs, and occasionally suffused with dull, dingy purple.

Or—Ground colour dull yellowish or whitish-green; dorsal line dusky green; subdorsal lines similar; spiracular line dull green, very narrow and faint; segmental divisions yellowish; undersurface whitish-green, without markings.

Or—Ground colour pale primrose, slightly suffused with green; dorsal line dull faint green, almost invisible on the posterior segments; subdorsal lines of the same colour, much broken, having more the appearance of detached spots; spiracular line very faint, pale yellow; undersurface whitish.

Or—Ground colour bright yellowish-green; dorsal line broad, pale olive; subdorsal lines narrow, similar in colour; spaces between these lines bright yellow; spiracular line faint, broken, dusky-green; undersurface sea-green. (Rev. H. H. Crewe.)

Some far darker forms are figured by Mr. W. Buckler, pale yellow-brown, or olive-brown, with the dorsal stripe very broad, blackish-brown and broken into a squared blotch on each segment, or narrower and unbroken but barred with black-brown blotches which pass down the middles of the segments to the spiracles; or with the black-brown stripe merely constricted from segment to segment. Larvæ found by Mr. McArthur in the Orkney Isles are described by him as nearly black.

Latter part of June till the beginning of August; upon foxglove (*Digitalis purpurea*); living within the blossom, the lips of which it unites with silk, so that it is unable to open, and remains, in appearance, a bud just ready to expand. Within this the larva devours the pistil, stamens, and unripe seeds. Its entrance is effected by biting through the side of the large bud.

PUPA rather slender, the tongue-case long, limb-covers sculptured with cross striae; wing-covers faintly and irregularly wrinkled or roughened, yet very glossy, the nervures raised; dorsal and abdominal segments narrowly pitted, the smooth margins rather broad; anal segment fully rounded; cremaster conical and running to a rather long pointed spike; wing-covers and front portion light green; dorsal and abdominal regions light brown; cremaster deeper brown. In a soft cocoon of silk and earth, in the ground.

In this condition through the winter; sometimes through two winters.

The moth sits during the day on the ground or on stones or rocks, keeping almost always among its food plant, and is quite unwilling to fly at this time. At dusk it flies over the foxgloves and is then easily captured. It has also been taken at light. Formerly an inhabitant of the outskirts of London, but now not to be found there, and the foxgloves of the parks show no sign of its presence. Otherwise to be found wherever these handsome plants abound throughout England to Yorkshire in the east and to Cumberland in the west; probably also throughout Wales, though I only know of its occurrence in the South. In Scotland it has a wide range, through the Solway district, Ayrshire, and other parts of the Clyde Valley; Perthshire, where it attains an elevation of upwards of 600 feet on the mountains; and from the districts of the Forth and Dee, to Argyle, Sutherlandshire; also in the Orkneys and Shetlands. In Ireland it has probably the distribution of its food plant, and is known to occur in the County Dublin, in Cork, Kerry, Galway, Sligo, Monaghan, Fermanagh, Tyrone, Donegal, and Derry. Its range abroad is small—Spain, Central and Western France, and Central and East Germany.

6. **E. linariata**, *Schiff.*—Expanse  $\frac{3}{4}$  inch (18 to 20 mm.). Fore wings blunt, tawny-white clouded with fawn colour;

central band bluish-grey or bluish-black; discal spot black but obscure. Hind wings smoky-white, clouded with grey.

Antennæ of the male simple, ciliated, dark brown; palpi short, black-brown, face and head purplish-brown; thorax tawny; abdomen small, slender, whitish-tawny, with a row of deep black dots or minute tufts down the dorsal ridge; anal tuft compressed. Fore wings but little elongated; costa faintly curved, more so towards the apex, which is rounded; hind margin also rounded, but the anal angle well marked; dorsal margin nearly straight, strongly ciliated; creamy pale buff or tawny-white clouded with fawn colour; at the base is a black streak along the costa; the outer edge of this, with a black dot on the median nervure, and a tawny dot on the subdorsal, indicate the basal line; in the middle of the wing is a strongly marked bluish-black or blue-grey central band, deep black on the costa and nervures, and the discal spot the same; on each side of this band is a slender, nearly parallel, line of blackish dusting, one forming an indented first, and the other a curved and rather sinuous second line; the pale space before the first line is richly and broadly clouded with bright fulvous, and the space beyond the second more narrowly so; hind-marginal area clouded or banded with rich tawny-red, in which are two blackish blotches, one over the anal angle, the other just above the middle, the nervures also being dashed with black; through all this runs a whitish, roughly clouded subterminal line; extreme hind margin edged with black streaks; cilia tawny-grey faintly spotted with brown. Hind wings small, rounded behind, smoky-white, mottled from the dorsal margin with grey, and along the hind margin with fulvous and grey; across the middle is a white band; hind margin streaked with black; cilia smoky-white, faintly spotted with black. Female similar.

Underside of the fore wings pale smoke colour, with a broad yellowish-white band beyond the middle; costa spotted with black; discal spot also black; nervures blackened; the

white subterminal line just perceptible. Hind wings pale smoky-grey dusted with black; central spot black; a white band beyond the middle is preceded and succeeded by bands of black streaks on the nervures and intermediate smoky clouding. Body and legs pale brown.

Very constant in colour and markings.

May and June; sometimes a partial second brood appears late in August or in September.

LARVA short and thick, slightly tapering towards the head, which is nearly black; yellowish-green with a series of large dull olive or rust-coloured dorsal spots or bars running the whole length, and bordered on either side by a dusky olive line; undersurface dusky; spiracles black; body sprinkled with short whitish hairs, and here and there studded with black tubercles. The dorsal markings are often very indistinct, and sometimes wanting altogether, the larva being then uniform yellowish-green. When young it is bright yellow, with blackish dorsal spots. (Rev. H. H. Crewe.)

August and September in the flowers of the common yellow toad-flax, or, as Mr. Crewe calls it, wild snapdragon (*Linaria vulgaris*), feeding on the anthers and seed vessel. It has also been found in gardens feeding on the seeds of *Antirrhinum*.

Very easily collected by the simple process of plucking a bunch of the common yellow toad-flax and taking it home. The larvæ, which are so effectually hidden within the blossoms as never to be seen without careful search and the breaking up of the flowers, leave at night when full fed and spin up in any corner, so that the first intimation that you have collected the larvæ may be—and has been—the sight of the moth, sitting on the ceiling of the room, its pretty wings laid flat, and its abdomen slightly curled up.

PUPA reddish-yellow, anal tip blood-red; thorax and wing-cases olive-green. In an earthen cocoon. (H. H. Crewe.)

In this state through the winter.

The moth doubtless hides during the day among its food plant, but is rarely seen at that time, and perhaps never induced then to fly. Its natural flight at dusk seems to be also seldom observed, and nearly all the specimens in collections have been reared in confinement. Probably this may arise from the great ease with which it is fed up and so obtained; there can be no reason to suppose that it could not be collected by watching the patches of its food plant at late dusk, but it would then be very obscure upon the wing.

It very closely resembles *E. pulchellata*, but is smaller, and its markings are darker and more sharply defined, the central band being very perfect.

Apparently common throughout the Southern half of England with the Eastern and Western Counties, with possibly the exception of Cornwall, yet this is more probably an absence of observation. It is less common in the Midlands, but extends to Cheshire and Yorkshire. Doubtless also throughout Wales, since it has been found at Dolgelly and Colwyn Bay, and I met with it pretty commonly in Pembrokeshire. In Scotland there is a single record—at Inverurie, Aberdeenshire—which, I think, requires confirmation. Dr. White did not know it as a Scottish species. The single record in Ireland—at Howth, Dublin, by Mr. Fetherstonhaugh—may refer to a specimen accidentally introduced.

Abroad it has a far more considerable range than the last species, through Central Europe, Spain, Northern Italy, Corsica, Livonia, some part of Finland, and South-east Russia.

7. **E. centaureata**, *Schiff.*; **oblongata**, *Staud. Cat.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings chalky-white; discal spot black in a large blue-grey costal blotch. Hind wings white with grey shading.

Antennæ of the male slender, simple, minutely ciliated, brown; palpi short and blunt, black-brown; head and face

purple-brown, with a white circlet round each antenna; neck-ridge brown; thorax white; abdomen brown thickly dusted with white, and having down the dorsal ridge a row of raised tufts, black in front, white behind; basal segment and anal tuft chalky-white. Fore wings elongated, narrow, costa very flatly curved; apex bluntly rounded; hind margin long and very oblique, but little curved; dorsal margin rather rounded; chalky-white clouded towards the dorsal and hind margins with grey; costa clouded with a series of smoky-black blotches; basal line only indicated by a black dot on the median nervure; first line only by one or two faint black streaks; second line more visible, exceedingly slender, oblique but curved back to the costa and forming black dots on the nervures; discal spot deep black, erect, lunate, joined outwardly to a broad, somewhat kidney-shaped blotch from the costa to the middle of the wing; along the dorsal margin is a series of cloudy black dots; subterminal line white, rippled, distinctly visible as it passes through a yellowish-grey or pale grey hind-marginal cloud; cilia white clouded with large greyish spots. Hind wings rather small, rounded behind, white; central spot black; dorsal margin barred with grey-black streaks; hind margin faintly dusted with smoky-brown, in which is a rippled faint white line; cilia white dusted faintly with smoke colour. Female similar.

Underside of the fore wings smoky-white, with black clouding along the costal area, and more faintly along the hind-marginal; discal spot black. Hind wings white, with a series of six dotted, shaded, and rippled smoky-black transverse lines, most distinct on the margins; central spot black; cilia white spotted with black. Body and legs white, but the tarsi brown.

A little variable in the whiteness of the wings, or in their being softly clouded with grey or yellow-grey; also in the size and darkness of the large reniform blotch; in rare instances, occurring principally in the London district and

in a second generation, this blotch is extended into a smoky-black transverse band, the lines at the same time becoming more definite and distinct, and a slender central line making its appearance. Still more rarely specimens have been found having this blotch diminished to little more than the discal spot.

On the wing from May till August, but a partial second generation seems to be produced occasionally from the eggs of the May or June specimens, emerging from August to October.

LARVA long, rather slender, tapering towards the head, skin slightly wrinkled; bright yellowish- or bluish-green, with a number of dorsal and subdorsal spots and lines of a darker shade, the dorsal markings very often forming a series of disjointed lozenge-shaped marks.

Or—Uniform yellowish or bluish-green, without any spots or markings whatever.

Or—Greenish or pinkish-white with a chain of deep red, trident-shaped dorsal spots, connected together by the central prong, and becoming confluent toward the head; undersurface whitish, with a short red line or spot in the middle of some of the segments.

Or—Mealy green; the dorsal line very indistinct, darker green; evanescent on all but the capital segments, subdorsal lines scarcely visible, dull green; spiracular line yellowish-white; segmental divisions of the same colour; undersurface destitute of markings. (Rev. H. H. Crewe.)

Mr. Buckler's figures show a still wider diversity—ranging through various shades of green, yellow, grey, slate-grey, purple-grey and greyish-white, without markings, with only a dorsal stripe, purple, purple-black or purple-red; and with this and lateral markings of pink, purple or purple-brown. The head is usually of the ground colour of the body, or a little paler.

July to September, on the flowers of different species of

ragwort (*Senecio jacobaea*, *S. vulgaris* and *S. crucifolia*), golden-rod (*Solidago*) both native and cultivated, yarrow, hemp-agrimony, knapweed, *Pimpinella magna* and *P. saxifraga*, *Silaus pratensis*, *Cicuta virosa*, *Campanula glomerata*, *Scabiosa columbaria*, *Clematis*, the seeds of *Plantago major*, and the blossoms of other plants, both wild and in gardens. Very often to be seen sitting in the middle of the disk of the flower.

PUPA short and thick, wing-covers thickened at the edges, veined and abundantly sculptured with minute, irregular incised lines, and not glossy; limb-cases similarly sculptured, lying very close; eye-covers protruded; dorsal portion of the thorax dull from minute pitting, and segments, both dorsal and abdominal, similarly pitted, with the exception of the hind band of each, which is smooth; anal segment rather embossed; colour pale ochreous-brown; abdominal segments red-brown; cremaster darker—a broad thick spike, covered with rough points and small spines. In a cocoon of silk and earth, in the ground. In this condition through the winter.

The moth may be seen at almost any time through the summer, in the daytime, sitting on posts, fences, rails, or walls in gardens, in town or country, its white wings fully outspread and its abdomen rather curled up, yet it doubtless escapes ordinary observation from its accurate resemblance to a bird's dropping. Often it will sit in the same manner on the stems and leaves of thistles and other coarse plants. If disturbed it will not fly far, and often will just lift its wings and run a short distance, to again press itself close to any surface. At dusk it flies gently, and usually frequents flowers, especially those of ragwort, wood-sage, or garden flowers; later it will come to light, or to the sugar used for attracting *Noctue*.

Common in the gardens of the London suburbs, and of other cities and towns, also tolerably plentiful throughout

the southern half of England, with the Eastern and Western counties to the Scilly Isles; rather scarce in the Midlands, or in some parts of them apparently absent, yet present in Warwickshire and Derbyshire, and becoming again common in Yorkshire, Cheshire, and thence throughout the North of England. Doubtless also in most parts of Wales, though the only records that I find are that of Mr. Vivian in Glamorganshire, and my own in Pembrokeshire. In Scotland it is present in Ayrshire, Renfrew, and elsewhere in the Clydesdale district, in Fife and the Edinburgh district, and in Perthshire. In Ireland generally distributed to Derry. Abroad it inhabits the whole of Europe, except the boreal regions, being common at Gibraltar and in Turkey, yet apparently scarce in Portugal; also found in Asia Minor, Armenia, Syria, India, and the mountainous regions of Central Asia.

8. **E. succenturiata**, L.—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings white, all the margins mottled and clouded with grey or grey-brown; discal spot round, black. Hind wings white clouded with smoky-black.

Antennæ of the male rather thick, simple, ciliated, dark brown, faintly barred with white at the back; palpi short and blunt, reddish-brown; eyes very prominent, golden brown; head and front of the thorax black-brown, sometimes dusted with white; hinder half of the thorax white; abdomen brown dusted with white, the basal and anal segments white; anal tuft compressed. Fore wings elongated, moderately broad; costa very faintly curved; apex bluntly rounded; hind margin long and very oblique, curved in a small degree; dorsal margin also a little rounded; colour white; along the costa is a series of broad brown-black clouds, the final one filling the apical space; along the hind margin is another such series, almost unbroken, of smoky-brown clouds, through a portion of which runs a rippled and angulated white subterminal line; discal spot

distinct, rather rounded, deep black; ordinary first and second lines very obscurely and faintly suggested by a few isolated dots and streaks without defined form, except that in a clouding of brownish-grey which occupies the dorsal margin they become faintly visible as white lines enclosed between faint brown ones; cilia black-brown. Hind wings small, rounded behind; white, often shaded with grey, the dorsal half also dusted with grey, and streaked across the nervures with grey-black; hind-marginal region shaded with grey, in which runs a white angulated line; cilia grey dashed with white. Female very similar.

Underside of the fore wings smoky-white, with a broad smoky-black hind-marginal band, in which is visible a white subterminal line; discal spot and a costal spot beyond it black. Hind wings white, the central spot black; a smoky-black band lying broadly along the hind margin is divided by a white cloud. Body white; legs brown.

There is some variation in the extent of grey or grey-brown clouding upon all the wings, specimens from western districts having often a faint shade over the greater portion of the white middle area. In rare instances the grey or grey-brown mottling is extended from all the margins so as to cover the middle area, and almost obliterate the white ground; such specimens were formerly known under the name of *E. disparata*.

On the wing in June, July, and August.

LARVA moderately stout, elongated, tapering toward the head; dingy, dull dark reddish-brown; dorsal line dingy black, connecting a chain of dull black inverted kite-shaped blotches, which become confluent on the anterior and posterior segments; subdorsal lines dusky, slender, waved, uninterrupted, darker between the dorsal blotches; spiracular line dirty white, interrupted; head bordered by a reddish line; undersurface dusky along the edges, pinkish-white in the middle, the central ventral line blackish; back and sides

sprinkled with a few reddish hairs. Varying to pale reddish-brown, with the dorsal line and blotches dingy olive, and the subdorsal lines dusky and very indistinct; or to a dark, dingy olive ground colour. (Rev. H. H. Crewe.)

September and October on Mugwort (*Artemisia vulgaris*), feeding at night on the upper surface of the leaves, and leaving the cottony undersurface almost untouched; also occasionally upon *A. maritima* (sea wormwood), tansy, and even wild camomile. During the day it is seldom to be found on the upper green leaves of the plant, but loves to hide among the twisted dead leaves below.

PUPA dull brown, with the wing-covers green or olive-green. In a cocoon of silk and earth, in the ground.

In this condition through the winter.

The moth is seldom seen in the daytime; doubtless it hides among its food plant, in the large masses of which it would be well concealed; at late dusk it flies over the same plants, and on into the night, and will come occasionally to a strong light. It seems decidedly to prefer the coast districts, though not confined to them, and has been found in Kent, Sussex, Surrey, Dorset, Devon, Cornwall, Somerset, Berks, Middlesex, Oxfordshire, Essex, Gloucestershire, Herefordshire, Cambridgeshire, Suffolk, Norfolk, Cheshire, Lancashire, Yorkshire, and Durham. In Wales Mr. H. W. Vivian has taken it in Glamorganshire, and I have found it rarely in Pembrokeshire. In Scotland the only record seems to be from Ardrossan, in Ayrshire. In Ireland it has been found on the Dublin coast at Howth, also in the Isle of Lambay, in Lonth, and Armagh. Abroad it has a wide range, through Central, and (temperate) Northern Europe, North Italy, Dalmatia, Southern Russia, Bithynia, and the mountainous regions of Central Asia.

This species was united with the following by Mr. Stainton in his "Manual," doubtless because of the existence of dark forms of both, which seemed to form connecting links. They

had, however, been described as distinct by previous authors, and the Rev. H. Harper Crewe and the Rev. John Hellins fully succeeded in proving their distinctness by means of their larvæ.

9. **E. subfulvata**, *Haw.*—Expanse  $\frac{7}{8}$  to 1 inch. Forewings fulvous or red-brown, margined with umbreous; discal spot distinct, black. Hind wings pale smoky-brown.

Antennæ of the male slender, simple, finely ciliated, dark brown; palpi short, black-brown; eyes black; head and neck-ridge dull umbreous; front of thorax deep dark brown, hinder portion pale brown, frosted with white; abdomen reddish-brown, the dorsal ridge set, like a fine saw, with minute raised tufts; anal tuft rather long, compressed. Fore wings hardly elongated; costa very flatly arched; apex rounded; hind margin smoothly curved, and the dorsal margin also a little rounded; colour fulvous or red-brown; the costa clouded with umbreous cut up by numerous pale grey-brown streaks which seem to suggest the beginnings of transverse lines, not otherwise visible; discal spot black, rather rounded; nervures slightly darkened; hind marginal area tinged with umbreous, through it, or edging the dark colour, is a frequently angulated, obscure, white subterminal line having on its inner side black dashes on several of the nervures; cilia glossy umbreous, faintly dashed with darker. Hind wings rather broad, rounded behind; pale smoky-brown dusted with dark brown upon the dorsal half and also behind; central spot very small, black; near the hind margin is a rippled white slender line; cilia smoky-brown, dashed with darker brown. Female similar.

Undersides of all the wings shining smoky-brown, the fore pair barred along the costa with smoky-black; discal spot black; the white subterminal line faintly visible; on the hind wings is a large black central spot, beyond which are two curved smoky-white bands. Body pale brown; legs dark brown.

Not very variable, but occasional specimens show faint traces of a slender dark brown basal line, or of this and the second line or even all the usual lines and a pale angulated stripe following the second line, but usually these markings are faint. In rare instances—more frequent in the east of Scotland—the usually fulvous area is filled in with these lines and a grey-brown mottling, so that the brighter colour is almost, or even quite, obliterated. This series of forms is known under the varietal name of *cognata*.

Oa the wing in July and August.

LARVA long, tapering but slightly towards the head; reddish-brown, with a series of oval dusky olive dorsal spots confluent towards the head and tail, and connected and intersected by a dorsal line paler in colour; subdorsal lines black, interrupted, dark opposite the dorsal blotches, pale and almost or quite evanescent between them; spiracular lines white; dorsal region thickly studded with minute white tubercles and less thickly with whitish hairs; under-surface whitish, with a central purplish line running the whole length. A variety has the ground colour pale yellowish-brown with similar markings. (Rev. H. H. Crewe.)

This is a redder larva than that of the last species and its dorsal spots are narrower and more ovate.

September and October, on *Achillea millefolium* (milfoil or yarrow), feeding at night on the flowers, seeds and leaves; ordinarily remaining upon the plant by day, lying along the midrib of a leaf, which it so closely resembles as to become almost invisible; or sometimes at full length along a stem. Occasionally also on flowers of tansy (*Tanacetum vulgare*); and Mr. Prout states that in confinement it will feed willingly on the blossoms of garden chrysanthemum (*C. sinense*).

PUPA not very stout, but having the wing-covers thickened at the margins and also ribbed at the nervures, roughened with abundant and rather coarse sculpture of incised lines and pits; eye-covers not very prominent, smooth; antenna-

covers and those of the limbs covered with rough sculpture of cross-ridges and incised lines; dorsal and abdominal segments coarsely pitted in the usual broad bands; cremaster broadly triangular, hollowed beneath and tipped with a long spike forked at the apex; red-brown or orange red, the wing-covers a little paler, the cremaster deeper red. In a cocoon of silk and earth, in the ground.

In this condition through the winter.

The moth hides during the day among its food plant and other herbage, but may occasionally be seen sitting upon a post or paling or some other neighbouring object. It is not at all disposed to fly much at this time, but moves about in a very lively manner at late dusk and may then often be seen settled upon, or flying over, the flowers of ragwort. It also will come to the attraction of sugar, and rather rarely to light, settling upon a window. Occasionally to be found in the suburbs of London—I have taken it myself at Nunhead—and elsewhere very much more common than is generally supposed, its secluded habits and the close resemblance of its larva to its food-plant protecting it from general notice in either state. It certainly occurs all over England, and in some districts quite commonly; also in all probability throughout Wales, though I have only Mr. Greening's record for Flintshire, Mr. Vivian's in Glamorganshire, and my own in Pembrokeshire—where it is common. In Scotland it is found in Wigtowshire, Berwickshire, Roxburghshire and other parts of the South, also in Argyleshire, Aberdeenshire, Kincardineshire and Moray. In Ireland on the Dublin coast and in Cork County, Wicklow and Louth.

Abroad its range extends through Central Europe, Livonia, Finland, Northern Italy, Dalmatia, South-Eastern Russia, and the Central Asian mountain regions.

10. **E. subumbrata**, *Schiff.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18 to 23 mm.). Fore wings narrow, white, with numerous

transverse slender grey or grey-brown lines; margins softly clouded with grey; discal spot a small black dot. Hind wings white with grey marginal clouding and lines.

Antennæ of the male simple, faintly ciliated, black-brown; palpi short and blunt, greyish-white clouded with black; head greyish-white, spotted before and behind the antennæ with black; neck-ridge and thorax brownish-white, dotted with grey; a dark brown shade lying across the back of the collar; abdomen white, much shaded with pale brownish-grey; apical tuft long, pointed. Fore wings narrow and rather elongated; costa very gently and flatly curved; apex rounded; hind margin long and gently curved, as also is the dorsal margin; white, rippled all over with grey and grey-brown lines; basal line oblique, angulated, dark grey, enclosing a grey-brown shade on the costa; first line triple, oblique, grey, preceded by a parallel grey-brown shade; after a short interval commences a series of fine, rather more erect, angulated and much rippled grey lines, the first of which embraces the black discal spot, and all bend back to the costa; before these is often another grey shade; a soft grey-brown cloud lies along the costal area; apical region occupied by a large slate-grey spot or cloud which after being penetrated deeply by a white angle, spreads again along the hind margin and is there divided by the slender rippled white subterminal line; extreme hind margin edged by alternate white dots and black streaks; cilia slate-grey. Hind wings rather broad, rounded behind, white; central spot small, black; dorsal half of the wing from the base dotted with grey-black; along the hind margin are two dotted and clouded lines of the same colour; extreme hind margin edged with short black streaks; cilia greyish-white. Female similar.

Underside of the fore wings shining pale smoke-colour; costa shaded, and beyond the middle barred, with darker; hind margin broadly clouded with the same colour through which the white subterminal line is faintly visible. Hind wings white, dotted and dusted on the nervures and margins

with brown; central spot black; cilia smoky-grey. Body and legs whitish-brown; tarsi more smoky-brown.

Only a little variable in the depth of grey or brown-grey lines and shading.

On the wing in June.

LARVA very long and slender, tapering much toward the head, which with the general ground colour is dull yellowish-green; dorsal line broad, dark green, narrower at the segmental divisions; subdorsal lines dusky, very narrow and indistinct; segmental divisions of the back orange, of the ventral surface yellow; spiracular line dusky green; on each side of the head and the anal segment is a yellowish line.

Or—Ground colour dirty greenish-brown; dorsal line dusky-olive; subdorsal lines of the same colour, narrow; posterior segments reddish; in other respects like the typical form. (Rev. H. H. Crewe.)

Those figured by Mr. Buckler are equally long and slender but otherwise differing—Rich bright green with a very slender purple-brown dorsal line, the head pale grey, the other markings obsolete.

Or—Yellow-green with very broad dorsal, and narrower subdorsal purple-brown stripes.

July to September on the flowers of *Apargia hispida*, *Crepis taraxifolia* and other low-growing plants. Staudinger and Hofmann add flowers of *Scabiosa*, *Centaurea*, *Solidago*, *Globularia*, *Gentiana*, *Jasione*, *Origanum*, *Hypericum*, *Chrysanthemum*, *Euphrasia*, *Campanula* and *Pimpinella*.

PUPA short and thick, tapering rapidly behind; eye-covers smooth and prominent; antenna-covers much raised and strongly cross-ribbed; limb-covers thickened; wing-covers very prominently ribbed, and wrinkled with cross sculpture; three of the abdominal segments strongly ridged with a raised edge, also abundantly dotted with pitted sculpture; cremaster proportionately thick and large, armed with a strong spike; either wholly red-brown; or with the wing-

covers and anterior portion green, the abdominal segments pale brown, and the ridges and cremaster red-brown. (From pupæ furnished for description by Mr. W. H. Harwood.) In a cocoon of silk and earth. The winter is passed in this state.

The moth hides during the day among low-growing herbage close to the ground, but is so readily disturbed on a sunny afternoon as almost to give the impression of a day-flying species. It however certainly flies at dusk. Its favourite haunts are flowery banks and broken ground about sea-cliffs, rough fields and fens; also open spaces between woods; and occasionally it may be found in damp spots on the margins of heaths. It is certainly a local species, apparently partial to coast districts, and fond of the warmest corners of the rough ground which it affects. Found in Kent—commonly in the Isle of Sheppey—Sussex, Hants, Dorset, Devon, Berks, Bucks, Gloucestershire, Essex, Suffolk, and the fens of Cambridgeshire; rare in Norfolk; absent to all appearance from the Midlands and many of the western districts, again appearing in North Lancashire, Yorkshire, Durham, and Northumberland. In Wales Mr. Vivian has found it at Port Talbot, Glamorgan, and I have taken it—but rarely—in Pembrokeshire. In Scotland it is recorded from Dunkeld, Perthshire; Braemar, Aberdeenshire; and Argyle, and the Messrs. Gordon have found it not very uncommonly in Wigtownshire. In Ireland it is not scarce in Cork County, Galway, Sligo, Fermanagh, and Donegal. Abroad widely distributed through Central Europe, Livonia, Finland, and the Central Asian mountain regions.

11. *E. irriguata*, *Hüb.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18 to 22 mm.). Fore wings glossy white; discal spot black; basal band dark brown; costa and hind margin spotted and clouded with the same colour. Hind wings white, with brown clouding and a black central dot.

Antennæ of the male slender, simple, ciliated, whitish-

brown; palpi small, black-brown, tipped with white; face prominent, silvery white, head and neck-ridge dusky white; thorax black-brown, barred in the middle with white; abdomen brown with a row of minute black dorsal tufts and some white dusting around them; anal tuft short and compressed. Fore wings narrow; costa slightly and flatly arched throughout; apex narrowly rounded, almost angulated; hind margin long, oblique, faintly curved; dorsal margin straight; colour white; base tinged with brown in which is a black costal cloud; this extends to a curved brown transverse stripe, blackened on the costa and nervures, which precedes the excessively obscure first line of carelessly arranged brown dots; in the middle of the wing are four successive black spots on the costa; underneath them is the discal spot, elongated, deep black; from them proceed three angulated lines of brown dusting which enclose the discal spot and become more distinct toward the dorsal margin; beyond, on the costa, is a brown blotch connected with a series of brown clouds of unequal width, which attains the anal angle, and is bounded on the outside by the white irregular subterminal line; another brown blotch occupies the apex of the wing, and is slenderly continued along the hind margin and there edged by black streaks; cilia white, spotted with black, and clouded with brown. Hind wings short, the hind margin rather sinuous and flattened; colour white; central spot small, black; a large black-brown spot on the dorsal margin near the base is followed down that margin by similar dotting and dusting on the nervures; hind margin clouded with brown dusting, and edged with black streaks; cilia brownish-white, spotted with brown clouds. Female similar.

Underside of the fore wings smoky-white; costa spotted with black and white; discal spot black; apex and hind margin rippled with dark smoky clouding, in which appears a pale subterminal line. Hind wings white, dotted round the margins with grey; central spot large, black; extreme

hind margin sharply edged with black crescents. Body and legs greyish-white, the tarsi black.

There is a little variation in the depth of colour of the markings; those from Herefordshire being decidedly darker than specimens from the South of England.

On the wing at the end of April and in May.

LARVA long, slender and tapering slightly toward the head; skin rather rough and wrinkled; ground colour dull yellowish-green; dorsal line dull rusty-red, very indistinct except on the capital and caudal segments, enlarged on the middle portion of each segment of the middle of the body into a somewhat conspicuous elliptic blotch; subdorsal and spiracular lines yellowish, the latter very faint; head rusty-red; undersurface greenish, without markings. (Rev. H. H. Crewe)

End of May and June, on oak and occasionally on beech.

PUPA slender, thick-skinned; dark brown, sometimes with the wing-cases olive-green. In a cocoon under bark or moss. (C. Dietze.)

In this condition through the winter.

The moth sits during the day on the trunks, or on the underside of the branches, of oaks, or on fences or hedges close to oak woods; from which hiding places it is easily disturbed, flying to a short distance. Its natural time of flight is at dusk and at night, but it does not seem often to be observed at this period. Usually a very scarce species and extremely local; more common in the New Forest, Hants, than, probably, anywhere else in the United Kingdom, but found occasionally in oak woods in Surrey, Sussex, Dorset, Devon; in Savernake Forest, Wilts; in Berks, Gloucestershire, Herefordshire, Suffolk and Norfolk; doubtless also in Essex. In Wales Mr. H. W. Vivian reports one or two specimens in Glamorganshire; but I know of no other localities for it in these Islands.

Abroad it is found throughout the greater portion of Central Europe, Italy, Corsica, Dalmatia, and South-East Russia.

12. **E. pusillata**, *Schiff.*—Expanse  $\frac{3}{4}$  inch (18 mm). Fore wings glossy whitish-brown, with four oblique, indented, ill-defined brown transverse stripes, and intermediate faint lines; discal spot large, black. Hind wings smoky-white.

Antennæ of the male slender, simple, minutely ciliated, dark brown; palpi also brown, very short and blunt; head and thorax light umbreous, dusted with black; abdomen dull brown dusted with white, a black line down the dorsal ridge but the tufts hardly perceptible; anal tuft compressed, purple-brown. Fore wings narrow; costa very flatly arched; apex narrowly rounded; hind margin moderately oblique but very little curved; dorsal margin long, rather filled out; colour glossy whitish-brown; no basal line; discal spot placed just *before* the middle of the wing, large, ovate, black; across it runs the first line, double, umbreous, blackened on the costa; immediately beyond it is the second line, parallel, dark umbreous, edged outside with whiter clouding; beyond this is another parallel dark brown stripe; then the subterminal line, also parallel, ill-defined, brownish-white; and a final brown stripe lies along the hind margin, edged with black streaks; cilia brown, a paler line lying along their base. Hind wings rather narrow, a little sinuous at the hind margin; pale umbreous, darker behind, where is a faint transverse paler line; central spot dull black; extreme hind margin edged with black; cilia shining brownish-white, clouded with darker. Female similar.

Underside of the fore wings whitish-umbreous; a paler streak along the costa is barred three times with smoky-black; discal spot black. Hind wings dusky white dusted with brown, having two indistinct curved darker brown transverse stripes; central spot black. Body and legs brown.

Usually not variable, but a specimen taken near Ipswich

by Mr. H. Miller, and in his collection, is singularly pretty, the brownish-white ground colour very clear and pale, and all the markings very sharply defined.

On the wing in May and June.

LARVA long, slender, and tapering considerably toward the head, which is rounded, red-brown; general colour orange-red or dull ochreous-green; dorsal line dusky-olive often only apparent on the anterior segments; subdorsal lines also dusky-olive; spiracular lines yellow; segmental divisions orange-colour; central ventral line yellowish. (Rev. H. H. Crewe.)

June and beginning of July on spruce fir (*Pinus abies*). It does not cling so tightly to its food plant as some of its allies, and may be beaten out into an inverted umbrella.

PUPA slender and delicate, pale ochreous-yellow; the eye-covers black and prominent; upper edge of wing-cases bordered by two black spots; lower edge by a slender blackish line. In a slight earthen cocoon, in the ground (Rev. H. H. Crewe.)

The winter is passed in this condition.

The moth hides during the day in spruce fir trees, from which it may be disturbed by the beating stick and readily captured. Its time of natural flight is late dusk or night. An exceedingly local species, but sometimes common in its very restricted localities. Formerly all our specimens, or nearly so, were obtained in or near the Archbishop of Canterbury's park at West Wickham, Kent, but it is now found equally freely in the New Forest, Hants, and elsewhere in these two counties; also in Surrey and Devon; and rarely in Wilts and Suffolk. So far as I know this is the extent of its range in these Islands. Abroad it is found throughout Central Europe, the temperate portions of Northern Europe, Northern Italy and Greece.

13. **E. nanata**, *Hüb.* — Expanse  $\frac{3}{4}$  inch (18–20 mm.). Fore wings long, produced at the tip, greyish-white with several well-defined, very oblique, brown-grey or black-grey transverse stripes; a white spot is placed above the anal angle. Hind wings greyish-white.

Antennæ of the male slender, simple, ciliated, dark-brown; palpi small, blunt, black-brown; eyes deep black; head and thorax grey-brown; abdomen similar, with extremely minute black tufts along the dorsal ridge; anal tuft compressed, pale-grey. Fore wings narrow; costa straight to beyond the middle, thence arched; apex rounded; hind margin very oblique, gently curved; dorsal margin also a little rounded; colour greyish-white with a brown shading; basal line oblique, sharply angulated, black, followed by two somewhat parallel greyer lines, and a third, more oblique, which turns back so as to form an angle around the discal black spot; immediately beyond this angle is a group of small black costal streaks, which extend to a rather broad and sharply angulated white stripe faintly intersected with grey; beyond this the hind-marginal region is grey-brown distinctly divided into two stripes by a rippled white subterminal line; in this subterminal line, above the anal angle, is a more distinct white crescent or V-spot; and before the discal spot is, almost always, a round white spot; close to the extreme hind margin is a row of black streaks, edged outside by a grey line; cilia grey, intersected and spotted with black. Hind wings rather elongated but small, flatly rounded behind; pale smoky-grey faintly bounded beyond the middle with darker, but down the dorsal region more distinctly with alternate bars of dark grey and white; extreme hind margin edged with black streaks; cilia dark grey-brown, clouded with grey-black. Female similar.

Underside of the fore wings glossy smoky-brown; costa rather blackened, and a little barred with black; discal spot black. Hind wings dusky white, dusted with black; central spot black, followed by two rows of cloudy black dots indi-

cating bands, and a browner band, intersected or clouded with white, toward the hind margin. Body and legs grey-brown.

Variable in the depth of colour of the oblique transverse stripes of the fore wings, and in the presence or absence of a round white spot in the discal cell. A rather striking form of the first-named variation is that in which, the other stripes being obscure, the two nearest the middle of the wing are dark, placed near together, and so form a distinct and pretty central band. This phase of variation seems to become rather frequent in Scotland, I have it from Dumbartonshire. In the north of Ireland, on the other hand, specimens are found in which all the stripes are nearly or quite obsolete.

On the wing from the end of April till June, and as a partial second generation at the end of July and in August.

LARVA long and very slender, tapering toward the head; ground colour of head and body white or greenish-white, with a chain of pear-shaped red dorsal spots, bordered on either side by an interrupted line of the same colour, and becoming confluent on the capital and anal segments; sides spotted with red; a central red line runs the whole length of the undersurface; body clothed with a few very short hairs.

A very pretty variety has the ground colour bright green, with a series of tooth or pear-shaped white dorsal spots intersected by a central horizontal dark green line, becoming purple at the anal tip; spiracular line white, broken; back sprinkled with a few short black hairs. (Rev. H. H. Crewe.)

Mr. Buckler further figures it greenish-white with the chain of dorsal markings black, the subdorsal dashes crimson, and the spiracular streaks black; also with these dorsal markings united by a dorsal dark line, and the colours of the lateral markings reversed; and deep green with the dorsal markings black, the subdorsal lines greenish-yellow, and the spiracular line broken up into white spots. A very variable and exceedingly pretty larva.

August and September on *Calluna vulgaris* (Common

Heather), feeding on both flowers and leaves. Possibly also on *Erica*, but this seems to be rather uncertain.

PUPA not very stout; limb-covers strongly ridged but smooth; wing-cases rather thickened, the nervures ribbed, and the interspaces sculptured with abundant minute incised lines; dorsal and abdominal segments almost covered with fine pitting; anal segment rather swollen, and furnished with a strong conical cremaster, terminated with a bunch of irregularly twisted and curled bristles; colour light bright chestnut, with a narrow band of dark chestnut at the hinder edge of each abdominal segment; or in some cases the whole of the thoracic portion to the ends of the wing-cases, and to the beginning of the dorsal segments, is dull green or pale brownish-green. (From pupæ furnished by Mr. W. H. Harwood for description.) In an earthen cocoon. The winter is passed in this condition.

The moth sits during the day among heather, but is alert and restless, flying up from the approaching footstep to settle again a few yards further. In northern districts it will sometimes rest upon rocks, or the trunks, or even in the branches, of fir trees growing among the heather. At dusk it flies of its own accord, keeping nearly always about its food plant. Plentiful on heaths in almost all parts of England, apparently less so in some portions of the west. No doubt also occurring through Wales, though to my surprise I can find no record there except those of Mr. H. W. Vivian in Glamorganshire, and Mr. Greening in Denbigh and Flint. In Scotland it seems to inhabit all mosses throughout the country, extending to the Hebrides, Orkney and Shetland Isles; also to be common in bogs, and on mountain heaths, all over Ireland. Abroad its range seems to be restricted to Central Europe, Finland, Livonia and Dalmatia.

14. *E. indigata*, *Hüb.*—Expanse  $\frac{3}{4}$  inch (18–20 mm.). Fore wings narrow, elongated toward the apex; thinly

scaled; pale brown; discal spot large, perpendicular, elongated, black; costa dotted with black. Hind wings smoky-white.

Antennæ of the male simple, thickly ciliated, dull brown; palpi small, drooping, purple-brown; head pale drab; thorax thin and weak, pale umbreous dotted with black; abdomen very slender, ashy-brown clouded with reddish-brown and having almost imperceptible black tufts on the dorsal ridge; anal tuft compressed, pale brown. Fore wings elongated and narrow, thin in texture and thinly scaled; costa very flatly arched throughout; apex suddenly, almost acutely, rounded; hind margin oblique, gently curved; dorsal margin rather filled out and well ciliated; pale brown faintly shaded with reddish-brown; no distinct transverse lines, but on the costa are usually visible five equidistant blackish cloudy spots, and sometimes there are faint traces of one or two lines toward the dorsal margin; discal spot an upright black streak, the only distinct marking upon the wing; cilia grey-brown. Hind wings small, rounded behind; dusky white; central spot cloudy black; dorsal margin very faintly barred three or four times, with brown; cilia concolorous. Female similar.

Underside of the fore wings semitransparent pale smoky-brown; nervures darker; discal spot a brown streak; above it, and beyond, are two blackish costal spots. Hind wings dusky white, twice faintly barred with slender brown lines; central spot faintly black.

On the wing in April and May; in Devon there is said to be a second generation in August.

LARVA long, slender, tapering considerably toward the head, which is reddish; ground colour pale greenish-yellow or yellowish-red; dorsal line dusky reddish-brown or olive, frequently very faint or entirely evanescent except on the thoracic segments; subdorsal lines pale yellow; spiracular line pale yellow; collar reddish-brown; segmental divisions

reddish; undersurface greenish-yellow; central ventral line yellow with a reddish brown line on each side. (Rev. H. H. Crewe.)

June and July on Scotch fir (*Pinus sylvestris*); when young preferring the inflorescence, afterwards feeding upon the leaves; also upon larch; and in confinement feeding readily upon juniper and cypress.

PUPA slender, pale red-brown; dorsal region and the wing cases, which lean together, darker. (Hofmann.) In a thin cocoon in the ground or under the bark of a tree. In this condition during the winter.

The moth sits in the daytime usually upon the trunk of a fir tree, and often at a considerable height. If disturbed it flutters hastily away and usually to the ground. It flies about the trees at late dusk, but as may be expected, is not often captured at that time. Almost or quite restricted to woods of Scotch fir, and never noticed in any abundance, yet to be found in such suitable localities throughout England from Cornwall to Northumberland. In Wales it has been taken in Glamorganshire. In Scotland recorded from Berwickshire, Roxburghshire, Clydesdale, Midlothian, Aberdeenshire and Kincardineshire, and abundant in Perthshire. In Ireland it seems to have been noticed only in Galway, Tyrone and Derry. Abroad its range is not very wide, but it is found in Holland, Belgium, Germany, Livonia and Finland, and possibly in Spain.

15. **E. constrictata**, *Gn.*; **distinctaria**, *H.-S.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18-21 m.m.). Fore wings grey-white, with numerous slender curved grey transverse lines, and near the hind margin a broader similar stripe, all faint and delicate; discal spot a distinct upright black streak. Hind wings very similar.

Antennæ of the male simple, thickly ciliated, dull brown; palpi not very short, purplish-black; face rather oblique,

greyish-white; head and neck-ridge of the same colour; thorax and abdomen pale grey; the latter with a series of minute black dots on the dorsal ridge; anal tuft pointed. Fore wings blunt, not very narrow except at the base; costa gently arched; apex and hind margin rounded; dorsal margin almost straight; colour pale brownish-grey; basal line rather oblique, curved and slender, dull black; first line almost parallel, faintly duplicated, slender, brown; beyond it is a triple series of extremely slender rippled, curved, and bent brown lines closely embracing the discal spot, which is an erect black streak; beyond these three lines is a parallel series of brown dots, closely followed by a slender brown thread which perhaps is the ordinary second line; this is edged outside by a stripe of the ground colour, and this followed by two faintly browner stripes separated by an excessively indented paler subterminal line; cilia concolorous. Hind wings rather broad, rounded behind; pale smoky brown, slenderly barred by three pairs of brighter brown, sinuous cloudy lines; central spot obscurely black; cilia pale brown. Female similar. The markings in both sexes, although numerous, are all faint and indistinct.

Underside of the fore wings glossy pale smoky brown; costa spotted several times with squared smoky black spots; discal spot faintly black; beyond it are three equally faint slender smoky transverse stripes. Hind wings dusky white, three times banded with slender brown stripes, and between these with others, very faint; discal spot a long black crescent. Body and legs grey-brown.

Usually not variable except a little in the depth of the ground colour and the distinctness—or indistinctness—of the markings; but specimens from the Hebrides are of a more decidedly grey tint.

On the wing in June and July.

LARVA rather long and slender, tapering considerably toward the head; ground colour dark green; dorsal line

broad, purplish-red; spiracular line indistinct, greenish yellow; ventral segmental divisions yellow; down the middle of the undersurface is a whitish line; skin wrinkled; back studded with numerous very short, stiff, bristly hairs. (Rev. H. H. Crewe.)

August and September: on the flowers of the wild thyme (*Thymus scryphillum*), feeding at night.

PUPA yellowish-green and olive; enclosed in a slight earthen cocoon. (Rev. H. H. C.) Not more fully described.

The winter is passed in this condition.

The moth loves the firm settled portions of sea-sand-hills where wild thyme grows in masses, and similar spots on limestone or chalk hills and downs, any rough dry ground indeed in which thyme is plentiful. Here it hides in the cover of dwarf sallow, or any rough plants which afford shelter, as well as in the thyme beds, and is easily disturbed, in hot sunshine, by the footstep or the beating stick, flying instantly away with swiftness, close to the ground, so that a quick eye as well as hand is required for its capture. Its natural flight at dusk is not so frequently noticed. Locally common in the Isle of Wight, and in Sussex, Dorset, Cornwall, Somerset, Gloucestershire, Bucks, the Isle of Man, Derbyshire, Cheshire, Yorkshire, Lancashire, and Westmoreland, and once taken in Northumberland. In Wales Mr. Vivian records in the peninsula of Gower, and Mr. Walker at Colwyn Bay. In Scotland it occurs on the coast of Wigtownshire, on trap rocks in Ayrshire, and elsewhere in the Clyde district, in those of the Forth, Tay, and West Ross, and has been taken by Mr. A. F. Griffiths in the Hebrides. In Ireland it has a very considerable distribution, particularly on the coast, and is recorded from near Dublin in plenty, also from Wicklow, Cork, Kerry, Galway, Sligo, Louth, Down, Tyrone, Armagh and Derry.

Abroad it seems to be little known or not generally recognised; it is reported from Central Germany and Bavaria,

and has been received from Egypt. It must therefore have a wider range.

16. *E. lariciata*, *Frr.*—Expanse 1 inch. Fore wings elongated, grey-white, with numerous dark grey or grey-black, rather oblique and bent, transverse stripes or lines; discal spot rounded, black; nervures streaked with black. Hind wings very similar; white in front.

Antennæ of the male simple, minutely ciliated, purple-brown; palpi small, rather blunt, black-brown tipped with pale yellow; face and head ashy-grey, dusted with black; thorax brown, similarly dusted; abdomen ashy-grey much dusted with black, and having black tips to the segments on the dorsal ridge; anal tuft small and compressed. Fore wings rather forming a long triangle; costa very flatly arched; apex bluntly rounded; hind margin also curved, and the dorsal margin a little filled out; pale greyish-white dusted with black; almost all the abundant markings composed of black dusting; basal, first, and two succeeding lines all oblique, parallel, much angulated and bent back near the costa, and all shaded off inwardly with black dusting, the fourth of these embraces the discal spot, which is conspicuously black; beyond this, in a stripe of the pale ground colour, is a central cloud of very pale fulvous; it is followed by an oblique stripe of smoky-black clouds each containing a black streak, and this by the second line—a dusky slender thread in a pale stripe; hind margin more broadly filled by two, still parallel, stripes of black dusting, separated by the sinuous, faint, pale subterminal line; extreme hind margin streaked with deep black; cilia pale grey spotted with black clouds. Hind wings broad, rounded behind; the front area broadly glistening, dusky white; remaining portion pale brownish-grey, repeatedly barred from the dorsal margin with dark grey cloudy stripes, blackened on the nervures; hind margin edged with black streaks; cilia smoky grey dashed with black clouds. Female similar.

Underside of the fore wings shining, pale smoky-grey; discal spot dull black; on either side of it is a dull black costal streak, and beyond a longer costal blotch; from two of these obscurely black stripes cross the wing; cilia prettily laced with black basal crescents. Hind wings dusky-white; central spot black; followed by two curved transverse stripes of black dots on nervures. Body and legs brownish-grey.

Only a little variable in the distinctness of the transverse markings. Sir Thomas Moncrieffe states that freshly emerged specimens often have quite a rosy patch in the middle of the fore wings, but that it rapidly fades away. A specimen taken near Derby, in the collection of Mr. J. Hill, is pale grey with a dark band round the hind margin of every wing.

On the wing in May and the early part of June.

LARVA long and rather slender, tapering toward the head; which is small, dark green; general colour bright grass-green, somewhat darker on the middle of the back; dorsal line dark green, but its anal tips reddish, sub-dorsal lines wanting, or so faint as to be scarcely visible; spiracular line whitish or pale straw colour; segmental divisions yellowish; undersurface whitish, with a dark green central line.

Or—Head and ground colour yellowish-red or reddish-buff; dorsal line brownish-olive, occasionally very faint; spiracular line pale greenish-yellow; anal tip of the dorsal line reddish; undersurface whitish with a dusky central and two broad blue lateral lines. (Rev. H. H. Crewe.)

End of June, and in July, on larch (*Pinus larix*), in confinement feeding also upon spruce fir.

PUPA rather long and slender; thorax yellowish-olive; wing cases deep green; abdomen yellowish-green, tinged with red; abdominal divisions and anal tip red. In a slight earthen cocoon in the ground. (Rev. H. H. C.)

The moth hides during the day in the branches or sometimes on the trunks of larch trees, or on the undersides of boughs; in windy weather hiding in the thickest portions. When beaten

or shaken out it often drops or flutters to the ground. At late dusk it flies about the trees, but is then not often noticed. It was discovered here in the year 1862, and eggs and consequent larvæ were then obtained by the late lamented artist, Mr. Edward Hopley, from moths taken in Sussex and Surrey. In 1866 it was found to be common in Yorkshire, and there were strong reasons for believing that an extensive immigration of the species had taken place from the Continent, since in a few years it had so spread over the country that it might be reckoned upon, almost with certainty, in any large plantation of larch. I have no record for Cornwall, and for Wales only that of Mr. Vivian in Glamorganshire, but wherever its food plant is plentiful it seems now to occur from Devon and Kent to Northumberland and Cumberland; and in Scotland in the Edinburgh district, Perthshire, Clydesdale, Aberdeenshire, and the Hebrides. It had reached Skye in 1883. In Ireland it has been found near Dublin, in Wicklow, Louth, Limerick, Galway, Westmeath, Monaghan, Tyrone, and Sligo, and is now abundant in Donard Demesne, Mourne Mountains, Down. Mr. Kane is of opinion that it is of recent introduction to Ireland consequent on the extensive planting of larch. Abroad its range extends through Central Germany, Bavaria, Switzerland, Russia, Armenia, and Tartary.

17. *E. castigata*, *Haw.*—Expanse  $\frac{3}{4}$  inch (18 mm.). Fore wings not elongated, brownish-white, with numerous very faint sinuous transverse smoky-grey lines; central spot a black dot; costa clouded with smoky-black. Hind wings white, faintly banded with grey.

Antennæ of the male simple, ciliated, light brown; palpi small, black-brown; head and thorax grey-brown dusted with black; abdomen whitish-grey at the base, middle segments grey-brown; anal segment and anal tuft grey. Fore wings rather broadly rounded; costa gently arched throughout; apex much rounded; hind margin curved and not very oblique; dorsal margin also rather full; somewhat glossy

brownish-white or whitish-grey ; basal line obscurely black ; first line a rather faint grey oblique stripe bent back at the costa ; in the middle of the wing is a similar but broader stripe, embracing the short black discal spot and from it bending back and becoming a black cloud to the costa ; just beyond this is a parallel similar stripe, also a little blackened as it bends back at the costa, in this are several small black wedges on nervures ; the outer edge of this stripe seems to correspond with the ordinary "second" line, a very slender grey thread there running through a narrow rivulet of the ground colour ; hind marginal region nearly filled up with darker grey except that a clouded and broken white subterminal line intersects it ; below the discal spot is a black streak on the median nervure ; cilia dark grey ; all these markings dull and obscure. Hind wings small, fully rounded, greyish-white ; central spot black ; nervures of the dorsal half streaked with black ; along the hind margin is a broad dark grey band ; cilia dark grey. Female similar.

Underside of the fore wings shining smoke-colour ; discal spot black ; on each side of it is a pale yellow costal spot, and along the hind margin a grey shade. Hind wings whitish-grey ; central spot black ; beyond it is a slender curved transverse row of blackish streaks. Body and legs grey.

Not apparently very variable in any one locality, but the ordinary brownish-white ground colour of the southern districts alters gradually to greyer-white in the Midlands, and in the North of England and West of Scotland produces, along with various shades of pale grey, a fine smoky-black form, very frequent at Paisley, and now well known, but which when first met with was a cause of some perplexity. Indeed the general shape of this species is so accurately that of several others that in the absence of markings and of the usual colour, the identification of this curious variety was a matter of some delicacy. After many efforts it was finally accomplished by the late Mr. W. H. Tugwell. Mr. J. E. Robson tells me that in rearing this species he finds that

those specimens which emerge uniformly black, showing no trace of markings, *remain* black; but that those specimens in which the markings are perceptible, however faintly, under the black shade, on emergence, gradually fade and soon become merely dark typical specimens. To all appearance the melanic tendency in this species is of quite modern development—probably within the last ten years.

On the wing in May and June and sometimes as a partial second generation, in August.

LARVA long, slender, and tapering; ground colour pale or dusky olive, or reddish-brown; with a chain of dusky lozenge-shaped dorsal spots, becoming confluent on the anterior and posterior segments; segmental divisions reddish; on the undersurface is a central blackish or purplish line running from the head to the anal tip; body thickly studded with minute white tubercles and clothed more sparingly with short bristly hairs. (Rev. H. H. Crewe.)

August, September and October; almost omnivorous. Mr. Crewe says “feeds promiscuously upon almost every description of tree, shrub, and flower.” I have found it even in a capsule of *Lychnis*, and on *Sedum telephium*, and it is recorded upon brake-fern and the seeds of rush.

PUPA. Thorax and wing cases yellow, the latter more or less suffused with green; abdomen slender and tapering, reddish or greenish-yellow. In an earthen cocoon. (Rev. H. H. C.)

In this condition through the winter.

The moth especially loves to rest during the day on the underside of the branch of a tree, especially of a large tree, and may sometimes be so seen in scores, specimen after specimen in following order, almost touching each other. When noticed they will move a little way, one at a time, in a restless fashion, but will not fly unless really disturbed. Often however it hides in a hedge or any bush, when it may

be beaten out and easily captured. Its natural flight is at rather late dusk, over bushes and hedges everywhere. It is not so common now as formerly in London gardens—indeed seems to be becoming rather scarce in them, but is elsewhere plentiful all over England, Ireland, and probably Wales; and in Scotland in all the more Southern districts, in Perthshire and the Hebrides; but in Aberdeenshire is rather scarce, and does not seem to extend beyond Moray.

Abroad it has a wide range through Central Europe, Northern Italy, Grenada, Finland, Livonia, the northern Balkan States, Tartary, the mountainous regions of Central Asia, Western China and Japan.

18. **E. virgaureata**, *Newman*; **pimpinellata**, *Gn. Stn. Manual*.—Expanse  $\frac{7}{8}$  inch (23 mm.). Fore wings elongated but blunt, pale grey-brown; nervures alternately dotted with black and white; costa clouded with black; discal spot black; a white spot is above the anal angle. Hind wings pale brown.

Antennæ of the male simple, ciliated, brown; palpi rather projecting, blunt, dark brown; head and thorax umbreous, dotted with darker brown, at the back of the latter is a short whitish bar; abdomen brown, with the lateral tufts well developed, but the dorsal tufts hardly perceptible, the anal compressed and depressed. Fore wings somewhat ovate; costa flatly arched; apex rounded; hind margin fully curved, almost expanded; dorsal margin also well filled out; light umbreous; the nervures all indicated by short black streaks and obscure intermediate white dots; on the costa is a succession of black-brown cloudy spots, of which one before and another beyond the middle are most distinctly black; discal spot between these, somewhat triangular, black; outside this is a more distinct series of black streaks or wedges on the nervures, with following black dots indicating a most obscure double second line; subterminal line visible as a series of faint curved white streaks, the most distinct forming

a spot or crescent just above the anal angle; hind margin edged with short black streaks; cilia umbreous, dashed with shining pale brown. Hind wings rather small, rounded behind; very pale smoky-brown; the nervures raised in ridges, and dotted with black, the intermediate membrane dusted with brown; central spot long, black; hind margin streaked with black; cilia pale brown. Female similar.

Underside of the fore wings shining smoky-brown; discal spot black; costa from it white, barred with black; the wing partially barred by two series of obscure black streaks placed upon nervures. Hind wings dusky white, dusted with smoky-brown; central spot black, followed by two curved transverse lines of smoky-black dots; hind margin strongly edged with black streaks. Body and legs pale umbreous.

Usually not variable, but in Midland and Northern hill districts found darker in varying degrees, until occasional specimens are smoky-black with blacker nervures, or even wholly deep black. Such specimens are in the collection of Dr. P. B. Mason, at Burton-on-Trent; and a beautiful series has been reared from Welsh larvæ by Mr. H. W. Vivian.

On the wing in May and the early part of June, and as a second generation in July and August.

LARVA rather slender, tapering toward the head, fulvous, with a series of black dorsal triangular spots becoming confluent towards the head, and faint or altogether evanescent on the caudal segment; on either side is a row of conspicuous slanting whitish or yellowish stripes forming a sort of margin to the dorsal spots; undersurface dusky, reddish in the middle, and having a dusky central line running the whole length; body studded with various-sized white tubercles, and thinly clothed with short hairs. (Rev. H. H. Crewe.)

From Mr. Buckler's figures this larva is seen to be somewhat broader and stouter than many of its allies, but rather flattened and tapering; its head, in each case, of the colour of the body. This last character varies, some specimens

being dark purplish-brown, or purplish-grey, or dull green, but in all cases with the trigonate dorsal dark stripes, the oblique stripes yellow or white, and these last margined beneath with a distinct blackish dash.

June, and as a second generation in August, September, and October, on the blossoms of golden-rod (*Solidago virgaurea*), ragwort, and millefoil; Mr. Buckler says also on flowers of heather.

PUPA very different from those of allied species; thorax yellowish-green, with a very accurately and distinctly defined border, and looking almost as though set in a frame. When examined with a glass some singular dark spots and markings are seen, which give it very much the appearance of a skull. The abdomen is yellowish-red, with two indistinct, interrupted, dorsal, and two, more distinct, subdorsal dusky lines; wing cases yellowish-olive streaked with dusky markings, and having the nervures very prominent. (Rev. H. H. Crewe.)

In a slightly spun earthen cocoon.

In this condition through the winter.

The moth hides during the day among its food-plants and other low-growing herbage, and may occasionally be disturbed thence and captured, but it is so obscure in its markings and appearance that unless quite fine and fresh it can scarcely be distinguished from some of the allied species. It flies over the same plants at dusk and is then easily captured, but since the larva is readily found on composite blossoms, the more satisfactory plan is to rear it and so avoid the perplexing results of wear and tear. It was formerly known here under the name of *E. pimpinellata*, and was so described by Mr. Stainton in his "Manual," but in the year 1859 this error was discovered and pointed out by the Rev. H. Harper Crewe, and in consequence it received, in Mr. Newman's "British Moths," the present name. It is somewhat local, though probably more widely distributed than we are at

present aware of, from the obscurity of captured specimens, as already pointed out. Recorded from Surrey, Sussex, Dorset, Devon, Cornwall, Somerset, Gloucestershire, Herefordshire, Worcestershire, Norfolk, Derbyshire, Cheshire, Lancashire, and Yorkshire. In Wales it was rather common near Pembroke, and in Glamorganshire Mr. Vivian found it with a fine black varietal form. In Scotland it has been found in Wigtownshire, by the Messrs. Gordon; in Ireland its distribution is far wider—Dublin County, Wicklow, Cork, Kerry, Galway, Sligo, Monaghan, and Armagh; but its range abroad is still uncertain—we only know it to occur in France and Germany.

19. **E. albipunctata**, *Haw.*; **tripunctata**, *H.-S.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings broad and blunt; brown, faintly rippled with whitish-brown; discal spot large, black; nervures faintly dusted with black and white; above the anal angle is a distinct white spot, and often one or two more above this. Hind wings pale brown with a white dot over the anal angle.

Antennæ of the male simple, ciliated, brown; palpi rather projecting, dark brown tipped with paler; head and thorax pale umbreous, dusted with darker, and having often a faintly whitish triangular spot at the back of the latter; abdomen dull brown; the lateral tufts visible on a strong ridge; dorsal tufts scarcely perceptible; anal tuft compressed. Fore wings broad and blunt; costa decidedly arched; apex bluntly rounded; hind margin curved but not very oblique, the anal angle fully formed; dorsal margin rather full; colour pale umbreous, thickly dusted all over with darker; nervures obscurely dotted and streaked with black-brown and white; costa clouded with numerous small obscure brown shades; discal spot black, short and rather rounded; lines absent, except the subterminal, which is white but hardly visible except in detached white dots, and a more conspicuous broad one above the anal angle; cilia dull brown. Hind wings

rather squared behind ; pale umbreous shading to white in front, and with the base rather pale ; central spot small, black ; nervures toward the dorsal half of the wing streaked with dull black and white, and the intermediate areas dusted with dark brown ; near the hind margin is a slender obscure whitish line expanding into a round white dot near the anal angle ; cilia pale grey-brown, clouded with darker. Female similar but with a rather stouter body.

Underside of the fore wings shining pale smoky-brown ; costa yellow-brown, barred beyond the middle with three narrow, and one broad, black-brown clouds ; discal spot narrow, black ; hind margin edged with black streaks. Hind wings shining, dusky white ; twice faintly barred beyond the middle with curved lines of brown streaks ; central spot black, triangular. Body whitish-brown with a dark brown anal tuft ; legs also whitish-brown, barred with black-brown.

Usually not variable to any noticeable extent, but a little over twenty years ago a unicolorous smoky-black form was reared at York along with ordinary specimens, and received the name of var. *anglicata*. This striking melanic form seems now to be rather frequent in the north, but not to be accompanied by intermediate varieties.

On the wing in May and June, and as a second generation in August.

LARVA rather wrinkled, not very robust, tapering toward the head ; general colour pale lemon yellow, more or less suffused with rich brown ; down the middle of the back is a series of lily-shaped deep brown spots, bordered on either side by a slender subdorsal line of the same colour ; on each side is a row of slanting light yellow stripes and deep brown blotches ; undersurface greenish-yellow ; central ventral line deep brown ; subventral lines much broader, of the same colour ; body studded with numerous small white tubercles.

Or—Ground colour pale yellowish-green ; down the middle

of the back is a series of semi-lozenge-shaped dusky brown spots, connected by the dorsal line of the same colour, becoming indistinct on the posterior, and confluent on the anterior segments; subdorsal lines dusky and indistinct, followed by a series of dusky blotches; central ventral line dusky and interrupted; the whole body, especially the back, studded with minute white tubercles and a few short blackish hairs. The dorsal, subdorsal, and lateral spots and lines are sometimes almost or entirely wanting, leaving the larva a uniform pale yellowish-green. (Rev. H. H. Crewe).

Other forms figured by Mr. Buckler have the general colour red-brown, purple-brown, grey-green, or full green; the head usually agreeing in colour with the body, and the markings usually very distinct in a far deeper tone of the ground colour.

End of May, June, and a second generation from the end of August till October; on the flowers of *Umbelliferae*; more particularly of *Angelica sylvestris*, and *Heracleum sphondylium*. Hofmann adds *Cicuta virosa*, *Laserpitium latifolium* and *Peucedanum oreoselinum*; and the late Mr. D'Orville, of Exeter, reared a fine series, from the egg, upon flowers of *Anthriscus sylvestris*, there being no other umbelliferous plant obtainable, in blossom, at the time at which these eggs hatched.

This case was somewhat peculiar—the moths from pupæ in his possession emerged in *April*. They paired, and the larvæ from the resulting eggs fed up so rapidly, on the *Anthriscus*, that some were full grown in a fortnight; the moths from these did not emerge till the beginning of July, yet this would allow full time for a third brood in the year. Mr. N. M. Richardson has found that it will feed freely upon the leaves of elder. While at rest, in the daytime it likes to sit on the under side of one of the secondary umbels of the great plants usually chosen, where it is only seen by close scrutiny. Unfortunately it is excessively subject to the attack of Ichneumon parasites.

PUPA short and stout, the head very blunt, thoracic portion thin-skinned, yellowish-green; the wing-covers dark green, and with the limb covers very glossy and almost without sculpture; dorsal segments sparingly pitted, yellowish green; abdominal segments red-brown, also rather sparingly pitted, the hinder margin all smooth and edged by a fine suture; abdominal segment swollen at the base, then conical, and the cremaster similarly conical, furnished at the tip with hooked bristles. In a silken cocoon among rubbish on or in the ground.

The winter is passed in this condition.

The moth doubtless hides among the herbage about its food plants, but it is very seldom seen, and almost all our specimens are obtained by rearing.

Although recognised and named by Haworth, it became so completely overlooked that no notice was taken of it in Mr. Stainton's "Manual"; but in a very few years later—about 1860—it was re-discovered, being then regarded only as the species recently named *tripunctaria* by Herrich-Schäffer. Shortly after it was recognised as Haworth's lost species. It certainly is widely distributed here, and not very uncommon, though so seldom seen. In the larva state it has been found in Kent, Sussex, Surrey, Hants, Dorset, Devon, Somerset, Berks, Bedfordshire, the Eastern Counties to Norfolk, Gloucestershire, Herefordshire, Worcestershire, Leicestershire, Staffordshire, Derbyshire, Cheshire, Lancashire, Yorkshire, Durham and Northumberland. In Wales Mr. Vivian took it at Port Talbot, and I found it in Pembrokeshire, but not commonly. In Scotland it has been obtained in Midlothian and Aberdeenshire; in Ireland in Cork and Sligo; but in both countries further investigation as to its wider range is desirable. Abroad its range is not yet ascertained, and it seems only to be recorded from Holland and Germany.

20. *E. pimpinellata*, *Hüb.*; *denotata*, *Stn. Manual.*—  
Expanse 1 inch. Fore wings a little elongated; rich light brown shaded toward the costa to grey-brown; and having numerous slender sinuous transverse brown lines blackened toward the costa; discal spot elongated, erect, black; median nervure spotted with black; subterminal line white. Hind wings greyish-white.

Antennæ of the male simple, ciliated, shining light brown; palpi short and blunt, dull chocolate; head and the conspicuous neck-ridge whitish-brown dusted with black; thorax pale reddish-brown; the basal two segments of the abdomen ashy-grey, edged behind with red-brown or dark brown, remaining segments reddish-brown, a series of minute black tufts embellishes the dorsal ridge; anal tuft rather long, compressed, ashy-grey shaded with red-brown. Fore wings rather elongated; costa flatly arched, more so toward the apex, which is bluntly rounded; hind margin smoothly and evenly curved; dorsal margin short and a little filled out; colour pale reddish-brown much shaded on the costal half with ashy-grey; transverse lines numerous, brown, oblique and somewhat parallel, very slender and faint, but each arising from a blacker spot on the costa, and every one emphasised by a black bar across the median nervure or its lower branch (vein 2) thus producing a series of black dots on these nervures; basal line single; first line duplicated rather widely apart; then a double central line crosses, and bends back at the discal spot—which is large, elongated, and deep black—this double line and a single one immediately following it are the blackest on the margin of the wing; following, but outside a stripe of the ashy shading, is the second line, obscure and rather dotted; some distance from this is the subterminal line, white, very irregular and repeatedly angulated, but complete and not widened into spots; extreme hind margin edged with very fine black streaks; cilia shining ashy-grey. Hind wings broad and rounded behind; greyish-white, repeatedly but faintly barred on the dorsal region with pale

brown, but with black on the adjacent nervures; shaded behind with smoky-grey, through which run two rippled faint white lines; central spot a black dot; cilia shining greyish-white. Female similar.

Underside of the fore wings shining pale smoky-grey; discal spot, one above it, and another beyond, on the costa, black; subterminal line whitish but edged with darker smoke colour; some small whitish dashes point in from the hind margin. Hind wings dusky white, with a strongly angulated transverse smoky-grey stripe near the base, followed by a faint duplicate; central spot black; opposite it on the dorsal margin are one or two smoky-black spots, and toward the hind margin two curved transverse smoky-grey stripes most distinct upon the nervures; hind margin sharply edged with slender black streaks. Body and legs grey-brown.

Not variable, except a little in size.

On the wing in June and July.

LARVA long, rather slender and tapering toward the head; green with three purple dorsal lines, the middle one broad and distinct, expanding considerably on the anal segment; the two side ones very indistinct; spiracular lines and segmental divisions pale yellow; head and prolegs purple; undersurface green; back studded with a few minute white tubercles, interspersed with, here and there, a black one.

Or—Uniform purple with two lines of a deeper shade on each side of the back. (Rev. H. H. Crewe.) Mr. Buckler has figured a nearly uniform pale green variety with a purple anal tip; and another, pale purplish-brown, with a darker dorsal line.

August, September, and the early part of October, on the flowers of *Pimpinella saxifraga* and *P. magna*, eating the blossoms and the upper portion of the pedicels, and often resting during the day stretched out on the remainder of a pedicel so as to look quite like a continuation thereof. Said also to feed occasionally on the flowers of *Angelica sylvestris*, and

Hofmann says on *Bupleurum falcatum* and *Peucedanum ocoselinum*, on the Continent. It prefers plants growing on hedge-banks and way-sides, and is sometimes terribly infested with Ichneumons.

PUPA moderately stout, rounded in front; wing and limb-covers rather glossy and almost devoid of sculpture, yellowish-green; anterior band of each segment roughly and abundantly pitted, the edges ridged; colour red-brown; anal segment a little swollen, cremaster conical, rather elongated, tipped with fine hooked bristles. Sometimes wholly red-brown. In a cocoon of silk and earth, in the ground.

In this condition through the winter.

This species also hides, in the moth state, among low-growing herbage, and is not easily disturbed in the daytime, nor very often captured at all in the moth state. It flies at late dusk over its food plant in lanes and at hedge-sides, but quickly becomes worn and difficult of recognition. Hence the specimens in our collections are principally those which have been reared in confinement. It seems first to have been noticed in this country in 1851 by the Rev. J. S. Henslow, who found and reared larvæ in Suffolk, but did not recognise the species. It has since been found—by the same means—to have a wide distribution here, to be common in the Eastern Counties, and to occur in all the Southern and Western Counties except perhaps Cornwall, reaching even to Westmoreland; also found in Derbyshire, Yorkshire and Durham. In Wales I have met with it in Pembrokeshire, but have no other record, nor does there appear to be any for Scotland, but in Ireland it is recorded from Killarney, and I have *seen* a specimen obtained by Mr. D. C. Campbell in Derry. Abroad it is found through the greater part of Central Europe, the South of France, the North of Italy, Livonia, Southern Russia, and in a rather greyer variety in the mountainous regions of Central Asia.

21. **E. helveticaria**, *Blc.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18-22 mm.). Fore wings bright purplish umbreous, with numerous faint brownish-white transverse lines; nervures dotted with black; costa spotted with the same; discal spot distinct, black. Hind wings umbreous.

Antennæ of the male simple, thickly ciliated, glossy brown; palpi rather prominent, black-brown; head and thorax umbreous, dusted with white; abdomen reddish-brown, basal segment ashy-grey with a black-brown transverse bar; from it the dorsal ridge is ashy-white, regularly broken by small black tufts which are tipped with white; anal tuft compressed, ashy-brown, tipped with black-brown. Fore wings somewhat trigonate; costa nearly straight, except toward the apex, where it becomes well rounded; hind margin also very smoothly curved, and dorsal margin similarly so; colour shining light purplish-umbreous thickly dusted with darker purple-brown; nervures all blackened, but this interrupted with white at every one of the numerous transverse lines; basal line and the double or triple first line most obscure, faintly and partially black with a slight white edging, arising from black costal dots but hardly noticeable elsewhere except where they cross the nervures: beyond these is a middle, triple series of rather blacker lines more distinctly edged with white, and blackened at the costa, of these the first embraces the discal spot, which is small, deep black and forms a crescent, the horns of which are cut off by the white lines; second line suggested by a double series of black and white dots on nervures, becoming white streaks on the dorsal margin; beyond this line the nervures continue dotted, black and white; subterminal line white, slender but rather complete, angulated, and a little thickened, above the anal angle; along the extreme hind margin is a row of thick, almost lunate, black streaks, edged outwardly with dull white; cilia smoky-brown. Hind wings rounded behind, smoky whitish-brown, with a whiter band in the middle, and white bars across the subdorsal nervure; central spot black; hind

margin edged with short black streaks; cilia pale smoky-brown spotted with darker. Female similar.

Undersides of the fore wings smoky-grey; costa clouded with smoky-black, which is broken beyond the middle by pale bars; discal spot black, followed by an obscure paler band. Hind wings whitish-brown, thickly dusted with black, and four times banded with aggregations of black atoms; central spot black. Body and legs brown.

Rather subject to local or climatal variation. Those from which the above description is taken were from Perthshire; those from the Pentland Hills, near Edinburgh, are often of a lighter purplish-brown, but pass through various shades to nearly black, always being of a rather small size; while a rather large variety from Southern English localities is of a decidedly lighter umbreous, without any purplish tinge, and having little or no trace of the white edgings to the transverse lines. All these forms shade one into the other in intermediate localities; but the last-named was at one time believed to be a distinct species under the name of *E. arcuthata*. A race of even more striking forms exists in Sutherlandshire, having no trace of purple-brown colour, but being dark grey; in some cases with the pale lines visible—two complete rippled whitish transverse lines in the central space and two more immediately outside the second line—or in other instances these whitish lines are partially or quite obliterated, the usual “first” and “second” lines becoming distinct and black, enclosing a central smoky-black band, down the middle of which is a blacker central line; sometimes also the spaces outside this central band are distinctly paler—a very striking and remarkable series of forms—in other specimens there is hardly a trace of dark lines or of rippled pale ones, and the fore wings are simply dusted with darker grey, the cilia being dashed with the same. There is a wonderful parallelism between these forms of the present species and those hereafter to be noticed in the case of *E. satyrata*.

On the wing from April till June, and a partial second generation in August and September.

LARVA rugose and rather stout with raised longitudinal ridges and flattened interspaces; head fully rounded, pale yellowish-green, the mouth pale brown; body bright green; dorsal line slender, darker or smoky green; subdorsal line white, placed on a raised longitudinal ridge; half-way down each side is another conspicuous raised ridge having upon it a broader white or pale yellow stripe, irregular and rather ill-defined; undersurface green, slightly ribbed transversely; legs and prolegs green, the latter swollen, the anal pair especially so. Sluggish, hardly disposed to move in the daytime, but if thoroughly roused jerking itself violently about.

June and July, and a second, partial, generation in September and October; on juniper; but in confinement it will eat cypress.

PUPA rather slender, the limb and antenna-covers closely compact and shining, without sculpture; wing-cases also shining and smooth, all dark green; dorsal and abdominal segments smooth and glossy, hardly showing a trace of pitting, but the segments ridged; paler green or yellowish-green; cremaster light brown, broad and conical, tipped with fine bristles.

Either spun up among the twigs of its food-plant, or in the ground in an earthen cocoon. Both methods seem to be adopted.

In this condition through the winter.

The moth hides during the day in the bushes of juniper, but I have no personal knowledge of its habits. It seems to be curiously sensitive to change of climate, pupæ from Scottish larvæ when brought into the South of England are very apt to produce the moths in January or February instead of April. It seems to have been discovered about the year 1857 in these Islands, larvæ having been found on the

Pentland Hills, by Mr. R. F. Logan, and reared. This locality still continues to furnish it in plenty, and it is found in Clydesdale, in Aberdeenshire, Perthshire, and in great abundance in Sutherlandshire. Probably on all Scottish hills upon which juniper grows. It is also found very locally in the North of England, especially at Grange, North Lancashire, but in England the typical form is usually replaced by the variety *arceuthata*, which has been taken in the larva state in Surrey, Wilts, and Bucks, though never in any numbers; moreover, this form has been found, along with the type, in the Edinburgh district of Fifeshire. A record of the typical form, at Killarney, in the south-west of Ireland, by Mr. E. Birchall, has not since been confirmed.

Abroad it is found in Switzerland, Northern and Western France, Germany, the North of Italy, Lapland, and Finland.

(*E. egenaria*, H.-S.—This species was introduced, and shortly described, in the "Manual," by Mr. Stainton in the year 1859, with the remark: "Has occurred in Wales and in the Isle of Wight," and Mr. H. Doubleday told me in 1874 that the original specimen was taken in Wales by Mr. Buxton. Mr. Stainton placed it in the section "having the central spot conspicuous, black," the wings brown and cilia unicolorous, comprising species from *E. helveticaria* to *E. criguata*. Beyond this the description hardly made the species clear, and for many years the question from those whose series of *Eupithecie* were nearly complete was "What is *egenaria*?" To this the answers were usually not satisfactory. A specimen taken in Essex by Miss Hutchinson, and afterwards in Dr. Battershell Gill's collection, was referred to this species (or name), but to this I have not access. One placed under this name in the fine collection at the Liverpool Museum is *E. innotata*. One so placed in another large collection was found to be *E. silenata*, a species as yet unknown as British; and the figure by Standfuss seems to indicate the same species. One or two of the late Mr. Bond's

specimens seem to be possibly *E. virgaureata*, var., but smoother, and those in the late Mr. S. Stevens' collection are apparently the var. *arcutata* of *E. helveticaria*. This also is the case with those in Dr. Mason's collection; and I feel no doubt that Staudinger is right in referring *egenaria* to this large variety of *E. helveticaria*; indeed this is confirmed by reference to Herrich-Schaffer's original figure. (*E. egenata*, Zeller, appears to be a very different species, from North America.)

22. **E. satyrata**, *Hüb.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings very pale umbreous with numerous faint brown rippled transverse lines, often having whiter fainter lines between, nervures dotted with white and smoky black; discal spot small, black. Hind wings whitish-brown.

Antennæ of the male simple, thickly ciliated, dull brown; palpi rather projecting, blunt, grey-brown; head and thorax ashy-brown; abdomen of the same colour, with a faintly white edge to each segment, and on the dorsal ridge a minute raised grey-brown tuft; anal tuft rather compressed. Fore wings moderately broad, ashy-brown, all the markings faint; the basal and first lines very obscure, the latter double or triple, most distinct on the costa, sometimes visible otherwise but often only as a faint dot or two on the nervures; discal spot black but small and indistinct; immediately beyond it is a series of four faint slender parallel grey-brown lines, edged outwardly with ashy-grey; then a fifth which is more dotted, and seems to represent the normal second line, and is without the pale edging; all these five are sinuous and strongly bent back below the costa; the subterminal line only exists in detached whitish dots, one of which, above the anal angle, is more distinct and whiter; cilia ashy-brown. Often the only indication of the transverse lines is by dots on the nervures. Hind wings rather broad; very pale greyish-brown, with a faint series of whitish commencements of transverse lines down the dorsal margin; central

spot obscure, smoky-black ; cilia ashy-grey. Female similar.

Underside pale brown, or ashy-brown ; the fore wings faintly crossed by two slender brown lines, and one broader ; hind wings dusted with brown ; central spot minute, black ; followed by a slender, dotted, curved brown line, and this by a more distinct brown band. Hind margins all edged with black lines. Body and legs brown.

Singularly subject to climatal variation. A common and well known form, which was at one time supposed to be a distinct species, under the name of *E. callunaria*, is found in plenty in Scotland and the north of England, frequenting heaths, and being in fact very much commouer than the typical form, which often occurs along with it. In this variety the fore wings are sharper, more trigonate and narrower, the colour is pale brown or pale greyish brown, and the markings are formed more into narrow darker transverse bands. Altogether it looks very like a distinct species, but intermediates are frequent, especially in the North of Ireland ; moreover, the Rev. H. H. Crewe reared the more typical southern form from eggs laid by this variety, the larvæ having fed upon garden flowers in the South of England. A still more remarkable climatal variety is that found commonly in the Shetland Isles, and also at one time recorded as a distinct species under the name of *E. curzoni*. This form is exceedingly pretty, greyish white with sharp and distinct lines, often becoming bands, of mottled blackish-grey or black, the central band often well formed—of two stripes enclosing a pale one and a small black discal spot—usually with an additional stripe beyond, but sometimes having the remainder of the wing pale and this central band alone conspicuous. Intermediate forms, uniting this perfectly with the var. *callunaria*, are found in Perthshire and Sutherlandshire, and in the North of Ireland.

Perhaps the most remarkable form of this species known. however, is that specimen which was reared many years ago

by the late Mr. Henry Doubleday from a larva found in Essex, sent by him to M. Gueneé, and finally described by the last-named writer under the name of *E. pernotata*. This specimen, the only one known, is still in Mr. Doubleday's collection in the Museum at Bethnal Green, and in perfect condition. It is very large—indeed extraordinarily so for this species—more than double the size of the var. *callunaria*; but after most careful and repeated study of it I feel convinced that it is no more than a very large female of the present species. It is of a pretty soft yellowish-brown colour with the transverse rippled lines of a deeper brown. I have seen a specimen under the same name, in another collection, but it appears to be only the var. *arcuthata* of *E. helveticaria*.

On the wing in May and June.

LARVA slender, tapering considerably toward the head; ground colour pale yellowish-green; segmental divisions pale yellow; dorsal line dusky green; down the middle of the back is a series of Y-shaped, dusky green blotches, edged with purplish-brown, and becoming confluent or merged in the dorsal line on the anterior and posterior segments; subdorsal lines very slender and indistinct, dusky green; spiracular lines yellow; between the subdorsal and spiracular lines is a row of small slanting purplish blotches; dorsal region studded with very minute yellowish tubercles.

Or—Back greenish-white; dorsal and subdorsal lines pink or rose-colour; down the middle of the back is a series of large rose-coloured, and rusty-red, goblet-shaped blotches, becoming faint or merged in the dorsal line on the anterior and posterior segments; spiracular line waved, rose-colour; subdorsal and spiracular lines connected by a number of slanting rose-coloured streaks; undersurface pale sea-green or greenish-white, with a central white line; back studded with numerous small white tubercles.

Or—The whole of the back suffused with rose-colour; subdorsal lines yellowish; dorsal blotches edged with yellow;

spiracular line interrupted with yellow patches; under-surface greenish-white; ventral segmental divisions white. (Rev. H. H. Crewe.)

August and September; on the flowers of *Centaurea nigra*, *Knautia arvensis*, *Verbascum thapsus* and other plants of the same genera, and of *Chrysanthemum*, *Helianthemum*, *Scabiosa*, *Geatiana*, *Hypericum*, *Galium*, *Hieracium*, *Aparjia*, *Cirsium*, *Rhinanthus*, *Polygonum*, *Galeopsis*, and many others; also in the North upon heath, sallow and *Arctostaphylos uva-ursi*.

PUPA. Thorax and wing-cases golden-yellow, suffused with red; abdominal segments and tip red. In an earthen cocoon, in the ground. (H. H. C.)

The winter is passed in this condition.

The moth in the South frequents open woods and wood-paths, the rough ground near, and the borders of heaths, but usually is not very common; in the North the typical form still frequents woody situations; but the var. *callunaria* is usually to be found on heaths and moors. It hides among herbage near the ground and is readily disturbed by a passing footstep in sunny weather. At dusk it flies of its own accord. It is taken, not too commonly, in Kent, Sussex, Surrey, Hants, Dorset, Cornwall, Bucks, Middlesex, the Eastern Counties, Gloucestershire, Herefordshire, Worcestershire, Warwickshire, Leicestershire, Cheshire, Lancashire, Yorkshire, Durham, Westmoreland, Cumberland, and Northumberland; in Wales in Flintshire and Glamorganshire; in Scotland, near Edinburgh, in Berwickshire, Roxburghshire, Wigtounshire, Clydesdale, Argyle, Perthshire, Inverness, Aberdeenshire, Sutherlandshire, and the Hebrides and Orkneys, and in the extreme form—var. *curzoni*—in the Shetlands. In Ireland in typical form or mixed varieties—the type having been found by Colonel Partridge so far north as Enniskillen—in Wicklow, Galway, Dublin, Leitrim, Sligo, Fermanagh, Donegal, Armagh, Tyrone, Derry, Antrim, and in

the Mourne Mountains in Down—probably in bogs and on moors everywhere.

Abroad it inhabits Central Europe and the greater portion of Northern Europe, including Iceland and Lapland, the North of Italy, the South of Spain, and Dalmatia; varying at least to var. *callunaria* in the more northern countries.

23. **E. plumbeolata**, *Haw.*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–19 mm.). Fore wings rather silky, whitish grey-brown crossed by numerous browner lines; no discal spot. Hind wings very similar.

Antennæ of the male simple, ciliated, glossy pale brown; palpi extremely small, dark brown; head and thorax pale grey-brown; abdomen paler, more glossy, minutely tufted on the dorsal ridge; anal tuft closely compressed. Fore wings rather ovate; costa evenly, but very little, arched; apex bluntly rounded; hind margin fully curved; dorsal margin stout, and also a little rounded; surface very silky, pale ashy-brown; discal spot absent; markings all pale brown and faint, —basal line very slender; first line also slender but faintly duplicated, followed by a suggestion of a central band of plain ground colour, darkened toward the costa but often constricted in the middle; beyond is a series of closely fitting parallel browner and paler rippled lines, of which the faintly darker middle one may represent the ordinary second line; hind marginal region broadly shaded with the colour of the lines, but this is much broken up by the very irregular sub-terminal paler line; cilia shining pale grey-brown dashed with paler. Hind wings rounded behind and rather small; colour as in the fore wings, or a very little paler, and in a similar manner crossed by very obscure rippled lines; no central spot; cilia concolorous. Female closely similar.

Underside of the fore wings shining, very pale greyish-brown; discal spot just perceptible, black; costa faintly barred with smoky clouds, divided by whiter shades. Hind wings greyish-white powdered with brown; central spot a

minute black dot; this is followed by a slender transverse curved brown line; but the whole wing is more faintly barred with similar lines. Body and legs grey-brown.

Usually scarcely varying at all, or only a little in the depth of colour of the transverse lines, but in the collection of Dr. P. B. Mason is a specimen entirely pale ochreous without either darker lines or greyer dusting.

On the wing at the end of May and in June.

LARVA rather short and thick; head yellowish, suffused with purplish-red; ground colour dull pale yellowish-green; dorsal line broad, uninterrupted, dull purplish-red, enlarged in the middle of each segment into a somewhat pear-shaped blotch; subdorsal lines narrow, sinuous, dull purplish-red; spiracular lines very faintly yellow; spiracles black; dorsal and lateral regions thinly sprinkled with slender yellowish hairs; under-surface naked, dull pale greenish-yellow; the middle line wanting, the subventral lines narrow, purplish-red. The dorsal and subdorsal lines are sometimes merged, leaving the back and sides suffused with purplish-red. (Rev. H. H. Crewe.)

July and August, on the flowers of *Melampyrum pratense* and *M. arvense*. (Cow-wheat.)

PUPA golden yellow, the abdominal segments and tip red. In a slight cocoon on the surface of the ground, or in a dry corolla-tube of the *Melampyrum*. (H. H. C.).

In this condition through the winter.

The moth rests during the day among its food-plant near the ground, but is very restless and easily disturbed, so as to appear often to be flying by day of its own accord. The natural flight, however, I think only takes place at dusk. Apparently to be found in all woods and wooded heath lands in which large patches of its food-plant, the common cow-wheat, are growing, and known to occur thus in Kent, Sussex, Surrey, Devon, Cornwall, Somerset, Wilts, Berks, Middlesex, the Eastern Counties, Gloucestershire, Herefordshire,

Worcestershire; Staffordshire, where it abounds on the heathy hills of Cannock Chase; Warwickshire, Derbyshire, Cheshire, Lancashire, Yorkshire and the more northern counties. In Wales Mr. Vivian records it in Glamorganshire, and I have taken it in Pembrokeshire. In Scotland it is found in Berwickshire, Ayrshire, Aberdeenshire, Argyle, and elsewhere in the districts of the Tweed, Solway, Clyde, Tay, and Dee. In Ireland in Kerry, Cork, Clare, Galway, Mayo, and near Lough Swilly, Donegal. Abroad its range is through Central Europe, Livonia, and Finland; and there are specimens in the British Museum labelled from Spitzbergen.

24. **E. isogrammata**, *H.-S.*; **haworthiata**, *St. Manual*.—Expanse  $\frac{5}{8}$  inch (14–16 mm.). Fore wings rather rounded or long-ovate, whitish-grey-brown with numerous smoky-brown or blackish transverse lines; no discal spot. Hind wings pale grey-brown. Basal segment of the abdomen ochreous.

Antennæ of the male simple, rather thickly ciliated, light brown; palpi small, very blunt, dark brown; head brownish-white; thorax grey-brown; abdomen strongly tinged at the base with orange-ochreous, and a little so down the dorsal region, otherwise ashy-brown; anal tuft compressed. Fore wings rather elongate-ovate; costa very flatly arched; apex bluntly rounded; hind margin gently curved, not very oblique and the anal angle defined; dorsal margin nearly straight; colour pale ashy-brown, transversely striped throughout with darker brown bands and lines, which usually are very obscure; there is, however, often visible, a basal line followed by a broader band of this dark brown; then the first line, triplicated, and followed by another dark band, narrowest in the middle; then two more fine lines and a slender dark band; beyond which two dotted dark lines seem to represent the ordinary second line; hind marginal region rather darker, completely intersected by a very

straight but rather rippled whitish-brown subterminal line ; discal spot not represented ; extreme hind margin edged by a series of thick short black streaks ; cilia glossy grey-brown, clouded with darker. Hind wings small, rounded behind, similar to the fore wings in colour, and even more obscurely barred throughout with dark brown clouding ; central spot absent ; cilia concolorous. Female quite similar.

Underside of the fore wings shining pale smoky-brown ; costa spotted alternately with smoky-black and yellowish-white ; three edges of transverse smoky cloudings indicate darker stripes ; hind marginal region mottled with yellowish-white ; discal spot visible as a small round black dot. Hind wings dusky white, banded throughout with brown stripes of varying widths. Body and legs brown.

Only variable in a small degree in the depth and distinctness of the transverse lines and bands.

On the wing in June and July.

LARVA short and thick ; the head dusky, spotted with olive ; ground colour of the body pale bluish or yellowish-green with three horizontal dorsal stripes of a darker shade ; these stripes are very often indistinct and sometimes altogether wanting ; surface sparingly studded with minute black dots.

July and August ; feeding inside the unopened buds of *Clematis vitalba* (Traveller's joy). Its presence may generally be detected by the blackened appearance of the flower-buds ; when it has eaten out the inside of one bud it comes out and bores into a fresh one ; but when nearly full-fed it often feeds among the stamens of the expanded flower, and may then be beaten into an umbrella. It also will eat the stamens of the white garden *Clematis*, and feeds up very rapidly. (Rev. H. H. Crewe.)

PUPA. Thorax and wing-cases green ; abdomen red. In a very tightly spun earthen cocoon, in the ground. (H. H. C.).

The winter is passed in this condition.

The moth is active in the daytime, flying very swiftly in hot sunshine about and over its food-plant. By this habit it becomes so rapidly worn that specimens captured on the wing are seldom in sufficiently fine condition for the cabinet, and very often are barely recognisable except for their small size.

Found almost exclusively about *Clematis*, but following this plant freely in gardens, in districts in which it is not found wild. Most plentiful, however, in the chalk districts of the South of England. Still to be found in the suburbs of London, and common in Kent, Sussex, Surrey, Hants, Dorset, Wilts, Devon, Somerset, Berks, Oxfordshire, Gloucestershire, Herefordshire, Essex, Suffolk, Norfolk, and Cambridgeshire, also found in Leicestershire, Worcestershire, Staffordshire, Derbyshire and North Lancashire, which last appears to be its northern limit in these Islands. In Wales it occurs in Glamorganshire and Pembrokeshire; and in Ireland in Dublin County, Kerry, Galway, Sligo, Tyrone, and Louth.

Abroad its range is through France, Belgium, Germany, Switzerland, Northern Italy, and South-Western Russia.

25. **E. pygmæata**, *Hüb.* — Expanse about  $\frac{3}{4}$  inch (16-19 mm.). Fore wings trigonate, rather pointed; pale umbreous with numerous obscure whitish transverse lines; no discal spot; a white spot above the anal angle. Hind wings smoky-brown.

Antennæ of the male simple, short, ciliated, brown; palpi very short and small, dark brown; eyes reddish-brown; head and thorax dull umbreous dusted with white; abdomen paler brown, dusted with ochreous; anal tuft compressed to a point. Fore wings somewhat trigonate, more nearly pointed than in allied species; costa almost straight; apex suddenly rounded; hind margin oblique but very little curved; dorsal margin nearly straight; colour umbreous with a faint gloss of golden-brown; nervures dusted with white almost throughout, the intervals being dark brown; costa edged

with dark brown; the basal line is indicated by a faint white costal cloud, and three pairs of more distinct white dots suggest the origins of the first, central, and second lines respectively, but these lines can only be traced by consideration of the white dusting on the nervures: subterminal line hardly indicated, except that it forms a distinct white spot above the anal angle; discal spot absent; extreme hind margin edged by a cloudy white line; cilia shining pale brown clouded with darker and showing a white dash near the white dot of the anal angle. Hind wings rather small, rounded behind; grey-brown, crossed by several hardly perceptibly whiter lines, but edged behind by a less obscure white line; cilia shining pale grey-brown. Female similar.

Underside of the fore wings pale smoke-colour; costa edged with dark brown, but spotted for two-thirds of its length with small yellow-white clouds; nervures beyond the middle dusted with darker colour. Hind wings whitish-brown, crossed by numerous brown lines, those beyond the middle being the most conspicuous; hind marginal area clouded with dark brown; central spot faintly brown. Body and legs whitish-brown; tarsi darker.

Apparently not variable.

On the wing at the end of May and through June, sometimes into July or even August; moreover specimens of a partial second generation are sometimes met with in the latter month and in September.

LARVA long, very slender, and tapering extremely in front; ground colour dull pale yellowish-green; dorsal line pale olive, connecting a series of very distinct, well defined, urn-shaped blotches of the same colour, which become confluent on the thoracic and anal segments; subdorsal and spiracular lines pale olive, sinuous, distinct, and rather broad; under-surface without markings; skin rugose, freely studded with short whitish hairs. (Rev. H. H. Crewe.)

June and July, also occasionally in a partial second generation.

ration in September ; on the petals and anthers of *Stellaria holostea* ; but in confinement will feed also on those of *Cerastium tomentosum*, *C. arvensis*, and *C. triviale*.

PUPA rather short, thoracic portion cylindrical, limb and wing-covers and thoracic shield all very smooth, glossy, and devoid of sculpture, yellow-green ; dorsal and abdominal segments also glossy, but finely dotted with small punctures in the broader anterior bands ; red-brown ; cremaster short and thick, armed with minute hooked bristles. In a tough strong cocoon of root-fibres and earth ; in the ground.

The moth flies in a lively manner, in the afternoon sunshine, over the flowers of its food-plant. It loves sunny spots at the edges of woods or heaths, or a broad space by a hedge-bank or on a railway bank, where the pretty stitchwort grows in large masses ; dancing gaily over and around it, but instantly disappearing if the sun is obscured, and hardly to be induced by any means to fly so long as the weather is cloudy. It used to be considered to be a fen insect, and indeed was named *palustraria* on its discovery here in the year 1850 ; but my own experience does not confirm this habit ; so far as I have observed, it only inhabits fenny districts in the same manner as drier localities—where the *Stellaria* exists in extensive beds. Records for the extreme South of England seem to be wanting ; but it has been taken, locally yet plentifully, in Buckinghamshire, Huntingdonshire, Cambridgeshire, Norfolk, Suffolk, Leicestershire and Derbyshire ; more rarely in Staffordshire ; also in Cheshire, Lancashire, Yorkshire, Durham, Cumberland, and Northumberland ; but I find only one notice for Wales, in Denbighshire. In Scotland it is not uncommon in Berwickshire, the Edinburgh district, Fife, Roxburghshire, Renfrew and other parts of Clydesdale, Argyle, and Perthshire ; in Ireland in Dublin County, Cork, Galway, Wicklow and Louth. Abroad its range seems to be limited to Holland, Belgium, Livonia, Finland and Lapland.

26. **E. trisignata**, *H.-S.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–22 mm.). Fore wings somewhat ovate, silky, pale brown, dotted upon the nervures with rather deeper brown; discal spot black; on either side of it is a dull black spot on the costa. Hind wings greyish-white.

Antennæ of the male simple, ciliated, brown; palpi small, rather upraised, reddish-brown; head and thorax smooth, pale reddish-brown; abdomen a shade paler; anal tuft compressed. Fore wings rather blunt; costa evenly arched; apex bluntly rounded; hind margin smoothly curved; dorsal margin nearly straight; surface silky and shining, pale reddish-brown; costal region and the nervures, to the middle of the wing, deeper brown, remainder of the latter dotted with the same; discal spot black, not sharply defined; on each side of it, on the costa, is a dull black-brown or smoky-black spot, the three forming a rather characteristic triangular group; usual transverse lines scarcely suggested, except that the subterminal line is faintly white and sinuous; cilia shining pale grey-brown. Female similar.

Undersides of all the wings very glossy; fore wings pale smoky-brown, whiter on the middle of the costa, and showing the three spots of the upper side; cilia prettily dashed with black-brown. Hind wings whitish-brown, once or twice crossed by faint brown lines; central spot visible, triangular, dull brown.

On the wing in June and July.

LARVA rather short and stout, tapering but slightly towards the head, which is black and bent down; ground colour pale green; dorsal and subdorsal lines dark green, the latter broader than the former; spiracular lines waved, whitish; segmental divisions yellowish; anal tip of the dorsal line purple; dorsal surface wrinkled, and sprinkled with a few short bristly hairs; undersurface green, with a central yellowish line. The black head gives this larva a very distinct appearance. (Rev. H. H. Crewe.)

September and October, on *Angelica sylvestris*, and occasionally upon *Heracleum sphondylium*; feeding on the flowers and seeds; resting during the day underneath the secondary umbels.

PUPA rather stout, eye-covers shining and rather prominent; limb and antenna-covers compact, the latter slightly barred with channels at the joints; wing-covers thickened at the margins, the nervures well indicated, the surface glossy but minutely wrinkled, pale olive-green and very transparent; back of the thorax ornamented with several flattened tubercles, pale olive; dorsal and abdominal segments faintly pitted, but smooth and strongly ridged at the hinder edge, yellowish-red; cremaster triangular, tipped with a tuft of short hooked bristles. In a tough cocoon of silk and earth or rubbish, in or on the ground.

In this condition through the winter.

The moth is rarely seen at large, or if seen is not recognised, since its first gloss and freshness become very quickly impaired by flight. Indeed, its distinguishing characters are scarcely ever reliably discernible in a captured specimen. Doubtless it hides among herbage near or among its food-plants. It was only discovered here by accident about the year 1859, by the Revs. H. H. Crewe and Joseph Greene, when searching for another species, and has not since been found in any large numbers nor to have a wide distribution. The records are almost, if not quite, invariably of the finding of the larva, and this has occurred in Sussex, Surrey, Dorset, and Devon in the South of England; also in Herefordshire, Worcestershire, Leicestershire, Warwickshire, Derbyshire, Yorkshire, and Lancashire. I find no record for Wales, but it is recorded from Argyleshire in Scotland, and in Ireland it seems to have been found at Howth, near Dublin, and in Cork County. Abroad, its range is either small or very little known, apparently extending only to Holland, Germany, and Switzerland.

27. **E. Valerianata**, *Hüb.*; **viminata**, *Dbl.*.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings rather elongated; pale shining brown, minutely stippled with obscurely browner transverse lines; discal spot absent; subterminal line faintly white. Hind wings whitish-brown.

Antennæ of the male simple, slender, minutely ciliated, whitish-brown; palpi narrow, dull brown; head and thorax whitish-brown or drab; abdomen smooth, ashy-brown; anal tuft compressed. Fore wings narrow at the base, elongated; costa gently arched; apex rounded; hind margin strongly rounded; dorsal margin also rather filled out; smooth and glossy, brownish-drab; nervures minutely dotted with white; costa faintly barred with the smoky-brown commencements of all the lines, which otherwise are very faint; the basal is only represented by the costal cloud and a dot on the median nervure; the first is double, smoky-brown, enclosing a white thread; central only just perceptible; and the second consists of a chain of faintly white lunules with a smoky-black edging, both most marked upon the costa; subterminal line a succession of equally faint white dots and lunules, but bending out into the hind margin above the anal angle; discal spot a very slender, erect, black streak; cilia whitish-grey. Hind wings rather long, rounded behind; brownish-white, rather browner towards the dorsal and hind margins; cilia concolorous. Female similar.

Underside of the fore wings glossy, smoky-drab; discal spot faintly black; beyond it is a whitish costal spot, and also two extremely faint rippled whitish transverse lines. Hind wings smoky-white with three or four curved transverse brownish stripes, most marked on the nervures; the latter towards the hind margin are blackened; body and legs shining greyish-white.

On the wing in May and June.

LARVA rather short but tapering very considerably towards the head; ground colour bright green, very translucent;

dorsal and subdorsal lines dark green, but varying considerably in breadth and intensity of colour; spiracular line whitish-green; segmental divisions yellow; underside generally destitute of markings but occasionally traversed longitudinally by two slender faint subventral lines rather darker than the ground colour. When young the general colour is greenish-white. (Rev. H. H. Crewe.)

July and August, on the flowers and seeds of *Valeriana officinalis*.

PUPA short and thick, wing-covers much thickened, having the nervures prominent and the surface between them covered with cross-wrinkles; leg and antenna-cases thickened, the latter barred at the joints; eyes very prominent; dorsal and abdominal segments sparingly pitted and rather glossy, the hind bands smooth and ridged; cremaster broad but rather tapering, tipped with a bunch of fine bristles; colour yellowish olive-green; the segments more olive-red. In a small loosely constructed cocoon of vegetable debris, on or in the ground.

The winter is passed in this condition.

The moth hides during the day among its food-plant, and flies over it at late dusk, but is seldom seen, and our cabinets are almost wholly furnished with specimens reared from the easily collected larvæ. It frequents marshes, fens, osier-beds, and the broad ditches and wet places in which its food, the tall common Valerian, grows. Therefore somewhat local, but found in Devon, Dorset, Wilts, Bucks, the New Forest, Hants; Suffolk, Norfolk, Gloucestershire, Herefordshire, Derbyshire, Cheshire, Lancashire, Yorkshire, Durham, and Westmoreland. In Wales Mr. N. M. Richardson found it at Llangannoch, but I have no other record for the Principality; and none for Scotland. In Ireland it has been met with in the Counties of Cork, Clare, Galway, and Cavan. Abroad its range is not large, but extends through Central Europe and South-eastern Russia.

28. **E. fraxinata**, *Cress.*—Expanse  $\frac{7}{8}$  inch (22 mm.). Fore wings narrow and produced at the apex, pale umbreous, the nervures a little darker; discal spot black; beyond it are one or two obscure bent transverse lines. Hind wings brownish-white.

Antennæ of the male simple, minutely ciliated, brown; palpi very short, dark brown; head and thorax rough, umbreous; abdomen of the same colour, barred with black, and having a row of minute black tufts on the dorsal ridge: anal tuft short and blunt. Fore wings long and narrow; costa almost straight to beyond the middle, arched towards the apex, which is acutely rounded and much produced; hind margin long and oblique, gently curved; dorsal margin short and nearly straight; dull umbreous dusted with darker; the basal, first, and central lines only suggested by faint aggregations of this dusting; but the second line excessively oblique and bent back to the costa; subterminal line just visible, brownish-white, a little more distinct above the anal angle; discal spot black, rather lunate; nervures toward the base and hind margin streaked with brown; costa usually faintly barred with brown or black-brown; cilia grey-brown. Hind wings rather long, rounded behind, greyish-white, broadly dusted with grey-brown toward the dorsal margin and narrowly so behind; central spot black; cilia greyish-white clouded with smoky-black. Female similar.

Underside of the fore wings pale smoky-grey, with faint brown clouds along the costa; central spot dull black; beyond it are two broad but obscure partial transverse brownish bands; cilia smoky-brown, clouded with black. Hind wings smoky-white; central spot a black dot; followed by two rippled and angulated grey-brown transverse stripes; extreme hind margin edged with black; cilia whitish-grey. Body whitish-brown, tufted behind, and shaded with smoky-black; legs pale grey-brown, with darker tarsi.

Usually not variable, but in Leicestershire and elsewhere in the Midland counties specimens are sometimes obtained

darker in varying degrees, to smoky-black with blacker nervures, and even to deep black. Such examples are in the collection of Dr. P. B. Mason at Burton-on-Trent.

On the wing at the end of June and in July; also in a very partial second generation in September and October.

LARVA long, smooth, slender and rather tapering towards the head; ground colour uniform dark green with a wavy yellowish spiracular line; segmental divisions yellow; on the anal tip is a dark purplish spot; undersurface whitish and wrinkled, a dark green central line running its whole length.

Or—With a series of dorsal dusky triangular markings, becoming very faint or altogether evanescent on the anterior and posterior segments; on each side is a row of oblique yellowish stripes tinged with pink.

Or—Deep velvety green, dorsal line wanting; subdorsal lines each represented by a series of yellowish-white spots; spiracular line of the same colour; on the middle of each segment, between the subdorsal spots and the spiracular line, is a rather large purple blotch; undersurface whitish green, with a central dark green line.

Or—Ground colour dull reddish-purple; dorsal line dusky purple, enlarged into an arrow-shaped spot at each segmental division; subdorsal line much broken, dull orange; spiracular line bright yellow, orange in the middle, spotted with purple at the segmental divisions, and bordered broadly, on the lower side, with dull purple; dorsal line at the anal tip reddish; undersurface greenish or pale yellow with a central narrow purple line.

Or—Pale yellowish-olive with the undersurface paler; dorsal line deep purplish-red, enlarged in the middle of each segment, paler between, but very dark on the anterior and anal segments; subdorsal lines dull yellow, purple in the middle of the segments; spiracular lines yellow, similarly blotched with purple.

Or—Uniform bright velvety green; dorsal line faintly

purple, subdorsal lines only appearing in detached spots in the middle of the segments; spiracular lines pale yellow blotched on the upper side in the same situations; under-surface whitish or yellowish with a slender central green line. (Rev. H. H. Crewe.)

August and September; and an occasional, very partial, second generation in October and November; on ash; but in confinement on *Laurustinus*; and I am assured by Mr. J. E. Robson that he has found and reared it upon the blossoms of *Scabiosa*.

PUPA long, rather slender and tapering; thorax and wing-cases dark olive-green; abdomen darker, almost black, but tinged underneath with red. (Rev. H. H. Crewe.) In a slight cocoon under loose bark, in a deep chink, or under moss on an ash trunk, or in the earth at its foot.

The moth sits in the daytime on the trunks of ash trees or among the branches, usually running up high soon after drying its wings, and is not commonly seen; at late dusk it flies, also about the ash trees, but will come readily to any neighbouring strong light, such as a gas-lamp. It was formerly confused with *E. innotata*; and was described under that name by Stephens and Stainton, but this error was rectified, and distinctions of both perfect insects and larvæ very fully pointed out by the Rev. H. Harper Crewe. It seems to be by no means rare in the suburbs of London, especially in the Parish of Camberwell, and is to be found in other parts of Surrey, in Kent, Sussex, Hants, Dorset, Devon, Wilts, Middlesex, Cambridgeshire, Suffolk, Norfolk, Gloucestershire, Herefordshire, Warwickshire, Staffordshire, Leicestershire, Derbyshire, Cheshire, Lancashire, Yorkshire, Durham and Northumberland; and in Wales Mr. H. W. Vivian has found it in Glamorganshire. In Scotland it seems to occur only in the south, in the Edinburgh district, Clydesdale, and in the Solway region; in Ireland it is rare, but has been taken in Kerry, Wicklow, Galway, and

Sligo. Abroad it seems to have been observed only in Germany, or its distribution confused with that of the next species.

29. **E. innotata**, *Hüb.*—Expanse 1 inch. Fore wings long, narrow, trigonate, pale umbreous; nervures dotted and streaked with darker brown; discal spot a perpendicular black streak; second line angulated, faintly edged with white. Hind wings white, clouded with brown.

Antennae of the male simple, minutely ciliated, brown slenderly ringed throughout with white; palpi very small, reddish-brown; head and thorax rather rough, pale umbreous; abdomen paler, dorsal tufts hardly perceptible; anal tuft compressed. Fore wings elongated; costa flatly arched; apex very acutely rounded, almost pointed; hind margin curved, very oblique; dorsal margin filled out; colour pale umbreous or greyish-brown, thickly dusted, except in the discal cell, with dark brown; basal line strongly angulated but obscure, principally indicated by black dots on nervures; first line double, dark brown, oblique, but bent back sharply to the costa, and very indistinct; central line very similar but duplicated, parallel, the first of the pair embracing the black discal spot, the other faintly edged on the costa with whiter brown; second line also double, hardly darker than the ground colour, most visible by its pair of edgings of dirty white, whiter on the costa; subterminal line white, slender, sinuous, and just below the costa formed into two deep white loops; outside it some black streaks on nervures point to the hind margin; nervures in the middle of the wing also partially streaked and spotted with black; extreme hind margin edged with short black streaks; cilia pale grey, clouded and intersected with brown. Hind wings rather broad but short, rounded behind, brownish-white, the dorsal region broadly shaded with dull brown, which is broken by transverse whiter lines; hind margin also shaded with smoky-brown, in which is a faint series of whiter clouds; cilia brownish-white. Female similar.

Undersides of all the wings silky, pale grey; discal spot of the fore wings black: costa from the middle barred with smoky-black, and transverse rows of small smoky-black clouds lie along the hinder area. Hind wings prettily dotted in successive transverse lines with smoky-black. Body and legs greyish-brown.

A single specimen of a smoky-black colour has been obtained at Hartlepool by Mr. J. E. Robson; otherwise it scarcely varies at all.

On the wing in July.

LARVA. Tapers considerably towards the head; whole body rugose, studded with minute tubercles; head dusky purple; ground colour pinkish-grey: dorsal line rusty, or dull purplish-brown, connecting a series of well defined, top-shaped, blotches of the same colour, dorsal blotches margined by a number of white lateral stripes: each segment ornamented upon the sides with a large orange-red and dusky-purple spot; spiracular lines white; back and sides more or less suffused with orange; undersurface purplish-grey, with a central dusky purple line margined with white. (Rev. H. H. Crewe.)

August to October, on the flowers of *Artemisia campestris*, *A. vulgaris* (Mugwort), and *A. absinthium* (Wormwood), probably also on those of *A. maritima* and other species.

PUPA. Thorax and wing-cases yellowish-green, base of the latter almost yellow; abdomen pale yellowish-red. In a slight earthen cocoon. (H. H. C.)

In this condition through the winter.

As already explained, the species originally known in this country, under this name, proved to be distinct, and was separated under the name of *E. fraxinata*. The existence of the present species in these Islands became then problematical, but in the year 1879 Mr. G. T. Porritt took upon the sandhills at Skegness, Lincolnshire, two specimens, which

on examination proved to be genuine *E. innotata*. Since that time a very few more have been taken, and also a few larvæ, but it is still a rare species in these Islands, and scarcely anything is known as to its habits. Besides Lincolnshire it has been found in Devon; in the Wye district of Kent; at Shoeburyness, Essex; on the coasts of Cheshire and Lancashire; and at Hartlepool, Durham. I possess no reliable records for Wales, Scotland or Ireland. Abroad it seems to have an extensive range through Central Europe, the greater portion of Southern Europe, Finland, Livonia, Hyrcania, Armenia, and the mountainous regions of Central Asia.

30. **E. subnotata**, *Hüb.*.—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings broad and blunt, yellow-brown; discal spot black; transverse lines faintly blackened but edged with white. Hind wings brownish white, clouded with brown.

Antennæ of the male rather short, simple, nearly naked, shining pale brown; palpi a little projecting, pale drab; head and thorax rather rough, whitish-brown; abdomen of the same colour, but dusted with black, and having along the dorsal ridge a series of oblique half-raised tufts, black in front, white behind; anal tuft more open than in most of its allies. Fore wings broad and very blunt; costa almost straight to beyond the middle, then arched and the apex bluntly rounded; hind margin curved and rather expanded; dorsal margin a little filled out; yellowish-drab; basal, first and second lines faintly brown but hardly perceptible, the two latter composed only of scattered dotting; there is also about both, but especially the second, a dusting of white, in this last taking the form of a partial transverse band; subterminal line white, rather more distinct, dotted on the nervures, and spread, above the anal angle, into a double white spot; discal spot black, not sharply defined; extreme hind margin edged with black lines; cilia shining grey-brown. Hind wings rather broad,

rounded behind, dusky white, thickly dusted with round brown atoms which become black, and larger, on the dorsal half of the wing, and are there sprinkled over brown clouding broken up by whitish transverse shades; hind margin edged with black streaks; cilia grey-brown. Female a little larger and stouter, otherwise similar.

Underside of the fore wings ashy-brown, minutely stippled all over with faint cross lines of grey scales; discal spot black; costal and hind margins rather shaded with light brown. Hind wings dusky white, dusted with brown; central spot black; beyond the middle are two curved smoky-brown transverse lines. Body and legs whitish-brown, with smoky clouding on the tarsi.

On the wing in June, July, and the beginning of August.

LARVA stout and rather short, tapering forwards from the ninth segment, and very slightly behind, flattened beneath and transversely wrinkled; head small, rounded, green or pale brown; body dull green, ochreous, or pale brown, with a broad grey dorsal chain-pattern; dorsal and subdorsal lines grey; spiracular lines paler. Great variation occurs in the intensity of the grey markings, especially in the green larvæ. (Chas. Fenn.)

August and September on the flowers and seeds of *Chenopodium album*, *C. olidum*, *Atriplex patula*, and other species of goosefoot and orache; when young upon the buds, remaining among them during the day but feeding at night, when more nearly full-grown however often hiding under the lowest leaves by day.

PUPA rather stout, wing-covers thickened, moderately glossy, but covered with minute confused wrinkling in irregular lines, rather than sculpture; limb and antennae-cases closely packed and very similarly roughened; dorsal shield thickly covered with fine pitting, as also on the broad anterior portions of the dorsal and abdominal segments; hinder edges of these ridged and having each a narrow smooth

band; cremaster conical, tipped with a pair of very fine curved hair-like spikes, and some minute hooked bristles; pale yellow-brown, wing-covers sometimes olive-brown or olive-green, cremaster rather darker. In a slight cocoon of silk and earth, in the ground.

The moth hides itself during the day among its food-plant, or sits closely pressed to a rail, post, or paling near at hand, its abdomen curved conspicuously upwards. It flies at late dusk about waste places, at road sides, and in neglected portions of gardens, also in plenty about the masses of *Chenopodium* and *Atriplex* at the edges of salt marshes, the banks of tidal rivers, and ditches near the coast, and generally where these plants are plentiful; coming occasionally to a neighbouring gas-lamp or other convenient light later in the night. Still to be found, not uncommonly in gardens in the London suburbs, and throughout the southern half of England, most frequently in the Eastern Counties, and on the flatter sea-coasts; not common in the Midlands though known to occur in Leicestershire, Staffordshire, and Derbyshire; more frequent, especially on the coast, in Yorkshire, Cheshire and Lancashire. In Wales it occurs in Denbighshire, Glamorganshire and Pembrokeshire; in Scotland there is a single record in the extreme south-west; and in Ireland it is rather common on the coast near Dublin. Abroad it is found in France, Holland, Germany, Hungary, Livonia, Finland, and apparently in the north of Palestine.

31. **E. campanulata**, *H.-S.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings broad, blunt, glossy, light reddish-brown; discal spot black; transverse lines faint and few; nervures dotted with brown. Hind wings pale brown.

Antennæ of the male rather short, simple, finely ciliated, light shining brown; palpi blunt, dark reddish-brown, whiter at the tips; head and neck-ridge umbreous dusted with darker; thorax reddish-brown; abdomen dull brown, spotted on the sides with black, dorsal ridge furnished with

very minute whitish tufts; anal tuft depressed and drawn tightly together. Fore wings moderately broad and rounded; costa flatly arched; apex bluntly rounded; hind margin also well curved but not very oblique; dorsal margin rather full; colour reddish-brown; discal spot intensely black, erect and rather large; all other markings very faint; basal, first, and central lines so slightly indicated as not to be recognisable except by small brown dots on nervures and blackish streaks on the costa, but the latter is clouded throughout with blackish shades and faint lines, among which these are obscured; median nervure faintly dotted to the middle with black; second line like the rest, but rather more distinctly indicated by a row of minute faint blackish wedges; sub-terminal line brownish-white, very irregular and sinuous, nowhere white or distinct; hind marginal space outside it shaded with darker brown, and the margin edged with black streaks; cilia shining grey-brown. Hind wings greyish-white, but the dorsal half and hinder region to the middle rippled all over with transverse grey-brown lines and clouds, darkest, and dotted with black, in the dorsal portion; margin edged with black streaks; cilia shining grey-brown. Female similar.

Underside of the fore wings smoky whitish-brown, rather glossy; costa whiter; discal spot black; beyond are two transverse rippled brown lines. Hind wings white; central spot black; also followed by two slender curved transverse brown lines. Body and legs brown.

On the wing in July.

LARVA rather short and thick; head dingy brown or black; ground colour light ochreous-brown; dorsal lines deep brown or black, intersecting and uniting a chain of very strongly defined black or deep brown lozenge-shaped spots placed in the middle of each segment; subdorsal lines slender and faint, blackish or deep brown; spiracular and ventral lines dingy black or brown; dorsal spots confluent on the anterior

and posterior segments ; skin rough and wrinkled, sprinkled with a few whitish hairs. The spots and ground colour vary considerably in intensity of colouring. (Rev. H. H. Crewe.)

August and the beginning of September, on the unripe seeds and seed capsules of *Campanula trachelium* (nettle-leaved bell-flower). Mr. Crewe found it also, in his own garden, on *C. persicaefolia*, *C. media*, *C. latifolia*, *C. collina*, *C. patula*, *C. carpatia*, *C. rapunculus*, *C. rapunculoides*, *C. arcticaefolia*, and *Phytouma campanuloides*.

PUPA. Thorax and wing-covers golden-yellow ; abdomen reddish ; abdominal divisions and tips red. In a slight earthen cocoon. (H. H. C.)

The winter is passed in this condition.

This moth seems to be of singularly retiring and obscure habits, and I have not heard of any instance of its being captured at large in this country ; so far as I know all the specimens in collections have been reared from larvæ. These are readily found however in the withered blossoms and on the seed capsules of its food-plant, wherever this grows in plenty, usually in chalk districts. In this manner it has been found in Kent, Sussex, Cornwall, Herts, Bucks, Bedfordshire, Oxfordshire, Norfolk, Somerset, Gloucestershire, Herefordshire, and Worcestershire ; but so far as I know, not in any other part of the United Kingdom. Abroad it is found in Bavaria and Western Germany.

32. **E. vulgata**, *Haw.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch. (18-22 mm.). Fore wings dull brown, mottled with darker brown transverse lines ; discal spot small, black ; subterminal line white, spreading into a distinct spot above the anal angle. Hind wings smoky-brown.

Antennæ of the male simple, ciliated, purplish-brown ; palpi small, brown, tipped with purple-brown ; head pale brown ; neck-ridge and thorax reddish-brown ; abdomen of the same colour, with a row of black dots down each side and

a row of raised tufts on the dorsal ridge, black tipped with white; anal tuft compressed and tipped with yellowish-white. Fore wings broad and rather blunt; costa evenly arched; apex bluntly rounded; hind margin regularly curved; dorsal margin a little filled out; colour reddish-brown; discal spot small, black; lines faint and obscure but often rather blackened on the costa, the first curved, the central bent round the discal spot, but both excessively faint; the second rather more noticeable, somewhat erect, bluntly angulated just below the subcostal nervure; but about all three is a faint mottling of cloudy black and paler brown; subterminal line distinct, white, very irregular, and spread into a rather definite spot above the anal angle; extreme hind margin edged with black streaks or triangles; cilia blackish-brown, dusted with paler. Hind wings rounded behind, and a little hollowed between the nervures, glistening whitish-brown in front, shading to dull brown toward the dorsal and hind margins; nervures dotted with black and white; hind margin edged with black streaks; cilia grey-brown. Female similar.

Underside of the fore wings glistening pale grey-brown; nervures rather darker; costa clouded with black-brown, and having two smoky-black cloudy spots, one before, the other beyond the black discal spot; a small cloud of brownish-white lies at the apex. Hind wings smoky-white, dusted with brown; central spot small, black, followed by a slender brown transverse line; a small similar cloudy band lies along the hind margin. Body and legs brown.

Variable in general colour from light bright brown to dull blackish umbreous; also in the distinctness of the markings, which in occasional specimens present all the usual lines with tolerable distinctness, decidedly blackened on the costa, and in some cases forming a fairly marked central band to the fore wings.

On the wing in May and June, and as a second generation in August.

LARVA slender, tapering toward the head; general colour reddish-brown or dusky olive; down the middle of the back is a chain of dirty green lozenge-shaped spots, becoming confluent on the anterior and anal segments; spiracular line waved, pale yellow, occasionally interrupted with black; segmental divisions orange; whole body studded with minute white tubercles and sparingly clothed with short whitish hairs. (Rev. H. H. Crewe.)

June and July, and a second generation in August and September; on hawthorn, willow, bramble, raspberry, and whortleberry, feeding on the leaves, which it will even eat when withered. Also upon ragwort, golden-rod, bladder-campion, orpine, and other low growing plants, and garden weeds.

PUPA slender and delicate; head, thorax, and wing-cases olive-green; abdomen reddish, sharply pointed. In an earthen cocoon in the ground. (H. H. C.)

The winter is passed in this condition.

The moth is almost constantly in evidence during the summer, sitting flatly pressed upon doors, window-frames, walls, fences and palings, or on any other objects about gardens, houses, and road sides, in the daytime; or fluttering lazily out of any bush that is disturbed; sitting at night on the glass of a lighted window, or very often, even in numbers, on that of a gas-lamp; or buzzing obscurely along hedges and about bushes in the dusk. It is abundant in London gardens, and in hedges and gardens everywhere in England, Wales, and Ireland, and is also found in the southern portion of Scotland to the Clyde Valley, Aberdeen, Moray, and the Hebrides. Abroad it inhabits Central Europe, Northern Italy, Corsica, Livonia, Finland and Southern Russia.

33. **E. expallidata**, *Gn.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings broad, rounded behind, shining whitish-brown; transverse lines hardly perceptible; discal spot large, ovate,

black; on the costa are three or four black or smoky-black bars or spots. Hind wings smoky whitish-brown.

Antennæ of the male short, simple, ciliated, light brown; palpi small, pointed, dark umbreous; head and thorax light reddish-brown; abdomen of the same colour, but with a broad band of dull black, edged with red-brown, across the hinder half of the basal segment; anal tuft closely compressed. Fore wings broad; costa evenly arched, and the subcostal rib very strong and prominent; apex rounded; hind margin a little expanded and very fully curved; dorsal margin full and strongly ciliated; colour glossy whitish-brown of a very clear soft tint; basal line formed by a black streak on the costa and a dot on the median nervure; first line by a broader black costal spot and a dot each on the median and subdorsal nervures, and dorsal margin; central line by a smaller black costal spot and faint indications of dots on the nervures; it bends so as to enclose the discal spot, which is erect and deep black; the second line arises on the costa as a larger deep black spot, and continues as a minute black dot on every nervure to the dorsal margin; subterminal line very faintly indicated in whitish dusting; cilia shining pale grey-brown, faintly dotted with cloudy black. Hind wings rather small, rounded behind; whitish-brown; the dorsal region faintly browner, and very indistinctly barred with darker brown commencements of lines; central spot obscurely black; cilia pale grey-brown. Female very similar but decidedly larger.

Underside of the fore wings shining pale reddish-brown; nervures darker; costa lighter brown but barred with black before, and very distinctly beyond, the discal spot, which also is black; beyond it is a dotted brown transverse line, and a broader clouded stripe near the hind margin. Hind wings brownish-white, clouded behind with two browner bands; central spot black; cilia spotted with black. Body and legs brown.

Apparently only variable in size, and in the paleness of the white-brown ground colour.

On the wing from the end of June till August.

LARVA having a wrinkled appearance, the body minutely studded with yellow tubercles and very short hairs; ground colour pale canary-yellow; dorsal line pale brown; down the middle of the back is a chain of large deep rich brown tooth-shaped spots, united at the points, and bordered on either side by an almost black subdorsal line, these dorsal spots becoming faint and confluent with the dorsal line on the anterior and posterior segments, almost obliterated on the latter; below the subdorsal lines is a narrow rich brown line, and a row of oblique stripes of the same colour; spiracular line yellowish; undersurface suffused on either side with brown, and having a central line of the same colour running the whole length.

Or—Ground colour grass or yellowish-green; dorsal spots brown, perfectly lozenge-shaped, ceasing on the posterior segments; subdorsal lines deeper brown than the dorsal spots, interrupted at the segmental divisions; spiracular line yellowish, bordered on the lower side with brown.

Or—Ground colour various shades of green; all the markings except the subdorsal lines faint or altogether wanting.

Or—Whole body, with the exception of the dorsal portion of the posterior segments, suffused with deep rich chocolate-brown; remainder canary-yellow with a pale brown dorsal line; on the back of every other segment are two yellow spots; on each side two waved yellow lines enclosing a brown line. (Rev. H. H. Crewe.)

September and October on the flowers of *Solidago virgaurea* (golden rod), but in confinement content to eat blossoms of various species of Michaelmas daisy. Usually to be found on the scattered plants of golden-rod growing in open woods, often but a single larva upon each plant.

PUPA rather large and thick, the thorax and abdomen yellow, the latter deeply suffused with blood-red; wing-cases

more or less tinged with green. In a cocoon of silk and earth, in the ground. (H. H. C.)

The winter is passed in this condition, and it is not unusual for pupæ to lie over two winters.

The moth hides among its food-plant in the woods, but is not readily disturbed in the day-time. At late dusk it flies over and settles on the blossoms of the golden-rod, and sometimes visits those of ragwort and heather; but is not very commonly seen, and appears to be tolerably local. I have records of its presence in Kent, Sussex, Surrey, Dorset, Devon, Somerset, Gloucestershire, Herefordshire, and North Lancashire. In Wales Mr. H. W. Vivian found it at Porthkerry, Glamorganshire, and I met with it sparingly in woods around Pembroke. It also occurs rarely in Scotland; the Rev. C. T. Cruttwell obtained it in Perthshire, and Mr. Reid reports it in Aberdeenshire. In Ireland it has been taken on the coast near Dublin, in Wicklow, Louth, Westmeath, Galway, and even Derry. Abroad it seems to have but a small range, in Belgium and Central and Western Germany.

34. **E. absinthiata**, L.—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings broad, blunt, glossy, pale purplish-brown; transverse lines hardly perceptible; discal spot black; on each side of it is a black spot on the costa; a white spot lies above the anal angle. Hind wings smoky-brown.

Antennæ of the male simple, ciliated, dull brown; palpi small, black-brown; head and thorax reddish-brown; abdomen more purple-brown, and almost devoid of dorsal tufts; anal tuft much compressed. Fore wings rather ample; costa gently curved, more strongly so toward the apex, which is bluntly rounded, almost angulated; hind margin fully rounded; dorsal margin full and strongly ciliated; colour shining light purple-brown or red-brown; discal spot large and black; nervures very minutely dotted with black; costa faintly but repeatedly barred with smoky-black and having

two conspicuous deep black spots, one before and the other beyond the discal spot; lines imperceptible to the second, which is but faintly indicated by pairs of black dots on nervures; subterminal line white, faint but rather regular, spreading into a broad white spot backed with black, above the anal angle; cilia smoky-brown. Hind wings broad, rounded behind, pale smoky-brown; the dorsal half rippled with darker brown, divided by whitish threads; cilia smoky-brown. Female similar but larger.

Underside of the fore wings glossy smoky-brown; discal and costal spots as on the upper side; beyond are several paler and darker transverse lines and a smoky hind-marginal band. Hind wings pale smoky-grey; central spot black; followed by a transverse row of smoky-brown dots, and this by a similarly coloured hind-marginal band. Body and legs pale brown.

There is a good deal of variation in size in this species, possibly from the nature of the food, more probably from some of the specimens being reared in unfavourable conditions. Much more rarely there is a tendency to development of the usual transverse lines, and a rather dark example, which I possess, shows the first, second, and double central lines, oblique and strongly bent back to the costa, very clearly. A rather small form reared upon *Scabiosa columbaria* in Lancashire was described as a distinct species, under the name of *knautiata*, but I am unable to find any real—even varietal—distinction in it.

On the wing in June and July.

LARVA thick and short, tapering but little, body wrinkled, thickly studded with minute white tubercles and somewhat more sparingly with short white hairs; ground colour either yellowish-green, deep rose-colour, or dirty reddish-brown; down the middle of the back is a series of lozenge-shaped reddish spots, generally becoming faint or confluent towards the head and tail. In the green variety these spots are often

wanting. On each side a number of narrow oblique yellow stripes form a sort of border to the dorsal spots; spiracular line waved, yellow; segmental divisions yellow.

It would be impossible to give an accurate description of the almost endless varieties of this most variable larva; they run so closely into each other that it would be an almost Herculean task to separate them. (Rev. H. H. Crewe.)

Mr. Buckler has figured the larvæ pea-green, whitish-green, yellow-green, yellow-brown, purple-brown, and dark brown, sometimes with a pale spiracular stripe.

August till October or November, upon the flowers of common yellow, and hoary-leaved ragwort (*Senecio jacobæa* and *S. erucifolia*), hemp-agrimony (*Eupatorium cannabinum*), mugwort (*Artemisia vulgaris*), yarrow (*Achillea millefolium*), golden-rod (*Solidago virgaurea*), *Aster tripolium*, *Ballota nigra*, *Origanum vulgare*, and various species of Scabious.

PUPA. Wing-cases bright green with the nervures very prominent; thorax yellowish-green; abdomen reddish-yellow, with a dark green dorsal line. In a tightly spun earthen cocoon, in the ground. (H. H. C.)

In this condition through the winter.

The moth hides among coarse herbage and wild flowers, and in the neighbouring bushes, in the daytime, and is rather easily disturbed by the beating stick. It also flies about such places at dusk and may be found later at night on the flowers of composite plants. It is fairly common throughout the southern half of England to the Scilly Isles, and found less commonly in the Midlands, and through the more northern counties to Northumberland. In Wales it is common in Glamorganshire and Pembrokeshire, and is doubtless generally distributed, as also is the case in Ireland. In Scotland it seems to be found in the eastern portion to Moray and Aberdeenshire, in the middle parts to Perthshire, and in the west to Clydesdale. Abroad its range is over the greater portion of Central and Northern Europe,

Northern Italy, South Lapland, Canada, and some parts of New England. This is in fact the only one of our British *Eupithecia* which seems to have been recognised as an inhabitant of North America.

35. **E. minutata**, *Hüb.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–22 mm.). Fore wings narrow, with the apex elongated; smooth pale reddish-brown; the transverse lines often absent, occasionally visible on the nervures; discal spot black; on the costa are three or four black dots, and at the anal angle a white spot. Hind wings whitish-brown.

Antennæ of the male short, rather thick, ciliated, pale brown; palpi slender, dull brown; head and thorax pale brown and rather smooth; abdomen more reddish-brown; dorsal tufts hardly perceptible; anal tuft compressed. Fore wings a little narrow and elongated; costa very flatly arched; apex suddenly rounded, almost angulated; hind margin evenly curved; dorsal margin nearly straight; very pale brown with a reddish gloss; discal spot sharply deep black; costal area dusted with white and repeatedly spotted with cloudy-black; basal, first, and central lines scarcely suggested except by connecting them, somewhat arbitrarily, with the costal spots and with a series of very obscure dapplings of paler and darker brown along the subdorsal nervure; second line rather more visible as a broad faint stripe of whitish dusting edged and divided by rather darker brown; subterminal line white, irregular, and almost broken up into dots, of which one above the anal angle is duplicated and more conspicuous; hind margin edged with dull black streaks; cilia shining grey-brown. Hind wings not broad, rounded behind, grooved or wrinkled between the nervures; pale brown with but very faint traces of any markings; central spot dull black; cilia grey-brown. When, in rare instances, the transverse lines are visible they are regularly parallel, and but little oblique, rather straight and stiff, and bent back to the costa. Female similar.

Underside of the fore wings shining pale smoky-brown; costa whiter and having a black spot beyond the middle; discal spot faintly black; hind margin broadly clouded with a more smoky tinge. Hind wings shining smoky-white, almost silvery; faintly barred across the middle by a slender curved brown line, and outside it, more faintly, by one or two more. Body and legs reddish-brown.

Variable as already shown in the presence, or more frequently absence, of the transverse lines, also in the number and distinctness of the cloudy-black costal markings, of which often only two are black, and sometimes not one is at all distinct. In more rare instances the reddish-brown of the fore wings is unbroken by any distinct marking whatever.

On the wing in June and July.

LARVA short and thick; head dusky-olive, marked with white; ground colour dull pink or flesh-tint, with a series of dusky Y-shaped dorsal spots, connected by a central pink line, and becoming faint on the anterior, and almost obliterated on the posterior segments; spiracular line yellowish, interrupted at intervals by dusky blotches; undersurface dusky or pinkish-white; dorsal portion of each segment studded with four yellowish tubercles; and the back also sprinkled with small white, and a few black, tubercles and short hairs. (Rev. H. H. Crewe.)

August and September on the blossoms and seeds of common heather (*Calluna vulgaris*). Said also to feed on both species of *Erica*, and on various *Compositæ* and other flowers, but in this respect there may be confusion between this and the last species.

PUPA short and plump, the anterior end very blunt, eye-covers small, shining; limb-cases closely packed; wing-covers strongly rippled with the usual nervures, smooth between, but only moderately glossy; thoracic shield very minutely but closely wrinkled; dorsal and abdominal segments finely pitted, but the hinder edges smooth and strongly ridged;

cremaster stout, conical, tipped with several fine hooked bristles. Front portion, with the wing-covers, rich yellow, the latter semi-transparent; abdominal segments reddish-yellow. In a moderately thick cocoon of silk and earth, in the ground.

In this condition through the winter.

The moth hides among heather during the day, and may be disturbed by the footstep in hot weather, yet is far more readily met with at dusk flying over the same plant. Apparently common upon heaths throughout England and Ireland, probably also Wales, since it is abundant in Glamorganshire and Pembrokeshire. In Scotland it is found in Wigtownshire, Clydesdale, Perthshire, the Edinburgh district; not commonly in Aberdeenshire and Moray; and has been taken even in the Orkneys. Abroad it seems only to have been recognised in Holland and Central and Western Germany, and its further range is somewhat doubtful.

36. **E. assimilata**, *Dbl.*.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–21 mm.). Fore wings somewhat ovate, glossy pale reddish-brown; discal spot large, black: costa spotted with black clouds; a large white dot lies close to the anal angle. Hind wings pale brown.

Antennæ of the male simple, ciliated, pale grey-brown; palpi slender, leaden brown; head and thorax dull umbreous; abdomen of the same colour but tinged, at the sides, with red-brown; along the dorsal ridge is a series of minute raised tufts; anal tuft pointed. Fore wings ovate, rather rounded behind; costa strongly arched; apex well rounded; hind margin curved and rather full, as also is the dorsal margin; colour reddish-brown; discal spot large, deep black; basal, first, and central lines each indicated by a blackish cloud on the costa, and very faintly continued as an obscure brown thread rather directly across the wing; second line rather more distinct, arising from a more definite costal cloud, decidedly angulated, and continued as a similarly direct faint

thread; subterminal line white at the costa, continued as an excessively fine thread which leaves white dots backed with black-brown in the middle, and at the anal angle a more conspicuous white double spot; cilia shining reddish-brown tipped with grey. Hind wings not very broad, rather sinuously rounded behind, and grooved or wrinkled between the nervures; dull smoky-brown; central spot minute, black; dorsal area faintly but repeatedly barred with black-brown; along the hind margin from the anal angle are two or three white dots; cilia pale smoky-brown, intersected with darker. Female similar.

Underside of fore wings glossy pale smoky-brown; discal spot distinctly black; costa broadly tinged with smoky-yellow; immediately over the discal spot is a black costal spot, and beyond it two more, each serving as the origin of a faint transverse shady stripe; cilia spotted with black clouds. Hind wings smoky-white; central spot black, followed by two transverse smoky-brown stripes or lines of dots; cilia spotted with black. Body and legs whitish-brown; the tarsi blackened.

Rather variable in the presence or absence of the very slender transverse lines of the fore wings.

On the wing in May and June and as a second generation in August.

LARVA slender, tapering slightly towards the head; ground colour yellowish-green, divisions of the segments yellow; dorsal line dark green; subdorsal lines of the same colour but very indistinct, occasionally studded at intervals with black spots; body thickly sprinkled with small yellowish-green tubercles, and thinly strewed with short whitish hairs.

Or—When young uniform pale green, but after the last change of skin it assumes a series of brown dorsal spots, united by a central line of the same colour; ground colour then dirty yellowish-green; subdorsal lines dusky; dorsal spots merged

in the dorsal line on the anterior and posterior segments; sides suffused with dusky reddish-brown and traversed by slender waved lines of the same colour; head greenish, with black markings; undersurface pale green; body covered with minute white tubercles and sprinkled with a few short white hairs. The brown suffusion is sometimes wanting, leaving the larva of an uniform bright green, with a single chain of brown dorsal lozenges.

When nearly ready to spin up it turns pink, but another variety assumes a pink ground colour after the last moult; the back and undersurface tinged with green; the dorsal line is then dark green bordered on each of the middle segments by a black dot; and the divisions of the segments are tinged with red. (Rev. H. H. Crewe.)

June and July, and a second generation in September and October; on black-currant in gardens, elsewhere on wild hop (*Humulus lupulus*). Sometimes also to be found on red-currant.

PUPA yellowish-green, in an earthen cocoon. (H. H. C.)

In this condition during the winter.

The moth hides during the day in currant-bushes in gardens and in hedges where the wild hop grows, and may be beaten out by day or taken flying about the bushes in the evening. It also comes readily to light, and to the flowers of ragwort at night. Still common in gardens in the outskirts of London, and other cities, apparently to be found in suitable spots throughout England, and probably Wales, since it is common in Glamorganshire and Pembrokeshire. In Scotland in the Solway district, and in gardens in Clydesdale and Edinburgh, at Aberdeen and in Perthshire and Ross-shire. In Ireland in the outskirts of Dublin and Cork and in Galway, Sligo and Tyrone. Abroad it seems only to be reported from France and Germany.

37. **E. jasioneata**, *Crewe*.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–22 mm.). Fore wings long and narrow, blackish-brown;

the nervures faintly dotted with black and white; discal spot small, black; second line just visible; subterminal line zigzag, smoky-white. Hind wings smoky-black-brown.

Antennæ of the male simple, ciliated, grey-brown; palpi blunt, small, depressed, dark brown; head and thorax dull brownish-grey; abdomen dark brown; anal tuft compressed. Fore wings long and narrow; costa arched at the base, though very flatly so, apex decidedly rounded; hind margin extremely oblique and very little curved; dorsal margin rather straight; colour dull greyish-umbreous, dusted with black-brown; discal spot obscurely black; all the nervures faintly dotted alternately with dull black and dull white; costa clouded with black which is interrupted by small whitish clouds; transverse lines hardly perceptible except that the second seems to be represented by a double series of faint clouds divided and edged by blacker clouding; subterminal line grey-white, very irregular and angulated throughout; hind margin streaked with black; cilia dark smoky-brown. Hind wings narrow, rounded behind, furrowed between the nervures; smoky-white dusted with black-brown, and clouded with short transverse bands of the same colour on the dorsal and hind-marginal regions; extreme hind margin edged with short black streaks; cilia smoky-grey. Female similar. Somewhat similar to *E. castigata*, but the fore wings longer and narrower, also more rounded at the apex.

Underside of the fore wings shining pale silvery-grey, shaded by two faint partial smoky stripes beyond the middle. Hind wings equally shining, silvery-white dusted with dark brown and crossed by two smoky-brown cloudy stripes; central spot minute, black. Body and legs dirty whitish-grey; tarsi clouded with black-brown.

On the wing in May and June.

LARVA half an inch long; moderately stout; very rugose; tapering a little forward from the sixth or seventh segment,

behind from the tenth; head shining dark brown mottled with darker; the ground colour of the body varies, in different examples, from pale whity-brown, to brown, lighter or darker, warmer or colder; beyond the thoracic segments, to the ninth inclusive, there is on each segment somewhat of a barrel-shaped mark of brown, thickly and strongly marked on each side of the shape with dark brown: or this may be described as a bulbous flask shape, the sides of the bulb thickly defined with dark brown; a dark brown dorsal stripe running continuously through all to the anal tip; on the tenth, eleventh and twelfth segments the shapes are rudimentary: a fine dark brown subdorsal line runs by either side of the dorsal shapes, and bears a thick dark brown mark or blotch close to the widest part of the flask shape, sometimes uniting with it, but these do not occur after the ninth segment; on the side of each segment is an oblique dark brown cloudy streak downwards from the front towards the spiracular region; undersurface whitish cream-colour with a grey-brown central ventral line; each raised dot has a darker brown central dot bearing a short stiff bristle. Each segment is subdivided by six deep transverse wrinkles, the first four wider apart than the other two; the segmental divisions are very deeply cut, the end of each segment swelling out broader than the beginning of the next; the surface of the skin is thickly covered with granular points. (W. Buckler.)

This larva bears a curiously close resemblance to that of the very different *E. campanulata*—which however feeds on a closely allied plant—while it differs very much in proportions as well as in marking from that of *E. castigata*, for a variety of which it is sometimes mistaken.

When full grown the attachment of the brown spot on the subdorsal line to the outer curve of the side of the barrel-shape, becomes quite distinct, and there are faint shades of undulating lines below, while the ridge along the spiracular region becomes extremely pale.

August and September, on or rather in, the seed-heads of *Jasione montana* (sheep scabious), forming a sort of chamber in the seed-head by eating away the seed flasks, calices and pedicels, and lying snugly in the cavity, or if on the surface always having its head buried in the flower-head or seed-head, eating out such a cavity. Dr. G. B. Longstaff has conferred a great benefit on me by searching for this larva and sending up a good supply from Somerset and Devon, thereby supplying additional material for its life-history.

The moth doubtless hides during the day among its food-plant the Sheep scabious, in the dry hilly or sandy spots in which that plant grows, and flies over it at night, but I hardly know of the capture of a single specimen, all, or nearly all, in collections having been reared from larvæ collected in the seed-heads. It was first noticed about the year 1878, when Mr. Ficklin of Bristol found larvæ in North Devon, and reared the moths in the following year. After some consideration and inquiry it was named and described by the Rev. H. Harper Crewe, who had for so many years devoted himself to the elucidation of the habits of this difficult genus. It is an exceedingly local species, but is said to occur on the coast of North Wales, though I was unable to find it in South Wales, where its food-plant is abundant. I have no certain knowledge of its existence elsewhere in Great Britain except in the Counties of Devon and Somerset; but in Ireland it has been found commonly in the larva state in the County of Kerry about Valentia, Killarney and Kenmare; and in that portion of Cork which lies near Dingle and Bantry Bay. In this county, Captain Donovan and his brother have captured it on the wing upon the cliffs, and have found the larva commonly. Abroad it hardly seems yet to have been recognised.

38. **E. tenuiata**, *Hüb.*—Expanse  $\frac{5}{8}$  inch (14–16 mm.). Fore wings rather ovate, much rounded at the apex; pale umbreous, with a reddish tinge along the costa; transverse

lines obscurely dark brown; discal spot small, black. Hind wings pale brown.

Antennæ of the male very short, simple, ciliated, pale brown; palpi slender and pointed, light brown; head and thorax brownish-drab, the latter slender; abdomen small, reddish-brown, without dorsal tufts; anal tuft compressed. Fore wings short, somewhat ovate; costa strongly arched, especially so at the base; apex rounded; hind margin also fully rounded but not very oblique; dorsal margin rather full; colour pale umbreous or brownish-drab, with a distinct reddish-brown shade along the costal region, which is barred throughout with smoky-brown clouds; discal spot black, rather rounded; before it is a series of three or four parallel lines of brown dusting, faintly defined and representing the basal and first lines; immediately beyond it are three rippled parallel brown lines, bent back near the costa and representing the usual central line; then a series of three more, rougher lines partly consisting of minute wedge-shaped streaks representing the second line; and outside all these a cloudy-brown hind-marginal band, divided by a faint rippled pale subterminal line—all these lines, nearly parallel and rather faint, give the impression of a rounded wing rippled from end to end—cilia shining whitish-brown. Hind wings rather small, rounded behind, whitish-brown, much dusted and dappled with dull brown, in which are paler spots; cilia shining pale brown. Female similar.

Underside of the fore wings pale smoky-brown; discal spot a black dot; costa spotted with smoky-black, and a band of the same lies before the hind margin. Hind wings shining whitish-brown with a hind-marginal smoky band. Body and legs dull brown.

On the wing in June and July.

LARVA short and thick; head black; ground colour dirty yellowish-green; sides and middle of the back slightly tinged with rose-colour; down the middle of the back is a row of

very indistinct dusky spots becoming confluent in a black line at the anal segment, and bordered by an interrupted black line; on each side is a row of oblique tubercular flesh-coloured stripes; anterior feet black.

March and April, sometimes till the beginning of May, in the catkins of willow (*Salix caprea*, *S. cinerea*, and others), hiding so completely in the catkins that these may be shaken off the willow bush in abundance, and the moths reared therefrom, without a single larva being observed.

PUPA rather slender, glossy, eye-covers prominent, blackish, the wing and limb-covers very smooth, pale golden yellow or yellow-brown, faintly tinged with green; dorsal and abdominal segments very minutely and sparingly pitted on the anterior portion of each; the hinder smooth and rather ridged, the whole more dusky yellow-brown; cremaster narrowly conical and tipped with minute hooked bristles. In a slight cocoon among the fallen catkins or other rubbish on the ground.

The winter is passed in the egg-state.

The moth hides itself in and under willow-bushes in the daytime, and may sometimes be disturbed from them by the beating-stick, though it is very unwilling to move, more often by carefully dividing and investigating the thick growth of coarse grasses and herbage underneath. It flies at late dusk and may then be captured, since it keeps round about the same bushes, yet from its activity at that time, and its very dull colour, is by no means easy to box. Not very difficult, however, to rear from the catkins. Very common in the fens of Norfolk and Cambridgeshire, and apparently to be found in suitable marshy spots throughout England, from Devon to Northumberland; also found in Monmouthshire and Glamorganshire in Wales. In Scotland in Roxburghshire and other southern districts, in Dumbartonshire, Aberdeenshire, Perthshire, Moray, and intermediate places. In Ireland it is

plentiful in Wicklow, Cork, and Kerry; and found near Dublin, and in Louth, Sligo, Fermanagh, Armagh, and Derry. Abroad it occurs in Finland and has a wide distribution through Central Europe.

39. **E. subciliata**, *Gn.*—Expanse  $\frac{5}{8}$  inch (15–16 mm.). Fore wings narrow, rather pointed, pale brown, with numerous oblique deeper brown transverse stripes, most of them beyond the discal spot, which is a minute black dot. Hind wings very pale brown.

Antennæ of the male slender, simple, ciliated, pale umbreous; palpi slender, pointed, grey-brown; head and thorax dull brownish-drab; abdomen reddish-brown, streaked and dotted on the sides with black, and very minutely dotted upon the dorsal ridge with the same; anal tuft closely compressed. Fore wings narrow; costa very flatly arched, almost straight; apex narrowly rounded, almost angulated; hind margin rounded and oblique; dorsal margin a little filled out; pale umbreous or brownish-drab; the costa faintly spotted with brownish clouds; discal spot indistinct, minute, dull black; the lines most indefinite and obscure, but there is a series of very oblique parallel lines or shades of brown atoms from the base to the discal spot, across which a more perpendicular smoky shade seems to represent the central line; outside this two similarly oblique and more dotted lines indicate the usual second line, and these are closely succeeded by a stripe of the paler ground colour; hind-marginal area clouded with smoky-brown, through which a pale brown subterminal line widely meanders; at the extreme tip is a shining whiter streak from the costa and often a similar small apical cloud; cilia whitish-brown spotted with dark brown. Hind wings rather broad, the hind margin a little sinuous; whitish-brown; central spot minute, dull black; dorsal region dusted, and once barred, with brown; and a smoky-brown band, containing paler clouds, lies along the hind margin; cilia long, pale grey-brown, clouded with

darker. Female a little larger, and the ground colour faintly tinged with red-brown.

Undersides of all the wings shining pale silvery-grey, tinged toward the costa of the fore wings with brown, and there also clouded with smoky-black spots; discal and central spots small, smoky-black; beyond these on each wing are two slender smoky-brown transverse lines. Body and legs whitish-brown.

On the wing in July and August.

LARVA about five-eighths of an inch long and rather thick; the head has the lobes rounded, is smooth and polished, and considerably narrower than the second segment; body plump and obese in the middle, but attenuated at the extremities; the segments transversely wrinkled; ground colour yellowish-green, greenest on the anterior segments; head dull green; a broad deep purple stripe, darker at the segmental divisions, forms the dorsal line, and a pale shade of purple is suffused rather broadly on each side of it; subdorsal lines greyish-white; there is an equally pale waved stripe above the spiracles and a pale but greener stripe along them; ventral surface uniformly dingy green.

Or—Ground colour bright yellowish-green, the head green tinged with brown; a dark green pulsating vessel forms the dorsal line; subdorsal lines greyish-white; there is a similarly coloured waved line above the spiracles, and a pale green stripe along them; segmental divisions yellowish; ventral surface uniformly bright green tinged with yellow. (G. T. Porritt.)

April and May, on the blossoms and young leaves of maple (*Acer campestris*), but subsisting only upon the blossoms so long as they are available, and from its colouring so exactly like them as to be practically invisible. Easily obtained by beating those trees on which the flowers are abundant, over an umbrella.

PUÇA rather slender; limb and antenna covers rather

prominent; wing covers also thickened, rather smooth and scarcely sculptured, but showing the wing nervures and not brightly polished; dorsal and abdominal segments but faintly punctured and smooth; anal segment thickened and rounded; cremaster short, conical, furnished with numerous minute hooked bristles; pale brown; abdominal segments more reddish-brown, wing covers very transparent dull yellow. In a thin silken cocoon among rubbish on the earth.

The moth sits by day on the undersides of branches of maple or among the leaves, and if disturbed darts rapidly away, and to the ground. Formerly it was looked upon as a scarce species, but the Rev. H. Williams, who found it abundantly near Thetford, assured me subsequently that wherever in England he had found maple growing to sufficient size for flowering he had also found this moth. We have it recorded as occurring in Kent, Surrey, Sussex, Dorset, Wilts, Devon, Somerset, Essex, Suffolk, Norfolk, Cambridgeshire, Oxfordshire, Herefordshire, Shropshire, Yorkshire and Durham. In North Wales in Denbigh; and in South Wales at Gower and Porthkerry, Glamorgan, by Mr. Vivian. So far as I know this is the extent of its range in these Islands. Abroad it seems to be very little known; and recorded only from Germany, Dalmatia, and Norway.

40. **E. dodonæata**, *Gn.*—Expanse  $\frac{3}{4}$  inch (18-20 mm.). Fore wings somewhat pointed but not narrow, whitish-brown, whiter in the middle; transverse lines numerous, brown, much streaked and spotted on the nervures with black; discal spot black, united to a previous black horizontal streak. Hind wings brownish-white.

Antennæ of the male slender, simple, ciliated, dark brown; palpi very short, blunt, dull brown; head and thorax whitish-brown; abdomen reddish-brown; anal tuft closely compressed. Fore wings rather broad but pointed: costa decidedly arched; apex bluntly rounded, almost angulated; hind margin gently curved and not very oblique; dorsal margin also rather

rounded; colour whitish-brown, often with faint reddish-brown shading, but sometimes nearly white; basal line black, slender, rather angulated; first line connected with it by a black streak along the median nervure, black, very deeply angulated, almost hooked in the middle; this is closely followed by a narrow shading of light brown, and this by two clouded black lines, almost forming a narrow central band, and partly filled in with blackish clouding; close outside these is the discal spot, deep black and rather elongated; second line an angulated smoky-black shade emphasised by a minute black wedge on every nervure; of these wedges two, below the middle of the wing, are long, and point to two similar black streaks in the central band; hind marginal region light brown, dotted with black clouds and divided by a very irregular white subterminal line; cilia pale brown, dashed with smoky-black. Hind wings a little squared, and sinuous behind, dusky white; central spot dull black; followed by a short row of black wedges lying in brown shading; toward the hind margin is a more complete row of dull black streaks, lying in brown clouding, and followed by whitish spots; extreme margin edged with short black streaks; cilia dusky white. Female similar.

Underside of the fore wings silky brownish-white, tinged along the costa with yellow-brown, and there also faintly but repeatedly barred with smoky-brown; discal spot black; beyond it are two transverse smoky-brown lines. Hind wings dusky-white, shining; central spot black; followed by two transverse curved smoky-brown lines; cilia shaded to the tips with smoky-black. Body and legs pale brown.

Usually only varying a little in the distinctness of the markings, and in the degree of reddish-brown tint shading the ground colour; but the hawthorn-frequenting race shows a decided tendency to white ground colour with more grey-brown markings, and to absence of any reddish-brown clouding.

On the wing in May and the beginning of June.

LARVA cylindrical, hardly tapering to either extremity; colour of head and body ochreous-red; dorsal line very dusky olive, almost black, interrupted; down it is a series of dull black or dusky-olive, arrow-shaped blotches, reduced in size on the posterior segments, and merged in the dorsal line on the anterior; subdorsal lines slender, dusky, bordered with dull yellow; spiracular lines alternating between dull yellow and dusky olive; between the subdorsal and spiracular lines is a row of oblique bright yellow stripes, interspersed with dusky blotches; segmental divisions orange-red; body thickly studded with minute white tubercles, and thinly clothed with whitish hairs.

Or—Ground colour pale yellowish-green; dorsal line and blotches similar to the previous, but of a much paler olive; spiracular lines, segmental divisions, and oblique lateral stripes greenish-yellow.

Or—Ground colour orange-red; back tinged and suffused with dull yellowish-green; dorsal blotches wanting; dorsal line reddish-brown or olive, enlarged in the middle of each median segment; subdorsal lines of the same colour, slender; spiracular line and oblique lateral stripes greenish-yellow, the latter indistinct. (Rev. H. H. Crewe.)

June and July, on oak and hawthorn, feeding on the youngest and most succulent leaves, just expanding. Mr. G. F. Mathew has quite recently found it to feed freely upon the blossoms of *Quercus ilex* (evergreen oak).

PUPA rough and wrinkled, dark dusky red, upper edge of the wing-cases brighter red. In a slight cocoon in the earth or under loose bark. (H. H. C.)

In this condition through the winter, and often through a second winter.

The moth loves to sit during the day on the underside of long horizontal branches of oak, in a wood, or under the side branches of large hawthorns where they grow together in

groups. It is quite easily to be seen as it sits closely pressed to the surface, and if dislodged, by a sharp blow on the branch, will flutter to the ground, or drift away on the wind. It flies at late dusk about the outer twigs of the trees, and on a clear evening may readily be caught at this time as it visits them. Rather a local species, formerly common in the London district, but now pushed further into the country. Found in Kent, Surrey, Sussex, Hants, Dorset, Wilts, Devon, East Cornwall, Somerset, Berks, Middlesex, Essex, Suffolk, Norfolk, Gloucestershire, Herefordshire, Worcestershire, and rarely in Yorkshire and Cumberland. In Wales the only record that I possess is that of Mr. H. W. Vivian at Llantrisant, Glamorganshire; and I find no certain capture in Scotland. In Ireland it has been taken at Armagh among hawthorn, also near Dublin, in Wicklow and Sligo.

Abroad known to occur in Western, Central, and Southern France, Holland, the north of Spain, and Corsica.

41. **E. abbreviata**, *Steph.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings elongated and produced to a blunt apex; pale red-brown clouded with umbreous; transverse lines numerous, black-brown, edged with short black wedges; discal spot small, black, usually joined to a central dark blotch. Hind wings pale brown, with darker clouding.

Antennæ of the male simple, ciliated, black-brown; palpi blunt, dull brown; head pale drab; thorax reddish-brown; abdomen purplish-brown; anal tuft thickened but closely clasped. Fore wings elongated; costa considerably arched, especially so beyond the middle; apex rounded; hind margin very oblique, the curve passing the anal angle and rounding up the dorsal margin; light reddish-brown, with a transverse dusting of white between the nervures in the middle area; costa faintly barred with dark brown; discal spot an upright black streak placed in the white dusting; before it is an oblique cloud of black dusting which seems to answer to the first line, but this and also some previous clouding in the

place of the basal line, is devoid of definite form; the same may be said of some cross-shading in the place of the second line, visible as a small brown costal cloud; a smoky-black cloud outside the discal spot, and similar wedges on the lower nervures; all the nervures of the hind marginal region twice streaked with smoky-black, the interval representing the subterminal line, which otherwise is faintly dusted and dotted with white; cilia brownish-white, spotted with smoky clouding. Hind wings a little elongated, whitish-brown dusted with umbreous; central spot very small, obscurely black; from the dorsal margin four or five indistinct lines of brown dusting and dots partially cross the wings; hind margin edged with dark brown; cilia dusky white, clouded with smoky-brown. Female similar but slightly larger, its fore wings a little more ample, and of a more uniform brown ground colour.

Undersides of all the wings shining silvery whitish-grey; discal and central spots black; fore wings faintly crossed by three slender brownish lines; hind wings by two fainter lines of brown dots. Body and legs pale brown.

Rather liable to local variation. In the Eastern Counties showing a tendency to a more dull grey-brown colouring; but in Pembrokeshire and also in the South of Ireland having the ground colour nearly white, the brown shading almost absent, and the transverse lines and their streaks on the nervures more definite, forming a very neat and delicate-looking variety.

On the wing in April and May.

LARVA slender, hairy, tapering toward the head; ground colour pale yellowish-red; dorsal line pale olive; down the middle of the back is a series of pale olive V-shaped spots, sometimes bordered with yellow; spiracular line pale yellow; segmental divisions red; ventral line, when present, pale yellow. The dorsal spots are often merged in a broad dorsal stripe. The whole of the markings vary much in intensity

of colouring, but are usually faint and indistinct. (Rev. H. H. Crewe.)

June and July, on oak, feeding upon the leaves.

PUPA bright red, the thorax and wing-cases paler than the rest; bases of the wing-cases dusky; abdominal divisions and the tip deep red. In a slight earthen cocoon, in the ground. (H. H. C.)

In this condition during the winter.

The moth sits during the day in oak trees, usually on the underside of a horizontal branch. A sharp blow upon the branch will generally cause it to flutter away to a short distance, and then go down to the ground, but if the weather is warm it will sometimes fly actively away. Also where the oak trees are not provided with suitable horizontal branches, some other tree may be selected, and I have seen quite a number of the moths congregated under the branches of a beech, in such circumstances. Almost confined to oak woods, but in them tolerably common throughout England, and probably Wales, though my only records are from Glamorgan and Pembrokeshire. In Scotland found in the Solway district, Berwickshire, the Edinburgh district, Stirlingshire, Perthshire and Argyleshire. In Ireland, abundant in Wicklow, and found in Waterford, Kerry, Galway, Monaghan, Sligo, Tyrone, Antrim and Derry—probably wherever there are oak woods. Abroad its range is through Holland, France, Central and South-west Germany, Italy and North-eastern Spain.

42. **E. exiguata**, *Hüb.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–22 mm.). Fore wings rather pointed but broad; pale grey-brown or smoky-brown; discal spot large, black; second line a row of black wedges. Hind wings white, with grey clouding.

Antennæ of the male shining, simple, ciliated, dark grey with a white gloss; palpi small, dull grey-brown; head and

thorax grey, thickly dusted with dark brown; abdomen grey-brown, faintly barred near the base with black-brown; edges of the segments rough with slightly raised scales, the dorsal ridge showing them more particularly; anal tuft short and thick, but compressed. Fore wings moderately broad; costa gently and evenly arched; apex bluntly rounded, almost angulated; hind margin rather long, evenly curved; dorsal margin rather full and strongly ciliated; colour pale grey-brown; basal line distinct and very oblique from the dorsal margin, where it is smoky-brown, angulated in the middle when this portion is perceptible, more distinct on the costa, and rather blackened on the nervures; beyond this are several parallel, oblique, and but faintly perceptible, transverse grey threads, crossing which is a black streak on the median nervure, and above it a black dot in the discal cell; beyond this dot is the usual discal spot, deep black and elongated; and again immediately beyond, a series of deep black wedge-shaped streaks on the nervures, joined together by a grey-brown shade into a partial transverse line; this is followed by the second line, extremely faint, grey-brown, dotted with black on the nervures and placed in a rivulet whiter than the ground colour; outside this is a squared brownish cloud on the costa, a black-brown cloud just above the middle, and another above the anal angle, this last being divided by the angulated lower end of the faint whitish-grey subterminal line; extreme hind margin edged with short black streaks; cilia pale brown-grey clouded and barred with smoky-brown. Hind wings rather long, dull smoky whitish-brown, darker beyond the middle; central spot ill-defined, black; dorsal area repeatedly barred with smoky-brown; cilia dull pale brown. Female similar.

Underside of the fore wings smoke-coloured; costa rather paler, barred with smoky black beyond the middle; discal spot black; a smoky-black shade runs down the hind-marginal area. Hind wings white dusted with grey-brown; and barred twice beyond the middle with faint

similar transverse lines; central spot black; cilia smoky-brown.

Usually only a little variable in the distinctness of the markings, but Mr. H. W. Vivian has one taken in South Wales in which those of the costal half of the fore wings are distinct, while the rest are obscure, giving the specimen a rather singular appearance.

On the wing in May and June.

LARVA long, slender, and tapering; ground colour dark green; with a dorsal row of small red lozenge-shaped spots connected by a dorsal line of the same colour; spiracular line red, bordered with yellow; segmental divisions yellowish; in the centre of each dorsal spot is a small yellow dot. The dorsal spots are often wanting on the anterior segments and their place supplied by a greenish line. (Rev. H. H. Crewe.)

September and October on hawthorn, blackthorn, maple, barberry, currant, ash, alder, willow, dogwood, mountain ash, and snowberry; feeding on the leaves.

PUPA long, slender, and tapering; wing-cases dark olive-green; thorax and abdomen dusky olive; abdominal divisions very conspicuously yellow. (H. H. C.) In a cocoon of silk and earth, in the ground.

In this condition through the winter.

The moth sits on the trunks and branches of trees, particularly hawthorn, or on posts, rails or fences, or the stems of bushes, in the daytime, but if disturbed will fly actively away. Its natural flight is at late dusk. It was formerly abundant in the suburbs of London, but has now become there scarce; otherwise moderately common throughout England, and doubtless Wales, though the only records seem to be from Glamorgan and Pembroke. In Scotland found in the Edinburgh district, in Roxburghshire, Lanark and other parts of Clydesdale, and in Perthshire; in Ireland

widely distributed, recorded from Dublin, Wicklow, Kerry, Galway, Westmeath, Sligo, Monaghan, Fermanagh, and Tyrone. Abroad its range extends over the greater portion of Central Europe, also Livonia.

43. **E. sobrinata**, *Hüb.*.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (16–22 mm.). Fore wings rather narrow; greyish-brown, with a straight oblique black central line and a similar second line in which is a patch of black wedges above the middle; discal spot narrow, black. Hind wings pale smoky-brown.

Antennæ of the male simple, ciliated, dark brown; palpi very small, purplish-brown; eyes golden-brown; head and thorax pale umbreous, dusted with darker, and the latter tinged on the back with red-brown; abdomen purple-brown; anal tuft compressed. Fore wings rather narrow; costa flatly arched; apex bluntly rounded; hind margin very faintly curved, rather oblique; dorsal margin nearly straight; colour dull umbreous or blackish-brown, sometimes with a faint reddish flush on the dorsal half; basal line hardly perceptible—when present a faint blackish curved shade; first line scarcely more distinct, but faint shades of black dusting on the costa originate three or four obscure brown lines, oblique and tolerably parallel; central line very oblique, double, black, thickened on the nervures, running straight to the black discal spot, which it touches, and then bending back a little to the costa; sometimes forming a sort of central band from intermediate black shading; just outside the discal spot is a white edging or clouding; second line a rather broad smoky-brown shade, blackened on the nervures, especially on those situated beyond the discal spot, and its outer edge tolerably well defined; following this is a faint double stripe of whitish dusting; hind-marginal area shaded with smoky-brown, in which the subterminal line forms a series of angulated greyish-white dots; cilia pale grey-brown clouded with smoky-brown, but faintly whiter at the tips. Hind wings well rounded, dull brown, whiter toward the

costal margin; from the dorsal margin a series of dusted umbreous lines partially crosses the surface; hind margin edged with dark brown streaks; cilia paler dull brown. Female similar.

Underside of the fore wings shining pale smoky-brown, rather darker toward the costa, where it is faintly barred with darker brown; discal spot obscurely black-brown. Hind wings smoky-white; central spot dull black; before and beyond it is a series of curved transverse rows of small smoky-black clouds; hind margin darker. Body and legs black-brown.

Variable in the shade of ground colour from light or dark umbreous to different shades of black-brown; also in the definiteness of the markings, which in some specimens are quite distinct, in others obscure, and again in others suffused or almost absent. Moreover local or climatal variations are very striking, specimens from Perthshire, Sutherlandshire, and other mountainous parts of Scotland are often much more strikingly marked, blackened, or having the ground colour white in the middle area of the fore wings, the markings running into distinct and conspicuous transverse stripes, and the cilia more distinctly spotted; or the ground colour very light brown with the markings more slender and less definite. Curiously enough this phase of Scottish variation seems to lead directly to that which is found year by year near Dover, Kent—a very pretty light form, in which the ground colour is brownish-white and the markings, though slender and not very pronounced, are uniformly and distinctly present and suggest a rather even and regular banding of fine lines. This form seems first to have been brought under notice about the year 1861, when the late Mr. H. Doubleday sent specimens to Guenée and Herrich-Schœffer; the former thinking it to be probably a variety of the present species, the latter that it would prove to be new. Guenée seems further to have suggested that it might be a variety of *E. ultimaria*, and this name has been applied to it in some

collections. This proving to be inaccurate, the MS. name of *Stevensata*, after its original captor, has been suggested, and is still in use. Its claim to the rank of a distinct species has been strongly urged, principally on account of its habits, which are certainly curious. It is usually taken on the hills of the Kent coast about the blossoms of golden-rod and ragwort, and not about the juniper, and has even been found freshly emerged upon the first-named plant. In examining some fine specimens taken by Mr. F. J. Hanbury, on ragwort, further evidence seemed to be furnished by the position of the discal spot *away* from the central line; but in working through an immense series of the present species in all its varieties in the collection of Dr. P. B. Mason, I found that many specimens of otherwise typical colouring and markings have the discal spot distinctly separate from this line; also that many of the most strongly marked Scotch forms had the ground colour nearly white, and that these appeared to interchange with the *Stevensata* forms in every possible degree. No reliable separating character could be found by the most careful search. This result is confirmed by the results of examination of other large collections. Moreover, Colonel Partridge tells me that he noticed a tendency in the Dover specimens when disturbed to fly out to the juniper bushes on the inaccessible side of the cliff. If this form, when reared, should appear to be distinct from *E. sobrinata*, it will be an exceedingly difficult species to describe, seeing that although the shade of colour is peculiar, the markings, though differing in intensity, are accurately the same.

On the wing from July till the beginning of October, but so far as can be ascertained, in one, slowly emerging, generation.

LARVA rather variable in appearance; the ground colour is either dark green or yellowish-red with a series of rust-coloured dorsal blotches, intersected by a dark green dorsal line, and bordered on either side by a yellowish line; these

blotches generally disappear on the posterior segments and are sometimes wanting altogether; spiracular line wavy, pale yellow or whitish; on the undersurface is a central whitish line. (Rev. H. H. Crewe.)

Among those figured by Mr. Buckler some are bright green, with the blotches pink, carmine, purple, dull purple, or absent; the dorsal line in most of these purple; and in one case a lateral series of purple oblique wedge-shaped streaks; others have the ground colour reddish-brown, pinkish-brown, or drab, with a similar range of dorsal markings—a very fine series of pretty forms.

March till May or the beginning of June, on juniper. It clings tightly to its food-plant in the day, and is not very easily beaten out. Not at all confined to this plant in the *wild* state, but feeding on it equally well in gardens, shrubberies, and other places in which it is cultivated.

PUPA. Head, thorax, and wing-cases dark green; abdomen yellowish. In an earthen cocoon, or slight web among the stalks. (H. H. C.)

The winter is passed in the egg-state.

The moth flies about juniper bushes in hot sunshine from about noon till near sunset, when it settles down, but is on the wing again at late dusk, and at night will come freely to light. In the daytime if the sun is obscured and the weather not cold, it may readily be disturbed from the bushes and so captured. It used to be quite common in the suburbs of London, but lately has ceased to be so, though not wholly absent. Moderately common in Kent, Surrey, Sussex, Berks, and Oxfordshire, on the chalk hills on which the juniper grows wild; existing more casually, and more in connection with cultivated juniper in Norfolk, Suffolk, Cambridgeshire, Gloucestershire, Herefordshire, Leicestershire, Warwickshire, Staffordshire, Derbyshire, Yorkshire, South Durham and Cumberland. In Wales Mr. H. W. Vivian has found it in the peninsula of Gower, Glamorganshire. In Scotland it is

abundant on the Pentland Hills, the mountains of Perthshire, Braemar, Aberdeenshire, Inverness-shire, Sutherlandshire, and probably other mountain districts, occurring more sparingly in Roxburghshire, Berwickshire, Edinburgh, the Glasgow district and elsewhere to West Ross and the Orkney Isles. So far as is known at present it seems in Ireland to be more confined to cultivated places, but is on record from Dublin, Down, Antrim, Armagh, and also found among wild juniper on the mountains near Knockuarea, Sligo. Its range abroad is wider than that of many of its allies, extending through Central Europe, Northern Europe except the most frozen regions, but existing in Iceland; Northern Italy, Corsica, North-east Turkey, and the Ural Mountain districts.

44. **E. debiliata**, *Hub.*—Expanse about  $\frac{7}{8}$  inch (20–23 mm). Fore wings broad and blunt, very pale glaucous-green; first and second lines dotted with black, strongly so on the costa; discal spot small, black. Hind wings white clouded with grey and tinged with green.

Antennæ of the male rather short, simple, ciliated, dark brown, faintly barred at the back with paler; palpi slender, protruded, black-brown tipped with white; face and head white; neck-ridge pale brown; thorax green, spotted with black; abdomen silky white, faintly dotted with black along the dorsal ridge; anal tuft very blunt. Fore wings broad and blunt; costa strongly arched; apex very bluntly rounded, almost angulated; hind margin curved and a very little expanded; dorsal margin strongly ciliated and nearly straight; colour very pale glaucous-green; costal region faintly shaded with black clouds; basal line angulated and curved, slender, black; first line also dull black, composed of a costal cloud and a streak or spot on each nervure; discal spot black, small and ovate; second line rather erect but curved, consisting of a costal black cloud and a series of black dots on nervures; in the central area is a faint shading

of almost imperceptible smoky lines. Hind marginal area broadly but very faintly tinged with smoke colour, and intersected by a much rippled subterminal line of the green ground colour, but white at the costa; cilia shining smoky-white, dotted with faint clouds of smoky-black. Hind wings not very broad, rounded behind, or with the margin rather sinuous; shining dusky white with a greenish tinge and a dusting of smoky-brown, which is mainly gathered together into three transverse partial dotted stripes; cilia smoky-white. Female similar.

Underside of the fore wings shining white; discal spot large and black; nervures, discal-cell, and hind marginal region shaded with smoky-black; beyond the middle is a band of similar black spots lying upon nervures; subterminal line white. Hind wings shining white; central spot black, followed by a conspicuous smoky-black, strongly angulated, transverse stripe; hind margin clouded with smoke colour, in which is a series of white spots. Body and legs brownish-white; front tarsi clouded with black.

Very constant in colour and markings.

On the wing in June and July.

LARVA short and rather thick, somewhat translucent; head dusky brown or blackish-brown; body dull yellowish-green, suffused with yellow; dorsal line darker green; subdorsal lines wanting; spiracular lines dull yellow; under-surface destitute of markings. A dull uninteresting-looking larva, with but few distinctive characteristics. (Rev. H. H. Crewe.)

April and May, on *Vaccinium myrtillus* (whortleberry), feeding between united leaves.

PUPA pale yellowish-green, with a dorsal line darker green; abdominal divisions and tip reddish. In a slight earthen cocoon. (H. H. C.)

The winter is passed in the egg state.

The moth loves to sit on the trunks and branches of hollies, when these grow among its food-plant, and may be disturbed by a vigorous application of the beating stick. When hollies are absent it hides among the whortleberry, but is not readily induced, in that case, to fly, until its natural time at dusk. An exceedingly local species, usually confined to hill districts, and by no means following its food plant everywhere; on the other hand, usually common in its favourite haunts. Plentiful on some of the wilder hills of Devon and Somerset, and also found in Cornwall and Worcestershire, and in abundance in Staffordshire; said to have been formerly common at Chat Moss, Lancashire—a locality now destroyed. In Wales Mr. H. W. Vivian found it near Port Talbot, Glamorganshire, and I took it rarely in Pembrokeshire. The only record that I find in Scotland is in Aberdeenshire; but in Ireland it is abundant at Killarney and elsewhere in Kerry, and in Cork County, and found in Waterford, Wicklow, and Sligo. Abroad common in the mountainous portions of Central Germany, Northern Italy, Livonia, Finland, and in the Ural mountain region.

45. *E. coronata*, *Hüb.*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–19 mm.). Fore wings very short and broad: yellowish-green, with a distinct black <-mark from the costa at the end of the discal cell.

Antennæ of the male slender, simple, hardly visibly ciliated, black-brown with paler bars at the back: palpi slender but rather prominent, pale brownish-green, the tips white; head and thorax yellow-green; abdomen pale brown with a greenish shade, the basal segment barred with black marbling, and the second with deeper black spots; beyond this is a minute black dot on each side of the dorsal ridge on every segment; anal tuft tightly clasped. Fore wings short and very blunt; costa decidedly arched; apex very bluntly angulated, almost rounded; hind margin rather perpendicular, expanded and well rounded; dorsal margin also

filled out; colour pale pea-green or yellow-green; basal line suggested by a small black patch on the dorsal margin, and two black dots near the costa; first line much angulated, rather erect, faintly black, but forming a distinct black dot on the costa and at every nervure and angle; central line only suggested by a few black atoms on nervures; discal spot imperceptible; second line hardly beyond the middle of the wing, forming a black spot or streak on the costa, another on the subcostal nervure, and a black distinct > mark outside the discal cell, thence faint, showing only a black dot on each nervure; costa beyond the second line rather blackened except at the origin of a paler green faintly indicated sub-terminal line; cilia shining white, barred with smoky-black. Hind wings rather long, the hind margin rounded but a little sinuous; colour smoky-white, with a very faint indication of transverse darker bands arising from the dorsal margin; cilia smoky-white. Female very similar, but its hind wings rather more distinctly clouded with transverse darker bands.

Undersides of all the wings shining silvery greyish-white, with two or three faint smoky-grey transverse bands. Body and legs dusky white, tarsi blackened.

Probably not variable, except a little in size, but the green colour of the fore wings fades very rapidly during life to a dirty yellow. Fortunately, if preserved while quite fresh it is more constant.

On the wing from April till June or even July, and as a partial second generation in August.

LARVA somewhat different in shape from those of all the other *Eupithecia*, rather stout, and nearly cylindrical; body, when closely examined, very slightly hairy; excessively variable in colour; yellowish-green with three reddish dorsal lines, the middle one interrupted and sometimes enlarged into a chain of lozenge-shaped spots, the two side ones very indistinct.

Or—Ground colour uniform sea-green; the dorsal lines and spots wholly, or almost entirely, wanting.

Or—Ground colour greenish-yellow, with a series of rusty lozenge-shaped dorsal spots or bars; the sides and under-surface more or less suffused with rust-colour; segmental divisions bright yellow.

Or—Ground colour bright yellow, with a series of broad dull red dorsal bars, intersected and bordered by lines of the same colour; sides and undersurface thickly clouded with red.

Other varieties figured by Mr. W. Buckler are pale purple or pale grey with the dorsal markings as described, or the middle series formed into very ornamental sharp dark purple triangles, and a spiracular series of purple streaks. Altogether an exceedingly pretty as well as variable larva.

June and July, and the second generation from August till November; on flowers of *Clematis vitalba*, *Artemisia vulgaris*, *Eupatorium cannabinum*, *Solidago virgaurea*, *Lythrum salicaria*, *Lysimachia vulgaris*, *Hypericum perforatum*. *Achillea millefolium*, *Angelica sylvestris*, *Thymus serpyllum*, and other blossoms, and even on blackberries.

PUPA. It has the abdomen very much curtailed and sharply pointed; the eyes black and very prominent; the thorax and wing-cases spotted with black, the latter much ribbed. The spots do not appear for a week or two, during which period the pupa is uniform pale yellowish-red. In a rather closely spun cocoon, in the earth. (Rev. H. H. Crewe.)

The winter is passed in this state.

The moth sits sometimes on fences, posts, or rails, or the trunks of trees, in the day-time, but more frequently hides in thick bushes, and is then rather sluggish. At dusk it may be taken flying about bushes and hedges. It is rather common throughout the southern, eastern and western counties of Worcestershire, Herefordshire, Bucks, Oxfordshire, Cam-

bridgeshire, and Norfolk; but seems to be almost totally absent from the Midlands and North, with the exception of Yorkshire, where it is very local. In Wales it is found in Glamorganshire and Pembrokeshire; in Ireland in Dublin, Wicklow, Cork, Kerry, Monaghan, Sligo, Tyrone, and Derry. Abroad in many parts of Central Europe, Middle and Northern Italy, Sardinia, Corsica, South-east Russia; and in Japan, from which may be inferred some considerable Asiatic distribution.

46. **E. rectangulata**, L.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings short and blunt, dull dark green—varying from full green to deep black—central band broad, formed of black lines and green and smoky clouds; a series of blackish clouds lies along the hind margin. Hind wings paler green with numerous smoky transverse lines.

Antennæ of the male simple, finely ciliated, reddish-brown; palpi slender, dark green; head and thorax bluish-green; abdomen greenish-brown, each segment having a rather raised edging of scales at its margin; anal tuft compressed. Fore wings blunt and broad; costa flatly arched; apex bluntly rounded; hind margin not very oblique, smoothly curved; dorsal margin straight; colour dark green; basal line very slender, angulated, black; the first line arises near it on the dorsal margin as a black streak, forms a black spot each on the median and subcostal nervures, then bends back as a black cloud to the costa; a little further a similarly blackened and somewhat parallel central line clasps the black discal spot in its angle; outside it are two fainter and more direct slender black lines, and then the usual second line, formed of deep-black dots on nervures and a perpendicular black streak on the costa; this is followed by a rivulet-stripe of the green ground colour, intersected by a faint dark line, and edged by a smoky black band, which is interrupted below the costa and elsewhere thrown much into horizontal streaks and points; this again followed by the subterminal line—green;

and along the hind margin by a faint blackish cloud containing two or three short black streaks on nervures; cilia smoky black spotted with deep black. Hind wings rather elongate, a little squared behind, green, with five, single or double, faint transverse smoky black stripes occupying almost the whole surface; cilia shining, smoky white spotted with black. Female similar, sometimes a little larger and darker.

Underside very pretty; fore wings shining smoky white, with a green shade along the costal region, and a white stripe along the dorsal; discal spot black, preceded by a slender black transverse line, and followed by two conspicuous black stripes, both shaded off inwardly; cilia spotted with white clouds. Hind wings smoky greenish white, with a silvery gloss, the deep black central spot and three stripes as in the fore wings. Body and legs glossy white; tarsi clouded with black.

Variation in this species is, in one respect, of rather doubtful character. Specimens in which the ground colour is pale drab, pale brown, or almost white, but with the markings intact, are not unfrequent, but it is always doubtful whether they are not those which, originally green, have rapidly changed colour through the influence of damp or some other cause. Others of intermediate shades of pale green may be more genuine aberrations, yet even this is doubtful. Such specimens are not rare out of doors, but they do not seem to be reared in these pale forms from the pupa. With regard to an opposite phase of variation the reverse is the case. This is a striking tendency towards melanism, observable in London and a few other cities and large towns. This blackening is sometimes spread over the ordinary markings, making them darker, but much more over the ground colour, which then becomes smoky, often with little or no tinge of green remaining; but in a great proportion of reared specimens the whole insect—fore and hind wings, thorax and abdomen—has become smoky-black or silky-black, no trace of ordinary markings or colour remaining. Sometimes this form is

further changed in that the anal tuft becomes *white*. In the Yorkshire district in which melanism is so prevalent this species loses the silky black and takes a coarser black variation. In Scotland the green seems often to be replaced by brown—if, indeed, this also is not a result of fading—and from Edinburgh Mr. W. Evans has sent me a form in which the ground colour being rather pale green, the central band of the fore wings is filled in with smoky-black, and a similar but still broader band of the same colour crosses the hind wings.

On the wing in June and July.

LARVA short and thick ; ground colour very pale yellowish-green ; dorsal line varying much in intensity of colouring, sometimes rusty-red, sometimes dark green, frequently very indistinct, and sometimes altogether wanting ; spiracular line rather darker than the ground colour ; segmental divisions reddish ; whole body very transparent, and the circulation visible under the dorsal line ; back sprinkled with a few short hairs. When young darker and having the dorsal stripe broad, distinct, and rusty-red. (Rev. H. H. Crewe.)

April and May, in the blossoms of apple, both cultivated and wild, and of pear ; drawing the petals together and feeding within.

The winter is passed in the egg state.

PUPA. Thorax and wing-cases yellow suffused with olive ; abdomen tapering, the lower divisions and tip blood-red. (H. H. C.) In a slight cocoon under loose bark or moss on apple trunks, or in the ground.

The moth sits by day on the trunks and branches of apple trees, or on palings or any other suitable place in their vicinity, and if disturbed flies but to a very short distance. At dusk it flies about the apple trees, and later will sometimes come to a street-lamp. Very abundant in the suburbs of London, and most destructive in some seasons to the apple

crop; common also throughout England and probably Wales, though I have records only from Glamorganshire, Pembroke-shire, Carnarvon and Flint. In Scotland, found in Berwickshire, Roxburghshire, Edinburgh, Fife, Wigtownshire, Ayrshire, Argyleshire, Perthshire, Aberdeenshire and Ross-shire, but scarce in the more northern of these counties. Widely distributed in Ireland, and doubtless to be found wherever apple trees are common. Abroad it ranges through Central Europe, the temperate portions of Northern Europe, Middle and Northern Italy, Corsica, the Balkan States and Southern Russia.

47. **E. pumilata**, *Hüb.*; **rufifasciata**, *Hav.*.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–19 mm.). Fore wings narrow and pointed, whitish-brown shaded with tawny; first and second lines black, followed by tawny clouds. Hind wings brownish-white, rippled with red-black transverse lines.

Antennæ of the male simple, slender, most minutely ciliated, shining dark brown, faintly barred with paler; palpi very small, umbreous; head and thorax pale brown, the latter shaded across the front with darker brown; abdomen light brown, faintly barred with white; anal tuft compressed and deflected. Fore wings narrow and very pointed; costa flatly curved, hardly arched; apex shortly and bluntly rounded, almost pointed; hind margin oblique, nearly straight, yet curved off below; dorsal margin filled out and strongly ciliated; colour very pale reddish-brown or brownish-white; basal line curved, dark brown, enclosing a reddish-brown patch; first line oblique, curved, brown, preceded by a parallel narrow reddish shade and followed by a narrow brown stripe broadest on the costa; this last usually includes one or more black spots or streaks; second line black, shaded off inwardly in the costal half of the wing, thence brown and indistinct; closely following it is a white rivulet intersected by a slender brown thread; the middle of the wing is also usually whitened; hind margin faintly or strongly clouded with red-brown, through which runs.

a dull white subterminal line ; cilia pale brown, dashed with white. Hind wings narrow, rounded behind, white with two black or brown spots on the dorsal margin near the base, and following them two to four rippled black-brown partial transverse lines; beyond these are two or three browner and much angulated lines or stripes; cilia pale brown, dashed with white. Female similar, or sometimes larger and having the markings more distinct.

Underside of the fore wings shining silvery whitish-grey, very faintly clouded with two darker transverse bands. Hind wings white with a black central spot; followed by two transverse stripes of smoky-black clouds. Body and legs brown.

Very variable in size, and also in the depth of the ground colour, and of the markings; the red-brown clouds in the outer half of the fore wings sometimes becoming very conspicuous. It often happens that specimens of the first generation are larger and more strikingly marked than those appearing later in the year.

A form, known on the Continent under the varietal name of *tempestivus*, which is grey-brown or pale brown devoid of the red-brown colouring, does not seem to have been met with in these islands.

On the wing in April, again in May and June, again in July and August, indeed it has been taken in every month from April to September, and even in November; but there is not evidence to show whether in two, three, or even four generations, or whether in deferred or alternate emergences.

LARVA short and stout, tapering slightly towards the head; ground colour pale yellowish-olive, reddish-olive, or rusty-red; dorsal line dusky-olive, almost black; down the middle of the back is a chain of dusky arrow-shaped spots, more or less distinct, and becoming merged in the dorsal line in the anterior and posterior segments; on each side is a broad ribbon-like stripe, yellowish in the middle, dusky at the

edges; the dorsal spots bordered interruptedly with yellow; spiracular line yellowish.

Or—Ground colour yellowish-green, or almost primrose-yellow; dorsal line olive-green, intersecting and uniting a series of pear-shaped spots of the same colour; the latter becoming merged in the dorsal line in the anterior and posterior segments; subdorsal lines olive, two on each side; undersurface pale dirty green, with dusky edges. The spots and lines vary much in intensity of colour, and are sometimes almost entirely wanting, leaving the larva of a uniform pale yellowish-green. (Rev. H. H. Crewe.)

May, June, July, September, and probably in other months in uncertain generations as already stated; on the blossoms of furze (*Ulex europæus*), wild clematis, chervil (*Anthriscus sylvestris*), holly, and marjoram, also on hawthorn, mountain-ash, and other species of *Sorbus*.

PUPA quite slender, wing-covers rather thickened, dark olive-brown, showing the nervures, in relief, as strong black-brown ribs; eyes prominent, black; antenna, limb, and tongue-covers black on a ground of dark olive-brown; the antennæ sculptured throughout with incised bars; dorsal region olive-brown, raised at the back of the head and thorax into a decided ridge or swelling; abdominal segments small, rather attenuated, paler olive-brown, faintly pitted, but the hinder edges smoothly banded; anal segment dark brown; cremaster stout, provided at the tip with strong minute hooked bristles. In a slight cocoon in the earth.

The winter is passed in this condition.

The moth hides during the day, especially in dull weather, among bramble, or in hedges, bushes, and among coarse herbage, especially frequenting mountain sides, heaths, and moors, and is locally abundant. Very easily disturbed and induced to fly, and on warm sunny days flitting about of its own accord. To be found in suitable places throughout the south of England to the Scilly Isles, and the west, being

abundant in Westmoreland; but in the east, though common in Essex, hardly recorded beyond Suffolk; apparently very little known in the Midland Counties, the only records being in Derbyshire, but found also in Yorkshire. In Wales, where it must surely abound, the only records seem to be from Glamorganshire, Pembrokeshire, Carnarvon and Flint; in Scotland widely distributed about Edinburgh and in Fife; in Wigtownshire, Ayrshire, Perthshire, Aberdeenshire, Inverness, and Ross; indeed, Dr. Buchanan White gives its range as from the Solway to the Hebrides, and from the Tay to Moray and the Orkneys. Apparently abundant on hills and mountain heaths and in wooded valleys all over Ireland.

Abroad it is widely distributed in Southern Europe, including Spain and Portugal, great part of Western Europe, Germany, Hungary, Switzerland, and Livonia; also in Bithynia, Pontus, Syria, and Egypt, and abundant in Morocco.

Family 5. **ÆNOCHROMIDÆ.**

Antennæ simple; palpi small; head rather rough; thorax not crested; abdomen smooth; fore wings broad and rather short; hind wings broad, vein 5 fully developed and arising at or below the middle of the cross-bar; vein 8 separate from vein 7, but closely approximating to it before the middle of the cell.

Genus 1. **TANAGRA.**

Antennæ of the male simple, rather thick; palpi minute; head and thorax rather rough; abdomen smooth; fore wings short, broad, and rounded, very smooth; hind wings elongated, broad and rounded behind.

We have but one species.

1. **T. chærophyllata**, L.; **atrata**, *Staud. Cat.*—Expanse 1 to 1½ inch. Wholly smoky-black, except the apical margin of the fore wings, which is pure white.

Antennæ of the male rather thick, simple, finely ciliated, black, minutely barred at the back with dirty white; palpi very short, but thickly set with bristly hairs, deep black; head and thorax black, minutely dusted in front with dark brown; abdomen nearly cylindrical, smoky-black; lateral tufts small, placed on a thick ridge; anal tuft short and a little thickened. Fore wings broad and very blunt; costa but little arched, in its middle portion almost straight; apex rounded; hind margin very little oblique, almost perpendicular and straight, yet fully curved off at the anal angle; dorsal margin rather rounded, densely ciliated; the whole surface silky, smooth uniform smoky-black with the nervures a little deeper black; but the extreme margin and cilia of the apex, and running round to the costa, are narrowly pure white, the cilia below the apex shading off into shining black with a faint mixture of white. Hind wings rather elongated, much rounded behind, smooth smoky-black; cilia more glossy black. Female rather smaller, having the abdomen shorter and the fore wings rather more narrow; otherwise similar.

Undersides of all the wings, as well as the body and legs, smoky-black, the apical cilia of the fore wings white as on the upper side. Not variable, but becoming a little browner from fading during life.

On the wing in June and July, in the latter month more particularly in the north.

LARVA when full grown nearly three-quarters of an inch in length; cylindrical, stout in proportion, and about equally thick throughout, rather shining; head rounded, green; ground colour of the back green or bluish-green, becoming on the sides gradually paler toward the spiracular region; dorsal line darker green, becoming on the anal segment dark red, and thicker, forming a very conspicuous mark; subdorsal stripes of a darker green than the ground colour, and running between two fine lines of whitish-green, which in some individuals are seen to be very finely edged

externally with darker green; spiracles red; below them the green fades into a whitish stripe and is forcibly contrasted beneath by a darker tint of the green of the back, softening gradually into a paler green on the ventral surface, where there are three longitudinal whitish stripes, the middle one being the widest. (W. Buckler.)

March or April to the beginning of June, on the flowers of *Bunium flexuosum* (earth nut). So far as I can ascertain this is its only food in this country; but it is incredible that a mistake in the plant should have been made by Linné, who evidently named the insect from *Charophyllum*. Borkhausen described the larva from the same plant; and by Hofmann *Anthriscus sylvestris* is given as its food-plant. It seems reasonable, therefore, to suppose that in some parts of the Continent this larva is less dainty in its preferences.

PUPA apparently undescribed.

The winter is passed in the egg state.

The moth flies about in the daytime, especially in the afternoon, flitting a short distance and then alighting with wings erect, moving about continually in the sunshine. Probably it is quiescent at night. It inhabits damp meadows, always specially frequenting those in which the earth nut grows, and sometimes in such places is to be found in multitudes, also visiting any neighbouring clover fields. Damp spots among hills are also selected, and in such spots in northern districts it is often abundant, yet is everywhere exceedingly local. Formerly it was plentiful at Hampstead, close to London, and is still to be found at Harrow and Willesden, all in Middlesex; also in suitable places in Sussex, Hants, Dorset, Wilts, Devon, Oxfordshire—especially in meadows near Oxford—Herefordshire, Leicestershire, Warwickshire, Staffordshire, Derbyshire, Cheshire, Lancashire, Yorkshire, Durham, Westmoreland, Cumberland and Northumberland. In Wales in Flintshire, Merionethshire, and near Llantrissant, Glamorganshire. In

Scotland it is equally common in restricted localities near Hawick and Edinburgh, in Roxburghshire, Wigtownshire; the Clyde Valley; Argyle, with Bute; Perthshire—abundantly on river banks—Aberdeenshire and Moray. In Ireland it is abundant in the south, in Waterford and Kerry, also in Galway; and is found in Clare, Westmeath, Fermanagh, Tyrone, Sligo and Donegal, and rarely in Derry. Abroad it has a wide distribution through Central Europe, the greater portion of Northern Europe, Northern Italy, Spain, the Ural mountain regions, Asia Minor and Armenia.

Genus 2. **APLASTA.**

Antennæ simple, apparently naked; palpi short and blunt; head and thorax rather rough; abdomen smooth, not very slender; fore wings broad in the male, narrower in the female, rather squared behind; hind wings ample, squared at the anal angle.

We have but one species.

1. **A. ononaria**, *Fuessl.*—Expanse 1 inch. All the wings powdered, pale drab or reddish-drab, tinged behind with purple-red; fore wings with two, and hind with one, slender, transverse, purple-red line.

Antennæ of the male rather thick, short, simple, almost naked, yellow-brown; palpi short, thick, beak-like, pale chocolate; eyes deep black; face convex, almost globose, edged above by a deep channel under the antennæ, pale chocolate; head and neck-ridge pale brown; thorax slightly roughened, pale orange-brown; abdomen short, cylindrical, dull buff; lateral tufts small; anal tuft short and blunt. Fore wings broad and somewhat squared behind; costa gently arched; apex distinctly though bluntly angulated; hind margin just below it almost retuse, then expanded and but slightly rounded off toward the anal angle, which is prominent; dorsal margin straight, densely ciliated; colour

dull buff with a powdered appearance, dusted and shaded with reddish-orange; no basal line; first line extremely faint, a mere aggregation of the reddish atoms; second line more distinct, erect, not indented and but little curved, orange-red or purplish-red, shaded off outwardly to a sort of subterminal line of the ground colour, which is equally erect and nearly parallel; outside this the hind-marginal region is more thickly dusted with rich purplish orange; cilia pale buff, shading paler at the tips. Hind wings rather large, rounded a little behind, but the anal angle squared; pale buff at the base, shading to smooth purplish-orange at the hind margin, and only very faintly banded in the middle by a shade of the same colour; cilia pale buff. Female rather smaller, the wings not so broad and more narrowly rectangular, and the fore wings somewhat pointed; body rather thicker but pointed behind; colour of the wings similar, or else deficient of the orange-red or purplish-red shading.

Undersides of all the wings orange-ochreous; costa of the fore wings dusted with brown; discal and central dots obscurely visible, brown; beyond the middle of each wing is a faint smoky-brown transverse stripe; hind margins and cilia all tinged with the same colour. Body and legs pale buff.

There is considerable variation, as already remarked upon, in the amount, or absence, of purple-red dusting on the wings of the females.

On the wing in May and June, and in a second generation in July and August.

The LARVA is plump, thickest in the middle, with the segments distinctly marked; velvety or pubescent, colour sea-green; a dotted black line runs down the back; on each side above the feet is an undulating yellow line; prolegs of the same colour; head yellowish-brown; body sprinkled with fine raised dots and grey hairs.

April and the beginning of May, and a second generation at the end of June, on *Ononis spinosa* (restharrow). (Hofmann.)

PUPA greenish-yellow with brown wing covers. In an open cocoon of white silk. (Hofmann.)

The moth hides during the day in the thick beds of its food-plants, the common and spiny restharrow; and may be disturbed by the footsteps of any person so fortunate as to discover a locality in which it exists. Its flight is rather dull and heavy. Either a very rare inhabitant of the coast of Kent or an occasional migrant thereto; the number of known British specimens not as yet exceeding six, or seven. The first was captured upon Folkestone Warren on July 18, 1866, by Mr. Bernard Piffard, and is now in the collection of the late Mr. H. Doubleday in Bethnal Green Museum. The others seem to have occurred at intervals, two being captured by Mr. F. O. Standish in 1869; another was taken in 1871 by Mr. W. Purdey, all at the same spot, and there have been, I believe, one or two more. Most of these are now in the collection of Mr. Sydney Webb, at Dover. So far as I can ascertain no specimen has been found in these islands outside the county of Kent.

Abroad its range extends through Germany, Switzerland, Italy, Spain, Dalmatia, Greece, Asia Minor, Armenia, Syria, and Cyprus.

#### Group 5. *PYRALIDINA*.

A group composed of several families, in some respects rather distinctly and sharply defined; in part running in some degree parallel with the Noctuid and Geometrid, but elsewhere diverging into a somewhat close relationship with portions of the Tineid.

Antennæ in the vast majority of species threadlike and simple, though in some genera tufted, knotted, or dilated at

the base; eyes naked, and without lashes, generally rather prominent; tongue usually present and useful; labial palpi almost always distinct, often elongated and porrected; maxillary palpi usually present, often noticeable, and tufted; head fairly smooth; thorax in most species slender, smooth, without crests, but with the shoulder lappets well developed and long; abdomen generally slender, devoid of dorsal crests, but having the lateral tufts perceptible, and the anal tuft usually rather long. Fore wings either trigonate and rather pointed; or cleft and pointed; or else elongated and narrow; vein 5 arising from the lower angle of the cell. Hind wings usually ample, thin in texture, and folded well beneath the fore wings when at rest; but cleft where this is the case with the fore wings; usually plain. In these wings is situated the structural character by which the group is most reliably recognisable—the nervure nearest the front margin, known as vein 8, is depressed at a short distance from its base so as to closely approximate to vein 7, and even in some groups to combine with it beyond the cell, afterwards again separating before the hind margin; the three divisions of vein 1 are present and usually well developed; vein 5 almost always arises from the lower angle of the cell.

LARVÆ with sixteen legs.

PUPÆ not protruded from the cocoon (if any) on emergence.

#### SECTION 1.

Fore wings trigonate—*Pyralites*.

#### Family 1. PYRAUSTIDÆ.

Fore wings rather narrowly trigonate, somewhat pointed; vein 1a. arising separately from 1b.; v. 7 springing from the cross-bar. Hind wings with veins 4 and 5 arising from

a common angle; median nervure devoid of long scales on the upper side; v. 8 springing from v. 7.

### Genus 1. ODONTIA.

Antennæ simple; palpi pointed, porrected; tongue absent; thorax rough with large raised scales; fore wings blunt, having a distinct tuft of projecting scales on the dorsal margin; hind wings broad, the cross-bar angulated; legs stout, not long nor tufted.

1. *O. dentalis*, *Schiff.*—Expanse 1 to  $1\frac{1}{8}$  inch. Fore wings pale yellow-brown bordered with white dashes and mottled with black arrow-heads; hind wings dull white, with grey-brown nervures and stripes; brown in the female.

Antennæ of the male simple, finely ciliated, dull yellow; palpi porrected, slender, pointed, and, with the head and thorax, dull pale ochreous; abdomen rather slender, of the same colour. Fore wings trigonate; costa nearly straight; apex bluntly angulated; hind margin gently curved; dorsal margin embellished near the base with a large projecting tuft of long loose scales, mixed pale ochreous and brown; wing otherwise pale ochreous, the nervures edged with brown; in the middle is a transverse black-brown line angulated into long points which project like rays, but not attaining the costa; beyond the discal cell is a similar series—almost a bunch—of long points; in both cases these are clouded broadly outside with pale brown to near the hind margin; cilia long, whitish ochreous: deeply crenulated, the points all dashed with dark brown. Hind wings broad but rather pointed, the hind margin straightened; dusky white; nervures and hind margin shaded with brown, and having a broad middle transverse shade; cilia white. Female rather darker, and having the hind wings much suffused with brown.

Underside of the fore wings dull brown; the dorsal margin pale yellow; cilia of the same colour, dusted with brown;

hind wings dull white, with faint brown streaks. Legs whitish brown.

Variable in the colour of the markings of the fore wings from pale ochreous to dark yellow-brown; also in the degree of dark clouding of the hind wings, which in a specimen in the collection of Mr. G. T. Porritt are almost black.

On the wing in July and August, but occasionally from the end of June till October, apparently in but a single generation. On the Continent it is said to have two generations in the year.

LARVA. Head small, narrower than the second segment, porrected, obscurely triangular, and has a very flat face; body obese, somewhat shuttle-shaped; the skin transversely folded on the segments; on the second segment is a broad dorsal plate, very rough, and divided by a slender median longitudinal line; on each side of the same segment are also two scabrous spots; another rough place is on the thirteenth segment; legs short and horny; ventral prolegs short and moderately distinct; anal prolegs close together and very small; head and plates black; body pale yellowish white; raised dots black, placed in longitudinal series, and each bearing a small bristle. (E. Newman.)

May and the early part of June—but probably emerging from the egg in the autumn and hibernating while small—on Viper's bugloss (*Echium vulgare*) feeding on the lower portion of the stem and the leaf stalks and substance of the largest basal leaves, causing the latter to wither and become curled up.

PUPA thin-skinned, a little flattened; wing covers long, dull from minute frosting; dorsal and abdominal regions smooth and moderately shining; anal segment rounded and without visible cremaster; general colour light bright brown. In a hard firm cocoon of silk and vegetable material in one of the withered basal leaves of the food plant; the cocoon so

covered with the downy hairs of the plant as to seem to be a part thereof.

The moth is of rather secluded habits, keeping closely to the shelter of its food-plant; though it can be disturbed in the daytime, when it will fly a short distance to settle again on grass stems or among herbage, and is very easy of capture. Its natural time of flight is in the evening. Almost confined in these Islands to the South coast of England; formerly common near Folkstone and Deal in Kent; and near Brighton, Eastbourne, Hastings, Pett, and Lewes in Sussex; still occurring casually in most of these localities but in far smaller numbers; formerly also to be found in Devon; and quite recently in the Isle of Purbeck, Dorset. This, so far as I know, is the extent of its range with us. Abroad, it has a considerable distribution through Central and Southern Europe, Asia Minor, Syria and Egypt.

## Genus 2. **PYRAUSTA.**

Antennæ simple; palpi short, tongue present; head and thorax smooth; abdomen rather short, banded, smooth; fore wings trigonate; hind wings rather broad; legs untufted, not long.

1. **P. purpuralis**, *L.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18-23 mm.) Fore wings crimson-purple, spotted and banded with orange-yellow; hind wings black-brown with a purple tinge, banded and spotted with pale yellow.

Antennæ of the male threadlike, bronzy-black; palpi slender, rather porrected, dull brown; head and thorax golden brown mingled with black; abdomen slender, dull black, each segment edged by a pale yellow ring; anal tuft purple. Fore wings trigonate, the margins nearly straight; apex angulated; rich purple; at the base is an orange blotch dusted and edged with black scales; discal spot small, round, orange-yellow; second line an orange-yellow stripe, or series

of spots—one triangular on the costa, below it one larger and rather rounded, and a long crescent extends thence to the dorsal margin;—beyond this stripe is sometimes a faint yellow subterminal line; cilia purple tipped with white. Hind wings elongated, rounded behind; dull brown or black-brown, with a large yellow central spot rather near to the costal margin; immediately outside it is a broad transverse band or stripe of the same colour; usually this is followed by a purple shade toward the hind margin; cilia yellowish-white, shaded or intersected with black. Female similar.

Underside of the fore wings smoky-black bordered with purple toward the costa, apex, and hind margin; dorsal margin and a cloudy extension from it dusky white; discal spot small, pale yellow, followed by a large conspicuous similar spot and a partial transverse band of the same. Hind wings rich purple, with the yellow spot and band of the upper side well marked. Legs yellowish-white; purple in front.

Usually not very variable beyond the limits above indicated; but Mr. B. A. Bower possesses a specimen in which the fore wings are suffused with a curious glaucous or whitish bloom, very conspicuous on the dark portions and causing the yellow spots to appear almost of an orange colour. One in my own collection, taken in the Norfolk Fen district, has the yellow markings much enlarged. Some specimens from the West coast of Scotland are not only very brilliantly coloured but range up to nearly an inch in expanse.

On the wing in May and June, and, apparently as a second generation, in July, August, and even September.

LARVA grey with yellow dorsal and spiracular lines and pretty-looking white-ringed black raised spots; head brown. (Hofmann.)

June and July, and again in the autumn, on the various species of mint. But Mr. W. H. B. Fletcher has found it in September feeding upon *Prunella vulgaris*, forming a large chamber of silk close to the ground and eating the radical leaves.

PUPA yellow-brown. Not more fully described.

A very lively, active creature, inhabiting rough meadows and pastures, hillsides (especially in chalky places), the rides and borders of woods, and even marshes and occasionally fens; flying actively in the sunshine or sitting upon the herbage in sunny places, whence it darts swiftly to a distance if disturbed. It certainly flies occasionally at night, since it has been known to come to light. Plentiful throughout the Southern and Western counties of England, and moderately so in the Eastern; local in the Midlands and in Yorkshire, Lancashire, and Durham. Probably to be found throughout Wales since it is common in Glamorganshire and Pembrokeshire, and also in Carnarvonshire, Denbigh, and Flint: also common and widely distributed in Ireland. In Scotland recorded from Dumfries, Berwickshire, Fife, Perthshire, Renfrew, Arran, Aberdeenshire and Kincardineshire. Abroad its range extends throughout the Continent of Europe from Norway to Turkey; also to Asia Minor, Armenia, Tartary, and Central Asia.

2. *P. ostrinalis*, *Hub.*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18mm). Very similar in colour and markings to the last species, but colour darker; smaller in size and fore wings shorter and more sharply triangular.

Antennæ of the male threadlike, black-brown; palpi and head bronzy brown; thorax bronzy purple; abdomen black or dark brown, each segment edged by a yellow-white ring. Fore wings sharply triangular; costal and dorsal margins straight; apex sharply angulated; hind margin almost straight; colour bright purple, dull purple, purple-brown, or purple-black; usually a more or less blackened yellow spot lies near the base, often joining a black-ringed yellow dot in the discal cell before the middle; discal spot a yellow or white dot; beyond it is an oblique transverse yellow or white stripe constricted in the middle or broken into spots: cilia purple-brown. Hind wings rather narrow; rounded behind;

black or purple-black with a pale yellow or white central spot, closely followed by a curved transverse band or stripe of the same colour, broadest toward the costal margin ; outside this is often a bright purple shade ; cilia dirty white. Female similar.

Underside similar to the upper, but the yellow markings much larger and more brilliant ; the hind wings having an additional narrow yellow stripe near the hind margin. Legs yellowish white ; purple-brown in front.

Always and everywhere variable as already shown ; and the fore wings sometimes almost as dark as the hind.

On the wing from May till August, apparently in two generations ; even emerging sometimes in April in the South.

LARVA apparently undescribed, said to feed upon *Clinopodium vulgare*, *Thymus serpyllum*, *Calamintha ucinos*. and other labiate plants ; in September and October.

PUPA undescribed.

The moth frequents rough fields, hillsides, and grassy places generally where flowers abound—though it does not often sit upon flowers, preferring stalks of grass and all sorts of low-growing plants for this purpose. Very active in the warm sunshine ; appearing and disappearing almost like a flash, but darting away merely to circle round and return to nearly the same spot, and not difficult to capture. Found still in suitable spots even in the suburbs of London, and commonly throughout the southern half of England ; more sparingly in some of the more northern districts to Yorkshire and Durham ; but since it is often mistaken for *P. purpuralis*, the records are somewhat vague. In Wales found in Glamorganshire, Pembrokeshire, Montgomeryshire, Carnarvonshire and Denbighshire, and probably throughout the Principality ; in Scotland on the various hills of the Clyde district, in Fife, Berwickshire and Inverness ; and in Perthshire on the mountains to an altitude of 2000 feet. Common and generally distributed

in Ireland. Abroad it is found throughout the Continent of Europe, Asia Minor, and Central Asia, but is usually regarded as a variety of *P. purpuralis*. This view may possibly be correct, but a long and intimate acquaintance with both forms has induced in my own mind a belief in their distinctness. Possibly the discovery and comparison of larvæ may some day settle the point.

3. *P. punicealis*, Schiff.; *aurata*, Staud. Cat.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings brownish purple with a large orange spot before the apex; hind wings purple-black, with a yellow band only.

Antennæ of the male threadlike, black-brown; palpi rather thick, prominent, yellow-brown; head and thorax purple-brown, with superficial long yellow scales; abdomen brown-black, each segment edged with white; anal tuft dull black. Fore wings trigonate, costa a little arched beyond the middle; apex angulated; hind margin slightly rounded; colour rich dark purple or purple-brown dusted with bronzy black; first line represented by two orange dots; second by a cluster of faint similar dots above the dorsal margin, and an orange spot nearer the costa, on which also is a similar triangular dot; discal spot a minute yellow dot; cilia bronzy black-brown, tipped with white. Hind wings rather elongated, rounded behind; deep smoky black with a purplish tinge; in the middle is a broad transverse orange-yellow band; no other markings; cilia smoky black, tipped with white. Female similar.

Underside of the fore wings, from the base to the second line, yellow with black nervures and two black discal spots; second line black; area beyond it glossy purple, edged with black; dorsal area, to the middle of the wing, silvery white. Hind wings yellow, with the costal margin narrowly, and the hind margin broadly purple; a black central spot is followed by an irregular black transverse stripe. Legs pale yellow, more purple-brown in front.

Variable in the size of the sub-apical orange spot of the fore wings, and in the breadth of the orange-yellow band of the hind; occasionally a yellow cloudy shade is visible at the base of these last. This variation seems to become the permanent form in some parts of the South of Europe and in Palestine. In the collection of the late Mr. F. Bond, now in the possession of Mr. Sydney Webb, is a specimen having the fore wings black-brown, and the hind black, both unicolorous, and another in which the fore wings only are devoid of markings.

On the wing in May and June, and, as a second generation, in July and August.

LARVA a little over five-eighths of an inch in length, stoutest at segments eight, nine, and ten; thence tapering rapidly to the tail, more gradually to the head, which is the smallest segment; colour dull green on the back; dorsal line the same, only marked off by edgings of yellow; spiracular stripe broad and more yellowish, with a faint green line running through it; head and second segment pale brown, freckled with black; below the spiracles is a double greenish line; undersurface pale yellow; all the usual dots distinct, shining black, and narrowly ringed with yellow. When full fed it becomes tinged with pink. There is a variety wholly pale green with no darker stripes or lines; and another which has a pale yellow blotch on the back of the twelfth and thirteenth segments. (Rev. J. Hellins.)

September and October—and probably another generation in June or July—on *Nepeta cataria*, *Origanum vulgare*, some of the species of *Mentha*, and on *Thymus serpyllum*; feeding on the flowers, under a covering of confused silken threads. When quite young feeding on the undersurface of the leaves.

PUPA cylindrical, slender, the abdomen ending in a flattened, blunt projection, beset at right angles with some

curled-topped spines. In a very tough cocoon of pale brownish silk, spun up in late autumn. (Rev. J. Hellins). At what time this state is assumed therein remains uncertain, for after rearing some of the moths in May 1874, a living larva was found in one of the other cocoons in the following month. Mr. Buckler found that pieces of dead stems of umbelliferous plants were readily accepted for spinning up in.

This species is mainly confined to chalk districts, and loves the hillsides and downs, where it flies in a lively manner in the daytime, usually about thyme, marjoram and calamint. It was found by Mr. R. McLachlan for several successive years about mint in his garden at Lewisham, but otherwise has very seldom been observed in the London suburbs. On the chalk hills and slopes of Surrey, Sussex, Kent, Hants and Wilts it is very common, and moderately so in Devon, Cornwall, Somerset, Gloucestershire, Dorset, Berks and Oxfordshire; more locally in Norfolk, Suffolk, Cambridgeshire, Herefordshire, and Monmouthshire; and at Dovedale, Derbyshire; Yorkshire, and North Lancashire; in Durham it is common in Hezleden and Castle Eden denes. In Wales Mr. H. T. Stainton recorded it at Conway; and these localities seem to mark its limits in these Islands. Yet records occur of its presence in Lanark and Ayrshire which have not been disproved. On the Continent it has a wide range through Europe to Portugal, and is common in Corsica; also found in Madeira and the Canaries; the Barbary States; Asia Minor, Armenia, Persia, Afghanistan, the Central Asian mountain regions, and Siberia.

4. *P. cespitalis*, *Schiff.*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings dull olive-brown faintly tinged with yellow; hind wings smoky brown with a dull yellow central stripe, sometimes followed by another, narrower and more faint. Female darker and more sharply marked.

Antennæ of the male simple, ciliated, black-brown; palpi prominent, reddish-brown; head and thorax dull brown or red-brown; abdomen slender, smoky brown, each segment edged slenderly with white; anal tuft dull pale yellow. Fore wings trigonate with rather straight margins; apex angulated; colour yellow-brown, olive-brown or reddish-brown, sometimes dusted with black; the markings obscure, often very faint; first and second lines represented by indistinct stripes, or portions of stripes, of yellowish clouding; discal spot round, dull pale yellow; cilia very glossy, of the ground colour, shot with yellow, and tipped with smoky grey. Hind wings rather broad; apex fully rounded and hind margin curved; smoky brown, sometimes with a faint yellowish spot on the costal margin; in the middle of the wing is a slender, faint, yellow transverse stripe, and often outside this, a more slender one along the hind margin, which however is edged with black; cilia shining, smoky brown. Female rather smaller; usually of deeper, brighter, or darker colour; the fore wings more red-brown, the hind blacker, but the yellow markings decidedly more distinct.

Underside of the fore wings pale smoky brown; in the discal cell are two whitish spots edged with black; along the costa is a pale yellow dash, and a similar cloud edges the second line; hind margin dotted with black and preceded by a dull yellow cloud. Hind wings very pale smoky brown; from the base a yellowish white longitudinal stripe, interrupted by a central black-brown spot, runs to the pale transverse band of the upper side, here reproduced, and followed by another faint yellow band. Legs yellow-brown.

Rather variable in the lines indicated above, especially so in the female; also most richly marked in coast districts. In the collection of Mrs. Bazett at Reading is a specimen taken at Wokingham, Berks, which has both fore and hind wings suffused with shining black, and with the pale markings nearly suppressed.

On the wing in May and June; in warm spots, in the

South sometimes even in April; also in a second generation from July to the beginning of September.

LARVA five-eighths of an inch long, and fairly stout in proportion; head and second segment horny and glossy, the head the narrower, and having the lobes rounded; body cylindrical, but tapering a little toward the extremities; segments well defined; spiracles conspicuous. Colour dull smoky brownish-black; head and second segment wainscot-brown, freckled with darker brown; dorsal stripe similar, enclosed between two grey lines; a dingy ochreous stripe, of varying intensity in different specimens, extends along the spiracular region; raised dots polished, black, finely but clearly encircled with grey; spiracles black with minute white centres; ventral surface and prolegs rather paler and browner than the dorsal area; the anterior legs tipped with darker brown, and encircled with black at their bases. When younger tinged with olive. (G. T. Porritt.)

August and September (and probably another generation in June or July); on *Plantago lanceolata*, *P. major*, and *P. media*, feeding at night on the undersurface of a leaf and resting during the day in companies, in a web, toward the base of the leaf, or on the undersurface of one which lies flatly on the ground. (W. H. B. Fletcher.) Gartner says that it feeds also on *Salvia*, and eats into the crown of the root.

PUPA about one-third of an inch long, plump and glossy; thorax, head, and wing-covers dark sienna-brown; abdominal divisions dark orange. In a cocoon compactly formed of closely-woven snow-white silk, in a corner. (G. T. Porritt.)

The moth frequents grassy places on heaths and hillsides, more particularly chalk, oolite, or limestone hills, especially those along the coast, and may be found in all sorts of dry sandy places. It is readily disturbed at any time in the day, but flies most freely about sunset. In such places fairly

common throughout England, and plentiful in the South as well as along the coast. In South Wales so abundant that late in the afternoon I have seen it, on the coast cliffs of Pembrokeshire, in thousands, every step that I took disturbing a host which would fly in every direction, like rays from a centre, but almost every specimen settling again within a few yards. Equally common in Glamorganshire, and perhaps occurring throughout Wales, since it is found in Carnarvonshire and Flintshire. In Scotland, on hillsides in Fife, Perthshire, Roxburghshire, Wigtownshire, Arran, Aberdeenshire, Kincardineshire, Moray, the Orkneys, and in a strongly coloured form in the Shetland Isles. It seems to frequent dry pastures throughout Ireland. Abroad it inhabits the whole Continent of Europe except the coldest regions, being common in Turkey, also extending through Asia Minor, Syria, India, Afghanistan, and Eastern Siberia.

5. **P. sanguinalis**, L.—Expanse  $\frac{1}{2}$  to  $\frac{5}{8}$  inch (12–15 mm.). Fore wings narrow, yellow, the costa crimson; a central light crimson band is forked, or broadened as it approaches the costa; a broader similar band lies along the hind margin. Hind wings pale smoky brown.

Antennæ of the male slender, threadlike, black-brown; palpi slender, projecting, purple-brown; head dull yellow; thorax of the same colour, with a crimson-purple cloud on each side; abdomen shining grey-brown. Fore wings narrowly trigonate, pointed at the apex, and the margins very straight, the hinder quite oblique; pale sulphur-yellow, with the costa crimson to beyond the middle; a central transverse crimson stripe or band, greatly widened above the middle, or forked to enclose a dull yellow costal patch, is followed by another crimson stripe which occupies the hind margin and apex; cilia shining yellowish white. Hind wings rather long, rounded behind, smoke colour, darker toward the hind margin; cilia paler. Female similar.

Underside of the fore wings pale smoky brown, with the

apex purple, and a white cloud along the dorsal margin. Hind wings smoky white, with the apex broadly clouded with faint crimson. Legs brownish white.

Rather variable in the extent of the yellow ground colour or of the crimson areas respectively, some individuals becoming almost wholly suffused with the latter colour. In size our specimens are uniformly small as compared with those from abroad.

On the wing in June, July, and August, possibly in two generations.

LARVA. Head small, nearly spherical, slightly depressed; yellow, the mandibles and ocelli brown, behind the latter are two black spots; body fusiform; second segment, which has no corneous plate, distinguished by a double ring of circular black dots, each surmounted by a bristle, as also are the remaining black raised dots of the body; greyish-green tinged with vinous red; from the third to the twelfth segment is a distinct broad white dorsal stripe; spiracular stripe also white; spiracles very minute, white surrounded with brown; ventral area dingy white and without stripes; legs and prolegs of the colour of the body, the latter marked at their base with a triple black dot. (Millière.)

September and October on the flowers of the rosemary (*Rosmarina officinalis*), and on those of thyme (*Thymus serpyllum*), living in a silken tube, feeding up rapidly, but lying many months in this condition, in cocoon. There is some reason to suppose that in another generation it feeds up in July, and emerges almost immediately, but this is somewhat conjectural.

PUPA dull yellow green; abdomen brown, its extremity furnished with several fine hooked bristles. In an oval tough cocoon of paper-like material, among moss on the ground, usually attached to some solid object. (Millière.)

The moth is a swift and active species, flying in the sunshine over beds of thyme, but being most actively noticeable towards 6 P.M. It seems to settle only upon the thyme plants. Its one locality in England, where it was discovered in the year 1849, and which has continued to furnish it in tolerable plenty until the present time, is on the sandhills of Wallasey, near New Brighton, Cheshire; an extensive range of rather settled sandhills. Although this, its only English locality, is situated very near to North Wales, I know of only one instance of its occurrence in the Principality, at Rhyl, in Flintshire. In Scotland it was found about the year 1860, by the late Mr. Thomas Chapman and his son, Dr. T. A. Chapman, on some districts of sea-sand about Troon and Monkton on the coast of Ayrshire, and there also it still exists. In Ireland it was found about the same date on limestone pastures in Galway, and may still be obtained there in plenty, and in the adjoining county of Clare. There is also a record by the Messrs. Campbell at Magilligan, co. Derry. These isolated and rather distant localities seem to complete its range in these Islands; but it is well known all over the Continent of Europe except the coldest regions, being found commonly even in Corsica and Gibraltar; and further extending to Madeira, the Canaries. Northern Africa, Asia Minor, Palestine, Syria, Armenia, and India.

6. *P. cingulalis*, Schiff.; *cingulata*, L.—Expanse  $\frac{1}{2}$  to  $\frac{5}{8}$  inch (12–16 mm.) Wings all shining black, except a central curved yellow stripe upon each; and the cilia shining white.

Antennæ of the male threadlike, black-brown; palpi slender, pointed, black above, brownish-white beneath; head reddish-brown; thorax and abdomen black, the latter tapering and having a whitish edging to each segment; anal tuft shining black. Fore wings brilliantly glossy black, shot with a purplish gloss; first line curved, very slender, often hardly perceptible, pale yellow; second line a broader and

conspicuous yellow-white band, erect and complete; cilia white. Hind wings elongated, rounded behind; black, with a broad central curved yellow-white band; cilia white, preceded by a very slender white line. Female similar.

Undersides of all the wings shining black, with a dull yellowish cloud at the base of each, the white stripe of the upper side very distinctly reproduced; and a whitish cloud along the dorsal margin of the fore pair; cilia white. Body black; legs brownish white, clouded with black.

Usually not variable, except a little in size, and in the very occasional appearance of the first line of the fore wings as an additional yellow stripe; but in the collection of the late Mr. F. Bond is a specimen in which the marginal portion of each wing, from the band, is broadly white.

On the wing in May, June, and sometimes July, and as a second generation, in August.

LARVA spindle-shaped; yellowish grey with glossy black raised dots on which are small hairs; head glossy yellow spotted with darker; dorsal plate similar. (Hofmann.)

September, among the root leaves of *Salvia pratensis*, usually those which lie flat upon the ground; these it gnaws from the underside, leaving the upper epidermis. Its web, into which it escapes when disturbed, is generally found near one of the *Salvia* leaves, among moss and dead leaves; in its neighbourhood there are nearly always large heaps of black excrement. Rarely the larva, which is not very active, is found on a higher leaf, which then is rather spun together. It winters in a rather large grey-brown papery cocoon, and changes to a pupa in the spring. (Carl von Heyden.)

PUPA apparently undescribed.

The moth flies in the sunshine, especially late in the afternoon, about the short herbage, on chalk and limestone hills, seacliffs and sandhills, sometimes showing a partiality for patches of wild thyme, upon which the larva is supposed by

some to feed. If the weather becomes at all cloudy it is said to conceal itself at the roots of the grass and herbage. It shows a curious partiality for the rugged edges of wild precipices on the mountain limestone, flitting about over the chasms and settling on the vegetation along the extreme verge. Here it is tantalisingly easy to see, but in its ordinary haunts it is by no means distinctly visible when on the wing, and will sometimes appear suddenly settled within a yard or two of the collector—or vanish like a thought. The Rev. Canon Cruttwell tells me that in intensely hot sunshine it will congregate in bushes of juniper, yew, and guelder-rose, from which it may be beaten out in numbers. A local species, but sometimes common in such situations as are here mentioned, especially on the coast, in Kent, Sussex; Guildford, Mickleham, and Box Hill, Surrey; the Isle of Wight; the Isles of Purbeck and Portland, and Lyme Regis, Dorset; Dartmoor and also Seaton, Devon; Cornwall, Somerset, Gloucestershire; the chalk districts of Oxfordshire and Cambridgeshire; and suitable spots in Cheshire, Lancashire, Yorkshire, Westmoreland and Cumberland. In Wales it is common on the coasts of Glamorganshire and Pembroke-shire, at Barmouth and Llandudno in North Wales, also in Denbigh, Carnarvon, and Flint, and at Holyhead in Anglesea. In Scotland it used to be found upon Arthur's Seat, Edinburgh, and is still known to occur in Berwickshire, Aberdeenshire, Moray, Perthshire and Dumbartonshire. In Ireland local and scarce, occurring in the Counties of Galway, Sligo and Down. Abroad it is found throughout Europe except the coldest portions; and in Asia Minor and Armenia.

7. *P. anguinalis*, *Hb.*; *nigrata*, *Staud. Cat.*—Expanse  $\frac{5}{8}$  inch (13 to 15 mm.). Fore wings shining black with a faint basal, and distinct central, angulated white stripe, and a similar discal dot. Hind wings also shining black, with a bent central white stripe.

Antennæ of the male threadlike, black; palpi projecting,

hairy, black; head, thorax and abdomen also black, the latter tapering and ringed at the edge of each segment with white. Fore wings narrowly trigonate, but all the margins faintly curved; apex angulated; colour shining black, dusted with golden brown; first line indicated by an oblique white streak on the dorsal margin; second line a complete white stripe, sinuous and angulated in the middle, usually of even width; discal spot a white dot. Hind wings rounded behind but with the apex rather elbowed, similarly black; having a white spot near the base and a complete angulated white central stripe; cilia of all the wings white or greyish-white. Female similar.

Undersides of all the wings shining black with a purple gloss; all the markings as on the upper side, but of a clearer white; and in addition a large cloudy white spot on the dorsal area of the fore wings near the base. Body and legs black, shaded with silvery white.

On the wing in May and June, but occasionally appearing before the end of April; another emergence takes place in August.

LARVA. Head and second segment shining olive green, the lobes of the head marked on the crown with black, and on the face with fine black freckles; dorsal plate similarly freckled; body tapering from the third segment to the head, and also on the two hinder segments; beyond the thoracic portion each segment is subdivided by a deep wrinkle across the middle of the back, and by one each nearer the ends; the two middle portions, bearing the raised dots, very plump; general colour dull purple, with these dots black and furnished each with a fine hair; spiracles small, round and black; legs green; prolegs translucent and almost colourless. (Adapted from Mr. Buckler's description.)

August, September and October on thyme and marjoram; and Mr. W. H. B. Fletcher has found it feeding in a web on *Asperula cynanchica*.

PUPA shining dark brown, the anal tip furnished with a rounded knob, with widely diverging, fine, curly-topped bristles. In a cocoon of whitish silk, covered with a coarser outer structure. In any convenient corner. (Mr. Buckler.)

The moth is a lively little creature, fond of flying briskly in the sunshine about the rough slopes of chalk hills, and appearing especially attached to patches of wild thyme. More local than the last species, and more restricted in its distribution with us, hardly occurring away from the chalk, though in favourite spots upon that soil it is tolerably abundant. This is the case more particularly at Guildford, Box Hill, Mickleham and other chalk hills in Surrey; in Kent, Sussex, Dorset and Wilts; abundant on Durdham Downs, Bristol; and in smaller numbers it is found in Devon, Somerset, Gloucestershire, Herefordshire, Oxfordshire, Berks, Herts, Cambridgeshire, Essex, and near Tuddenham, Suffolk. The only other locality in which I find it recorded in Great Britain is in Westmoreland. In Ireland it was found by the late Mr. E. Birchall in the County Galway, and Mr. Kane records it from Derry. Abroad it seems to occur all over the Continent of Europe, though only in dry spots; and is also found in Pontus and Bithynia.

8. **P. octomaculalis**, *Tr.*; **octomaculata**. *Fab.*; **funebri**s, *Staud. Cat.*—Expanse  $\frac{5}{8}$  to  $\frac{7}{8}$  inch. (16 to 23 mm.). Shining black, the shoulder-lappets yellow; two large white spots each on all the wings, and sometimes on the fore wings a small additional discal spot.

Antennæ of the male threadlike, glossy black; palpi small, projecting, black, edged above with white; head black with a fine white line down each side of the face, and an edging of yellow at the back; thorax black with long yellow or white shoulder-lappets; abdomen black, but the segments each edged with white; anal tuft rather long, pointed, deep black. Fore wings rather elongated, widened behind; costal and hind margins rounded; apex angulated; shining black

with two large white spots, one near the base and dorsal margin, the other beyond it, larger, and nearer the costa; cilia black, tipped with white near the anal angle and apex. Hind wings shining black, also with two large white spots, one toward the dorsal margin near the base, the other in the middle; cilia black, tipped with white. Female similar but rather smaller; body shorter.

Undersides of all the wings glossy black, with the same large white spots, but that one lying near the dorsal margin of the fore wings is continued as a white cloud to the base, and those on the hind wings are almost united. Body black, sharply barred with white. Legs white.

Usually not variable, but in some districts, particularly in the West, a form having also a small white discal spot on the fore wings is not uncommon.

In the collection of the late Mr. Henry Doubleday, in Bethnal Green Museum, is a singular and beautiful specimen. On its outer, usually black, area, beyond the large outer white spot on both fore and hind wings is a series of white streaks, and below these a large sharply defined white spot above the anal angle, thus furnishing it with a dazzlingly pretty outer border.

On the wing in May and June, and sometimes to the beginning of July. Occasionally—I think rarely—there are indications of a second generation. For instance, I took in Surrey a specimen on September 1, 1863, and several in August 1864, but it remains uncertain whether these were the progeny of the individuals that had been on the wing in May, or merely produced from delayed pupæ. Mr. J. J. Walker took specimens in Galway on June 30, which he referred to a second brood. On the other hand, Mr. W. R. Jeffrey reared in July the moth of one of his larvæ of the previous August.

LARVA nearly three-quarters of an inch long; tapering at both ends; the head extended in front, somewhat broader at

the mouth than near the crown; the segments of the body well divided and plump, each crossed by three wrinkles, of which the middle one is the deepest; prolegs slender, the anal pair stretched out behind. Head whitish-brown, having a few light brown freckles; ocelli black; dorsal region broadly delicate light opaque cream-colour, divided by a narrow dorsal stripe of rich and very deep translucent green, narrower at each end; the pale cream-colour extends lower down the side of the hinder half than on the front half of each segment, and near the lower margin of this colour is a fine line of translucent yellowish-green, a little interrupted toward the end of some of the middle segments; under this is a stripe of translucent green broadest on the front half of each segment, and below on the anterior segments a stripe of lighter semitransparent green, which melts away into a still lighter watery opalescent green on the legs and under-surface; raised dots inconspicuous but having each a small central green dot; spiracles minute, ringed with brownish-black; whole surface of the skin glossy.

When full fed it becomes almost uniformly yellow. (Condensed from Mr. Buckler's description.)

August and September upon *Solidago virgaurea* (golden-rod). Abroad reported to feed also upon *Bellidiastrum Mischelii*. Feeding on the underside of one of the lowermost leaves of the plant, in a slight whitish web.

PUPA moderately stout, with well developed thorax, and long wing-covers, the abdomen tapering to a prolonged blunt anal point; rather warm dark brown, darkest on the thorax and anal point; surface of the wing-covers and lower rings of the abdomen shining. Between leaves, or in a convenient corner, within a semi-opaque whitish silken outer cocoon of strong texture, three-quarters of an inch long, in which is a series of open-work threads, forming a kind of loose hammock. In this the larva passes the winter unchanged, and the pupa state is assumed in the spring or early

summer. This, however, is a critical stage—fatal to almost all larvæ fed in confinement.

This moth differs a little in habits from the two preceding species, not possessing their swiftness nor the dazzling appearance which so greatly conceals their flight. It flies over its food plant in the daytime with a sort of spinning motion which is curious and quite characteristic, and frequents the open spaces in woods of undergrowth, the rides of large woods and their borders, and sometimes may be found on the broken crumbling cliffs of the coast. Tolerably common in the woods of Kent, Sussex, Surrey, Hants, Devon, Essex, Suffolk, Herts, Bucks, Oxfordshire, Herefordshire, Worcestershire, North Lancashire, and Westmoreland; very local in Yorkshire; and Mr. J. E. Robson reports the occurrence of two specimens in Northumberland in 1898. In North Wales it is to be found on some of the hill-sides in Carnarvon and Denbigh; has been taken in Montgomeryshire, and I have seen it on the sea-cliffs of Pembrokeshire. In Scotland it appears to be confined to Argyle, and the Islands of Skye and Mull; and in Ireland to Galway and Kerry. Abroad it has a considerable range through Central and Northern Europe, the South of France, Northern Italy, Armenia, Bithynia and Tartary.

### Genus 3. **BOTYS.**

Antennæ simple; palpi pointed, porrected; head rough and rather flattened; thorax thin; abdomen long and very slender, not banded; fore wings long, pointed, narrowly trigonate; hind wings rather ample; the discal cell short and the cross-bar curved; legs long, not tufted.

LARVÆ rather attenuated at each extremity, semitransparent; feeding usually within rolled leaves.

An attempt at tabulation may be useful:

- A. Fore wings bright ochreous-yellow, with slender transverse lines.
- B. Cilia of all the wings pale. *B. croccalis.*
- B<sup>2</sup>. Cilia of all the wings dark. *B. flavalis.*
- A<sup>2</sup>. Fore wings bright light yellow.
- C. Nervures of fore wings also yellow. *B. hyalinialis.*
- C<sup>2</sup>. Nervures of fore wings darker. *B. pandalis.*
- A<sup>3</sup>. Fore wings dull whitish-yellow. *B. repundialis.*
- A<sup>4</sup>. Fore wings tawny-yellow with darker latticed lines. *B. verbascalis.*
- A<sup>5</sup>. Fore wings creamy-white.
- D. Markings of fore wings in slender lines ; apex of hind wings blackened. *B. lutealis.*
- D<sup>2</sup>. Markings of fore wings obscurely clouded ; hind wings faintly bordered. *B. decerpitalis.*
- A<sup>6</sup>. Fore wings tawny-red with obscure darker spots. *B. ferrugalis.*
- A<sup>7</sup>. Fore wings brownish-white with long oblique brown shades. *B. forficalis.*
- A<sup>8</sup>. Fore wings nearly uniform glossy reddish-grey. *B. uliginosalis.*
- A<sup>9</sup>. Fore wings pale slate-grey with squared darker clouds. *B. asinalis.*
- A<sup>10</sup>. Fore wings glossy grey-brown ; long and narrow. *B. terrealis.*
- A<sup>11</sup>. Fore wings pale grey-brown, shining, rather broad. *B. fuscalis.*
- A<sup>12</sup>. Fore wings dull grey-brown.
- D<sup>3</sup>. Markings of fore wings obscurely clouded ; hind wings dark. *B. prunalis.*
- D<sup>4</sup>. Markings of fore wings white spots ; hind wings pale. *B. oivalis.*
- A<sup>13</sup>. Fore wings of male grey ; of female pale ochreous. *B. nubialis.*
- A<sup>14</sup>. Fore and hind wings blackish-brown with whitish blotches.

E. Three pale spots on the disc of fore wings.

*B. sambucalis.*

E<sup>2</sup>. Two pale spots on disc of fore wings. *B. stachydalis.*

1. **B. nubilalis**, *Hüb.*; **lupulinalis**, *Gn.*: female **silacealis**, *Hüb.*—Expanse, male 1 inch, female 1¼ inch. Fore wings pale brownish-grey or olive-grey, with a faint yellow-white discal spot and transverse stripe; hind wings of the same colour, with a broad whitish band. Female larger. Fore wings pale ochreous with browner markings.

Antennæ of the male threadlike, brown; palpi slender, porrected, yellow-brown; head of the same colour; thorax grey-brown; abdomen long and slender, dark grey-brown, each segment faintly edged with white. Fore wings rather elongate; costa arched; apex bluntly angulated; hind margin almost straight; dull smoky grey-brown; orbicular and reniform stigmata obscurely darker, with a yellowish-white cloud between them; first line faintly indicated by a whitish shade which bends suddenly outward and throws an obscure whitish streak to the second line; this last is cloudy white, much rippled, broadened below the costa and again above the dorsal margin; cilia grey-brown. Hind wings ample, rounded behind; similar in colour to the fore wings; having a broad dull white cloudy band placed transversely beyond the middle; cilia dull white. Female decidedly larger; thorax and abdomen stouter; fore wings ochreous-yellow; the first and second lines more definitely shown, slender and much indented, brown; the enclosed middle area clouded with red-brown; the spot between the stigmata distinctly yellow; before the hind margin is a rippled reddish-brown band, followed by a yellow marginal stripe. Hind wings pale smoky brown with a very broad submarginal pale yellow band, and yellowish-white cilia.

Underside in both sexes an accurate copy of the upper, but the darker portion in still darker colouring.

Said to be on the wing in May, June and July.

LARVA dirty white with three bright black warts on each segment; head black-brown; dorsal plate yellowish and black-brown, divided by a white stripe.

May and September in the stems of hop, both wild and cultivated, hemp, Italian-rye, and millet, feeding on the pith. (Hofmann.) Well known on the Continent from the damage caused by it to the millet crop. Schmidt says "the young caterpillar eats a way for itself immediately into the soft stem of the plant, where it feeds on the pith, thereby causing the millet to wither and die. When it has consumed the pith of one plant, it eats into another, proceeding always from the ear towards the root; and thus at the time of reaping the millet, the caterpillars being near the root, remain in the stubble. Although the caterpillar is fully grown in the autumn, it does not become a pupa till the ensuing spring."

PUPA light brown; apparently not further described.

There has been little opportunity of observing the habits of this species here, since it is one of our rarest insects. From confusion of names it is not easy to make sure of the species intended by some of the only records, but there are specimens of British origin in the collection of the late Mr. H. Doubleday at Bethnal Green Museum, and in that of the late Mr. F. Bond, now in Mr. Sydney Webb's possession at Dover. Moreover there is a definite record, confirmed by Mr. H. T. Stainton, of the capture of two specimens by the Rev. P. H. Newnham at Sandown, Isle of Wight, on July 6, 1853. On July 9, 1874, I had myself the good fortune to capture a male specimen, as it sat in the late evening, attracted apparently by a light, on the outside of a window in Peckham, South London. Another was taken in June 1891, flying over *Silene* and other sea-side plants at Hartlepool, Durham, by Mr. J. Gardner; and there are records of captures at Manchester, and at Padstow, Cornwall. Abroad

it has a wide range, being sometimes quite undesirably common; through Central and Southern Europe, including Corsica and Southern Russia; also in Siberia, Tartary, Asia Minor and Northern India.

2. **B. flavalis**, *Schiff.*—Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch (22–28 mm.). Fore wings pointed, shining yellow-ochreous, margined with dull grey-brown, and having the stigmata and lines of that colour. Hind wings smoky yellowish-white, with smoky brown transverse lines.

Antennæ of the male threadlike, bronzy-brown; palpi short and broad, but pointed, dark chocolate: head chocolate-brown but white at the base of each antenna; thorax slender, ochreous-yellow, rather browner in front; abdomen slender, pale ochreous. Fore wings elongated; the apex decidedly angulated: costa gently arched; hind margin slightly curved; colour clear smooth shining ochreous yellow, often with a tawny tinge; along the extreme costal edge is a narrow brown line, and the markings are all formed of blackish-brown dusting—first line oblique, slender; second line also slender, bent suddenly outward in the middle, and then, with a fine curve, up to the costa; the orbicular and reniform stigmata both present as ringed spots, and the claviform as a more flattened ring; subterminal line suggested by a series of faint clouds: extreme hind margin edged by a dark brown line; cilia pale leaden-brown. Hind wings rather broad, rounded behind, smoky pale yellow; central spot, and a wavy transverse line beyond it, faintly smoky black; the latter followed by a still more faint parallel cloud and a darker marginal line; cilia leaden-brown. Female similar, or sometimes having the fore wings of a more yellow tint.

Underside of the fore wings very dark, the ground, which is straw-colour, much obscured by the markings, all of which, as on the upper side, with the costa, apex, and nervures, are broadly dark bronzy-brown. Hind wings also obscured with

bronzy-brown clouding, but with the markings as above, the cilia rather whiter. Body and legs bronzy-brown.

There is a little variation in the depth of the ground colour and of the markings; occasional specimens being almost straw-yellow, with the lines faint. Specimens from the Continent are often decidedly larger in expanse, as well as paler in colour.

On the wing in the latter part of July and in August. Abroad there is said to be a second generation in September.

LARVA apparently not certainly known. It is hardly possible that the statement of Moschler, that he "has found the larva on nettle (*Urtica urens*) and bred the moth" is correct. There must surely be some confusion as to species. Ragonot says "the larva has been supposed to feed on bedstraw (*Galium verum*), and certainly the imago affects dry pasture fields where this plant is common; no doubt the larva is polyphagous."

PUPA apparently unknown.

The moth is found on open downs, especially chalk downs, and dry hill slopes, and with us is excessively local; sometimes to be found in numbers in very restricted spots, where the country for miles appears to be all equally suitable. In such favoured places it may be found commonly near Folkestone, Faversham, and other parts of Kent; on the Downs about Brighton and Lewes, Sussex; at Freshwater and Ventnor, Isle of Wight, and elsewhere on the Hants coast; and on the coasts of Dorset and Cornwall. This I think is the extent of its range in these Islands. Abroad it is common in Central and Southern Europe, including Corsica; and is found in South Sweden, Livonia, Hyrcania, Pontus, Armenia, and Tartary.

3. **B. pandalis**, *Hüb.*—Expanse 1 to 1½ inch. Fore wings glossy pale yellow with rather darker nervures, three

slender pale yellow-brown transverse lines, and discal spot. Hind wings yellowish-white with two similar lines.

Antennæ of the male simple, shining, yellow; palpi pointed, drooping, yellow-brown; head and thorax pale brownish-yellow; abdomen very slender and long, silvery yellow-white. Fore wings long, rather narrow; the costa straight to the middle, arched beyond; apex angulated; hind margin very oblique; colour shining pale yellow, with the nervures and the costal and hind-marginal areas faintly tinted with brownish-yellow; the first and second lines irregular and much waved, the latter very oblique and curving round a faint discal streak of the same colour; subterminal line similar, smooth and even, but curving back below the costa, and with the other lines becoming lost in the costal shade; cilia shining pale greyish-yellow. Hind wings rather short, rounded behind, greyish-white with a yellow tinge on the borders; on the front edge near the base is a faint pale grey spot, in the middle a much rippled transverse line of the same faint colour, and toward the hind margin a broader and more even shade; cilia shining yellow-white. Female similar, but with the abdomen shorter.

Underside of fore wings shining pale yellow, broadly margined and clouded with very pale grey-brown; hind wings of the same colour, similarly bordered. Body and legs pale yellow.

Not variable.

On the wing in the latter half of May and in June. Abroad there is said to be a second generation in August. Mr. Buckler had the curious fortune to rear specimens in October and November, other individuals of the same brood emerging in the following May and June.

LARVA seven-eighths of an inch in length, moderately slender, cylindrical, but tapering a very little at each extremity; segments plump and well defined, with a trans-

verse wrinkle across the back of each; head glossy dark grey with a black mark in front of each lobe; dorsal plate glossy black, divided by a dark grey line down the middle; colour of the back and sides down to the spiracles dark grey tinged with purplish-brown; the dorsal line still darker; on either side of the third and fourth segments are two faintly paler longitudinal lines; raised dots large, black and glossy, each with a fine hair; spiracles small, round and black; the surface below them light greenish-grey, or drab, and the spots there brownish-grey. Ventral prolegs short, but the anal pair extended behind. (W. Buckler—condensed.)

July till September, on *Teucrium scorodonia* (wood-sage), *Solidago virgaurea* (golden-rod), *Origanum vulgare* (marjoram), and *Clinopodium vulgare*. Colonel Partridge has found it to feed on *Centaurea*. Eating the leaves, and after the third moult inhabiting a movable case formed of pieces cut from the leaves of its food plant or from other leaves—especially those of bramble. Exceedingly shy, only protruding its head from this case to feed at night, and when perfectly undisturbed, but making a fresh case when that in use becomes withered.

PCPA half an inch long; rather slender; back of the thorax and of the abdominal segments rather keeled; head-parts moderately produced; wing-covers long and well defined; the hind part of the abdomen having a flattened and tapering prolongation and blunt extremity furnished with minute curly-topped bristles; colour dark purplish-brown with the lower abdominal divisions golden-brown; the wing-covers glistening; all the rest glossy. (W. Buckler.)

In the last case used by the larva, one end being fastened up. Remaining in this case through the winter as a larva, changing to pupa in the spring.

Usually a wood-frequenting species, preferring the open portions, where patches of wood-sage and tufts of golden-rod grow freely in the open intervals between undergrowth.

Resting through the day among these and other low-growing plants, but quite easily disturbed and captured. Flying gently of its own accord at sunset and early twilight. Formerly common in the woods of the London district, where it has now become scarce; still moderately plentiful and well distributed in those of Surrey, Kent, Sussex, and Hants; less so in Dorset and Wilts; found locally in Somerset, Gloucestershire, Herefordshire, Worcestershire, and Cheshire; also in Bucks, Cambridgeshire and Suffolk; rarely in Norfolk, and very locally in Yorkshire and Westmoreland. I find no record from Scotland, and in Wales only one in Carnarvonshire; but in Ireland it is found in Galway, Clare, and Fermanagh, though by no means commonly. Abroad it inhabits Central Europe, all Northern Europe except the Arctic portion, Bithynia, and most likely a more extended range in Asia, since it is well known to occur in Japan.

4. **B. hyalinalis**, *Hüb.*—Expanse  $1\frac{1}{2}$  to  $1\frac{1}{4}$  inch. Fore wings glossy bright light yellow, with a large discal spot and three slender yellow-brown transverse lines, the second bending greatly outwards. Hind wings yellow-white with two slender lines.

Antennæ of the male simple, threadlike, shining white; palpi slender, porrected, pale chocolate-brown, the inner side white; head whitish-yellow; thorax pale yellow with a tinge of orange-brown across the front; abdomen long and slender, shining whitish-yellow. Fore wings elongated; costa arched, especially so beyond the middle; apex bluntly angulated; hind margin faintly curved; colour shining light yellow; first line erect from the dorsal margin, but curved back to almost the base of the costa; second line arising in the middle of the dorsal margin, bends far outward below the middle, and then with a wide sweep curves up and attains the costa; from the first bend of this line a faint similar shady line seems to cross also to the costa giving the appear-

ance of a central line; this, however, is mainly formed of an obscure elongated discal streak; cilia shining yellow, preceded by a parallel brownish-yellow stripe; all these markings are somewhat faint. Hind wings broad but rather angulated at the apex, and the hind margin flatly rounded; shining pale yellow, with a faint rippled brownish central line, and a similar curved line along the hind margin; cilia shining pale yellow. Female closely similar, but a very little stouter.

Undersides of all the wings pearly whitish yellow; second and subterminal lines of the fore wings faintly purplish-grey, the orbicular and reniform stigmata visible, rather rounded, and of the same colour. Hind wings showing only a very faint middle line. Body and legs yellow.

Not variable.

On the wing at the end of June and in July.

LARVA thickest at the seventh segment; head very pale red with a dark dot on the top of each lobe and another on each cheek; dorsal plate paler, with hardly any tinge of red, having six small dots along its front edge, a double dot on each side, then a transverse row of eight, varying in size, and a pair close to the dorsal line, on its hinder margin; colour of the body dull opaque white, with perhaps the faintest tinge of green; dorsal region showing a faint shade of black from the internal vessel; undersurface yellowish-white; spiracles black; legs rich brown; raised dots small and black, placed on pale indian-ink warts which glitter brilliantly. (Condensed from Rev. J. Hellins' description.)

August till May or the beginning of June, on *Centaurea nigra* (knapweed); hibernating while small in a tough flat cocoon of rounded outline, formed of closely woven pale grey silk, and placed upon a fallen leaf. The very young larva spins a little silken web at the side of the midrib of the *Centaurea* leaf toward the stem, and eats little holes in the leaves. After hibernation it seems to continue to hide

in its hibernaculum, spinning short galleries so as to reach the tender leaves, and eating their entire substance.

PUPA long, tapering gradually to the tail, the cremaster being a long spike with a square end, set with six long curved spines; the skin glossy and shining, curiously ornamented with tufts of hair; on the back of each segment, just in the region of the subdorsal lines, there is a pair of tubercles, each set with a whorl of eight or ten harsh-looking waved and curled hairs; three of the anterior segments bear in addition each a pair of rather long transverse ridges behind these tubercles, and closely set with shorter curled bristles; and on the sides of the two segments next the head there is a group of three or four small spine-bearing tubercles; below the spiracles the abdomen is ornamented with tubercles bearing fewer and shorter bristles than those on the back; general colour pale chestnut-brown; the wing-cases and some patches on the back of the front segments darker brown; the bristles, which under a lens look like cocoa-nut fibre, are light brown. Altogether a most singular pupa. In a cocoon of regular figure, four-fifths of an inch long, of a very fine gauzy texture, made of white silk. (Rev. J. Hellins.)

The moth hides during the day in bushes, among herbage, or in hedges, and may be trodden up, or disturbed with the beating stick. It flies of its own accord at early dusk, and has been found to suck the honey from flowers, including those of clematis. Its usual haunts are sheltered spots on chalk hills and downs, and in the openings of beech-woods, and in such spots it is sometimes common. Of local distribution in Kent, Sussex, Surrey, Hants, Dorset, Somerset, Gloucestershire, Bucks, Oxfordshire, Herts and Worcestershire; also taken rarely in Norfolk. Except a record (unconfirmed) of its capture at Dolgelly, North Wales, I know of no other localities in the United Kingdom. Abroad it is found in most parts of Central and Southern Europe,

Finland, South Sweden. Bithynia, Pontus, Tartary, and North Africa.

5. *B. uliginosalis*. *Steph.*; *alpinalis*, *Stainton's Manual*.

—Expanse, male 1 to  $1\frac{1}{4}$  inch; female  $\frac{3}{4}$  to  $\frac{7}{8}$  inch. Fore wings shining yellow-brown or yellow-grey with a small faintly indicated dull white cloud at the end of the discal cell. Hind wings smoky white with a smoky brown hind border.

Antennæ of the male simple, black-brown; palpi porrected, but not long, tufted and pointed, pale brown; head and thorax light reddish-brown or olive-brown; abdomen slender, glossy greyish-white; anal tuft yellow-brown. Fore wings long and pointed; costa faintly undulating; apex angulated; hind margin oblique, hardly curved; colour pale olive-brown, yellow-grey or yellow-brown, very glossy, without perceptible markings except a cloudy white dot, or small cloud of white at the end of the discal cell; cilia concolorous. Hind wings shining smoky-white; the nervures, and a band of even width along the hind margin, smoky brown; sometimes a similar slender stripe crosses the middle of the wing; cilia dusky white. Female smaller; the fore wings narrower and more sharply pointed, paler or yellower in colour; hind wings darker; body shorter.

Underside of the fore wings shining smoky brown, unicolorous; hind wings shining white with smoky marginal shading and a similar slender central transverse line. Body and legs grey-brown.

Variable, as already suggested, in the ground colour of the fore wings from yellowish-drab to pale red-brown; and a little so in the degree of smoky shading of the hind wings. On the wing in the latter part of June and in July.

LARVA “glossy brown-red, with four shining raised dots on the back of each segment, and a somewhat swollen stripe along the sides; head and front feet bright black.”

“July on grasses and low-growing plants” (Freyer).

PUPA apparently undescribed. Neither larva nor pupa seems to have been observed here. The egg only had been seen by Mr. Buckler.

The moth frequents the higher portions of mountains and considerable hills; from 1200 to 2000 feet altitude. Here it sits quietly by day among the grass and herbage, but is alert and rather swift in its motions, rising sharply when approached and flying a few yards to settle again, but usually retreating *up* the steep slope, so that considerable labour is often expended in its capture.

It seems to be distinct from the species known as *B. alpinalis* abroad, though rather similar, and certainly very closely allied thereto. The latter has a large and somewhat squared white spot in the middle of the fore wings, and the hind wings are of a clearer white. Mr. Stainton apparently regarded the two forms as mere varieties, but there seems to be no evidence of the occurrence in these Islands of that known as *alpinalis*.

Our insect seems here to be confined to Scottish mountains. It is common in Perthshire upon Ben Lomond, Ben Nevis, Schehallion, Craig Cross, and other high hills; in Aberdeenshire on Braemar; and in similar suitable places in Invernessshire, Forfarshire, Stirlingshire, Dumbartonshire, and Argyleshire. Hitherto I have no knowledge of its occurrence on any mountain in England or Wales; and the only record in Ireland proved, when the specimen was examined, to be an obvious error. Abroad it is found throughout the Alpine region, and on the mountains of Hungary and Galicia.

♂. **B. fuscalis**, *Schiff.*—Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch (22–28 mm.). Fore wings silky, pale olive-grey, each with a faint transverse whitish line edged with smoky grey. Hind wings also bordered with darker grey.

Antennæ of the male simple, shining, dark brown; palpi porrected, pointed, dark brown; head and thorax bronzy

grey-brown; abdomen slender, shining grey. Fore wings rather widened, costa arched; apex angulated; hind margin moderately oblique, the anal angle well developed; colour pale olive-grey or yellowish-grey, smooth and shining; markings faint—the first line upright but rather curved; second rippled and strongly bowed outwardly, both dark grey and the latter edged with paler—a spot in the discal cell is just perceptibly darker; cilia concolorous, very glossy. Hind wings whitish-grey or pale olive-grey with an obscure curved narrow white transverse stripe in the middle, and another along the hind margin; cilia grey-white, intersected by a grey line. Female similar.

Underside shining pale smoky grey, the fore wings with a faint discal spot, the hind with an obscure whitish transverse stripe. Body and legs glossy grey.

There is some variation in the ground colour from smoky-grey to yellowish-fuscous, and this seems to be in some degree local; specimens from the fen districts often showing a strong tendency in the latter direction, while those from the North-west of Scotland have a decidedly smoky tint.

On the wing in the latter part of May and in June; but in Scotland in July.

LARVA but little more than half an inch long, very slightly tapering at each end; segments well defined, each having a subdividing wrinkle across the back; head rather small, rounded, the lobes well developed, glossy blackish-brown; dorsal plate similar, divided by a fine pale line, the margin next the head remarkably pale; colour of the back and sides dark grey-brown, darkest in front; spiracular region and undersurface pale ochreous-drab; dorsal line darker and warmer brown than the back; segmental folds ochreous-drab; raised dots shining blackish-brown, on the thirteenth segment united into a large spot; anal plate brown, minutely freckled with black-brown; spiracles small, round, black; the raised dots beneath them brown, each bearing a

fine hair. When quite full fed, the whole larva assumes a pink tint. (Condensed from Mr. Buckler's description.)

July and August on *Rhinanthus crista-galli* (yellow rattle), *Melampyrum pratense*, and *M. cristatum* (cow-wheat); feeding on the flowers and tender seed capsules, uniting these to the stalk by a silken gallery often much covered with frass; or else uniting two sepals of a flower together so as to form a hammock.

PUPA barely three-eighths of an inch in length, moderately slender; the wing-covers long; thorax and three upper abdominal segments keeled; the spiracles forming tumid eminences on the latter and also on the penultimate segment; cremaster a taper, downward curving, flattened point, slightly bifid and furnished with six minute curled bristles; colour light bright mahogany brown; the tips of the wing-covers and abdomen darker brown; and the surface generally glistening. In a tough semi-opaline silken cocoon spun up in any angle, and semi-transparent. In this the larva lies through the winter and assumes the pupa state in the spring. (W. Buckler.)

The moth hides during the day among its food-plants and other herbage and grass, in meadows and marshy places where the yellow-rattle abounds, and also in open woods among the two species of cow-wheat. It is always lively and ready to start up at the approach of a footstep, flying a short distance to settle down in a similar spot, and before early dusk may be seen fluttering in hundreds over the herbage. Common in such suitable spots throughout the United Kingdom, with the exception of the Shetland Isles; also in the Central and Northern portions of the Continent of Europe, Italy, the North of Spain, Asia Minor, Armenia, Siberia, and Tartary.

7. **B. terrealis**, *Tr.*—Expanse 1 to 1½ inch. Fore wings long and very pointed; shining dark grey-brown, with a

faint transverse darker line beyond the middle, much bent outwards; hind wings rather paler, with a similar transverse line.

Antennæ of the male simple, bronzy brown, front of the base white; palpi porrected, pointed, pale chocolate; basal portion of the tongue white; head chocolate, edged on either side with silvery white; thorax slender, pale bronzy brown; abdomen very slender, grey-brown; a whitish ring edging each segment. Fore wings long and narrow; the costa gently arched beyond the middle; apex sharply pointed; hind margin very oblique; colour dark grey-brown, shining with a bronzy gloss; the markings very indistinct; first line erect, obscurely darker brown; orbicular and reniform stigmata barely visible, dark brown; second line of the same colour but edged with paler brown, strongly bowed outwardly; cilia concolorous, shining. Hind wings narrow but prolonged toward the apex; pale smoky brown, whitish toward the front margin, nervures faintly paler; a slender brown transverse line beyond the middle is followed by a darker clouding along the hind margin; cilia concolorous, very glossy. Female similar, but with the abdomen shorter.

Undersides of all the wings shining smoky white; the stigmata and second line of the fore wings and the slender line of the hind wings all perceptibly darker; the undersurface of the head, palpi, and thorax white; of the abdomen and the legs smoky white.

Not variable.

On the wing in June and July.

LARVA about an inch in length and of tolerable bulk in proportion; head globular and shining, small, about the same width as the second, but much narrower than the succeeding segments; body cylindrical but very markedly attenuated toward the extremities; segmental divisions rather deep; skin glossy and semi-translucent, clothed with

a few scattered short hairs; head and anal segment pale yellowish-brown; mandibles and a few spots on the lobes darker brown; general colour rich reddish-pink; dorsal stripe broad, deeper in colour and conspicuous; no other particular markings, but the sides are variegated a little with a darker shade of the ground colour; ventral surface a little paler; each proleg tipped on the outside with a black dot. (G. T. Porritt.) This description was made from a full-grown larva which had assumed the full adult colouring. Other observers describe it as "pale-green" or "white-green," and Freyer says that it has light green dorsal and spiracular stripes, and white raised dots. Doubtless younger larvæ are, in these cases, referred to,

July to September on *Solidago virgaurea* (golden rod), feeding on the leaves, and living in a loose silken web on the underside of a leaf; from its ravages the plant sometimes becomes much disfigured.

PUPA apparently undescribed; in a strong silken cocoon of a yellowish-white colour in some corner, or among moss. In this the larva remains unchanged, having faded to a creamy white colour, until May, before the pupa-state is assumed.

A very local species, not to be found in the woods in which its food-plant is often so common, but usually confined to hill and mountain sides or rocky limestone districts, extending to 300 feet above sea level. Here it hides among herbage and the bushes near its food, and may be disturbed by the beating stick, or trodden up. At dusk it flies of its own accord. Found very locally in North Devon and Cornwall; and in Cheshire, North Lancashire, Yorkshire and Westmoreland. Also in various parts of North Wales, as Llanferris, Beddgelert and elsewhere in the Snowdon district; in Denbighshire, Flintshire, and rarely on the coast of Pembrokeshire in South Wales. In Scotland in Kirkeudbrightshire and Argyle, also in Fife,

where it is not very rare; but so far as I know it has no more extensive range in these Islands. Abroad it is generally distributed in Central Europe, the temperate portions of Northern Europe, Eastern Spain, Italy, Dalmatia, Bithynia, the Central Asian Mountain regions, with Afghanistan; and in some portions of North America.

8. **B. asinalis**, *Hüb.*—Expense 1 to 1¼ inch. Fore wings sharply pointed, pale slate-grey, with faint ringed stigmata and a darker central band of squared cloudy blotches. Hind wings greyish-white.

Antennæ of the male simple, thickly ciliated, bronzy-brown; palpi long, blunt, porrected, thickly tufted. mouse-colour; head and thorax dull grey-brown, the hinder portion of the latter whiter; abdomen long and slender, shining grey-brown. Fore wings long and rather narrow; costa arched; apex decidedly angulated, and hind margin very oblique; colour grey-brown or pale brownish-slate; first line erect, faintly darker, from it a curious, softly deeper slate-coloured stripe curves down to the dorsal margin, then up to the median nervure, there forming a squared blotch; the undulating and dotted second line, skirting the outer edge of this blotch, then bends outward and passes round another rather squared dark blotch at the end of the discal cell; stigmata perceptible, pale slate, edged with darker; cilia shining, concolorous, faintly intersected by two paler lines. Hind wings large, the apex angulated and the hind margin somewhat undulating; smoky whitish-grey with a rather perpendicular slender grey-brown transverse line beyond the middle; cilia concolorous, and glossy.

Undersides of the fore wings pale smoky grey; costa paler; second line just visibly darker. Hind wings brownish-white with the grey-brown transverse line more distinct. Body whitish-brown; legs whiter, both glossy.

Rather variable in the distinctness of the markings of the fore wings; in some specimens these being unicolorous slate-

grey; while in others, especially Continental examples, the dark blotches are much intensified, and an additional one appears at the base.

On the wing from May till the beginning of July, and usually a second generation from the end of July till September or even October.

LARVA one inch and an eighth in length; middle segments plump and round but each becomes smaller than its predecessor from the middle to the extremities, giving the body a strongly attenuated appearance; head broad but flattened, the lobes rounded and polished; divisions of segments conspicuous, and each segment crossed by a central transverse groove; skin soft and semi-translucent, clothed with a few short hairs; anal prolegs extended widely behind the anal segment. Head straw-colour with darker brown markings; general colour dull pinkish-brown (brighter in young specimens), dorsal stripe pale pinkish-yellow, intersected throughout by a dark olive-brown line; subdorsal stripes also pinkish-yellow, broadly bordered above with olive-brown, indeed this dark colour forms a broad stripe between the dorsal and subdorsal lines; spiracles and raised dots distinct, black; ventral surface, legs, and prolegs greyish-green. The skin is so transparent that the movements of the muscles can be distinctly seen.

July and the beginning of August; and a second generation in October; on *Rubia peregriua* (madder), eating the substance of the leaves from the underside, but leaving the upper skin intact, so that it forms a thin white pellicle, held in shape by the strong midrib and margins of the leaf, and gives the plant a singular appearance, as though disfigured with an abundance of small white bladders. At the same time the larva conceals itself in a hammock or movable case composed of a dead rolled leaf of some other plant—I have found it in such a rolled leaf of *Truerium scorodonia*, but there is no reason whatever to suppose that it had fed upon

this plant. Mr. N. M. Richardson has found it, in confinement, willing to eat *Galium aparine*.

The winter is passed by the larva of this later generation in its dead-leaf habitation on the ground, and the pupa state is assumed in the spring.

PUPA slender, bright red; the antenna and wing-cases reaching far down the abdomen and ending in a projecting knob. In a silken web attached to some neighbouring object. (Rev. J. Hellins.)

The moth hides during the day among its food-plant, in hedges, along the edges of rocks, or among bushes, and may be disturbed by the beating-stick, when it shows itself to be sufficiently active. Sometimes, where the cover is thin, it will creep into the crevices of rocks. Its time of natural flight is at dusk, and it will then visit the blossoms of clematis, or of ivy or heather. Most frequent upon the coast, but accompanying its food-plant inland, especially upon calcareous soils. In such situations found in the Isle of Wight; commonly in the Isles of Portland and Purbeck, and near Lyme Regis in Dorset; on Durdham Downs, Clifton and elsewhere in Somerset; on the north and south coasts of Devon; in Cornwall and Gloucestershire. It seems to occur all along the South coast of Wales, and has been found in the Northern portion at Llandudno. Except that a report of its occurrence on the North-west coast of Ireland may prove to be correct, this seems to be the extent of its range in these Islands. Abroad it extends through Southern Europe to Portugal, and is found in the South of Switzerland, in Bithynia and the Canaries.

9. **B. repandalis**, *Schiff.*—Expanse  $\frac{7}{8}$  inch (22 mm.). Fore wings yellowish-white with three or four obscure slender pale yellow-brown transverse lines or narrow stripes. Hind wings white with similar stripes.

Antennæ of the male simple, whitish-brown; palpi thick,

porrected, pale drab; head and thorax creamy brownish-white, yellowish-white behind; abdomen of the same colour, rather short. Fore wings somewhat narrow; costa very straight; apex bluntly angulated; hind margin rounded; colour creamy yellowish-white, with three faint yellow-brown lines which are thickened and rather clouded; the first erect and nearly straight; the second arising half way down the dorsal margin, but bent broadly outward above the middle of the wing, so as to allow room for a cloudy discal streak of the same colour; third or subterminal line midway between this and the hind margin, and parallel with the latter, which also is edged with the same colour; cilia yellow-white. Hind wings elongated, rounded behind; white with a faint smoky tinge; an obscure yellowish line, or narrow stripe, from the dorsal margin partly crosses the wing, as does another from the anal angle; hind margin tinged with the same colour; cilia white. Female similar.

Undersides of all the wings yellowish-white with the nervures faintly darkened; a smoky brown cloud lies along the disk of the fore wings, and beyond it a faint brown line; the hind wings are crossed by a very obscure smoky shade. Body and legs yellowish-white.

On the wing in July.

LARVA thick, tapering in front; yellow-white with numerous, black, single hair-carrying dots; head honey-yellow; dorsal plate of the colour of the body, set with raised dots.

March till May, and again in July in the leaves of *Verbascum*, inhabiting a felted mixture of the leaf-down of the plant. (E. Hofmann.) Treitsche says that the larvæ live gregariously, in the above months, among the leaves of *Verbascum thapsus* and *V. thapsoides*, in a mixture of silk and the down of the plant, or in the flower-shoots in a little passage eaten down into the stem. And A. Schmid adds that the young larvæ pass the winter in a slight web under the root

leaves and young shoots of *Verbascum nigrum*. Mr. Burney's larvæ were found feeding in flower heads.

PUPA yellow, in a red-brown cocoon among debris.

This species, so far as I am aware, has never been captured in the moth state in these Islands. The only instance of its occurrence known to me is the discovery of a number of larvæ feeding in the heads of the mulleins in a rough field near Dawlish, Devon, about the year 1876, by the Rev. Henry Burney. From larvæ there collected Mr. Burney reared eleven specimens of the moth. These remained unnoticed for ten years, being supposed to belong to one of our common species, and it was only in 1886 that their identity was discovered and announced in the "Entomologist's Monthly Magazine," vol. xxii. page 145. There seems to be a cause for fear that the "rough field" has passed under the hands of the builder, yet a close search in the same portion of South Devon ought to result in the re-discovery of this species, which has a considerable range abroad, through Central and Southern Europe, Asia Minor and the Barbary States in North Africa.

10. **B. verbascalis**, *Schiff.*—Expanse 1 inch. Fore wings shining tawny-yellow, clouded with dark brown; with three transverse black-brown lines, the second excessively angulated and bent outward. Hind wings similar in colour and markings.

Antennæ of the male simple, bronzy brown; palpi porrected, rather blunt, yellow-brown; head and thorax tawny brown; abdomen slender, pale ochreous, with a very narrow whitish edging to each segment. Fore wings only moderately elongated; costa arched; apex bluntly angulated; hind margin very straight and rather oblique, with the anal angle well formed; colour rich tawny yellow clouded with brown dusting, especially so along the costal area; first line erect, once angulated, black-brown; touching it a faint similar ring

indicates the orbicular stigma ; second line also black-brown, arising at the middle of the dorsal margin, and suddenly bent outward halfway up, makes a broad sweep round and back to the costa ; at its sudden bend a brown shade rises perpendicularly from it to the costa, partially enclosing a yellow patch in the discal cell ; subterminal line excessively undulating but faint or often only dotted, of a paler brown ; cilia shining leaden brown. Hind wings rather short, the apex angulated and hind margin gently curved ; tawny yellow shaded with brown ; base dusted with shining brown ; beyond, in succession, are three looped and rippled similar brown transverse lines ; hind margin leaden brown ; cilia shining leaden white. Female similar.

Underside of the fore wings dark smoky yellow, with two black lines from the costa and a pale yellow spot in the discal cell ; dorsal margin broadly shining silky white. Hind wings paler smoky yellow, with the markings of the upper side faintly repeated. Body and legs pale yellow-brown, the front tarsi yellow-white.

On the wing in June, July and the beginning of August.

LARVA nearly an inch long, tapering at each end, segments well divided ; prolegs slender, the anal pair extended behind in line with the body ; head pale semi-translucent drab, finely dotted on the crown with black, the lobes freckled at the sides with brown, and having a pair of black dots over the mouth ; second segment of the same pale colour, freckled at the sides with light brown and having there a conspicuous elongated black dot ; on the dorsal portion of this segment is a broad triangle of rich semi-translucent full green, which is continued as a dorsal stripe of equal breadth to the eleventh segment, whence it becomes gradually narrower to the thirteenth, having within it a darker pulsating vessel ; this green stripe is bordered on either side by a rather narrower stripe of opaque white, ragged and shading off at its outer edge ; sides rich translucent full green, inclining a

little, in part, to bluish-green; spiracular stripe yellowish-white, extending to the anal prolegs, having throughout its course, on every segment, a concave upper and a straight lower edge, thickening the stripe at each segmental division, and thinning it in the middle, just where each round black spiracle is placed upon it; undersurface very pale watery-green with an even paler line under the spiracles; raised spots of the colour of the surface on which they occur, but with a central black dot bearing a fine hair; the whole skin very glossy and shining. (Condensed from Mr. Buckler's description.)

August and September, on *Teucrium scorodonia* (wood-sage), hiding in the daytime under a leaf where it has constructed a faint covering of white silk, when older sometimes uniting two leaves slightly together; eating holes in the leaves from the underside.

PUPA three-eighths of an inch long, moderately slender; thorax slightly keeled; spiracles on the fixed segments of the abdomen rather prominent and larger than those on the flexible rings; wing-covers long; leg and antenna-covers longer still; abdomen tapering, the anal segment rather blunt, cremaster prolonged and more pointed, furnished with two minute converging bristles; colour shining ochreous-brown. In an oval cocoon about half an inch long, of tough grey silk covered with sand, in the ground. In this cocoon the larva lies through the winter, assuming the pupa state in the spring.

The moth hides during the day among its food-plant, the wood-sage, usually preferring open patches of the plant on heaths, or rough ground, or loose sandy woods of larch or fir; but is seldom to be found where the plant grows upon hedge-banks, or in dense woods. It keeps quite closely to these patches, and is not very willing to move in the day, though a few specimens may usually be trodden up. These, however, bear but a small proportion to the number that

may be seen flitting over the plants in the early dusk. Quite a local species with us, but tolerably plentiful in suitable spots in Kent, Surrey, Sussex, Hants, Dorset, Herts, Gloucestershire, Cambridgeshire, Suffolk, and Norfolk. It is reported to have been taken near Sheffield, Yorkshire, but this requires confirmation. Otherwise it appears to be restricted to the range above given, so far as these Islands are concerned. Abroad it has a wide distribution—Central Europe, Northern Spain, Dalmatia, Sicily, Southern and Western Russia, Syria, Asia Minor, India and Japan; Morocco and other parts of Northern Africa.

11. **B. sambucalis**, *Schiff.*—Expanse  $\frac{7}{8}$  to 1 inch. All the wings shining dark olive-grey; the fore wings with three yellowish-white spots before the second line, and similar blotches toward the apex; hind wings similarly spotted.

Antennæ of the male simple, dark brown; palpi small, rather bluntly projected, tufted, dark brown; head and thorax black-brown; abdomen similar, slender, each segment faintly edged with pale yellow. Fore wings elongated but rather blunt; costa arched beyond the middle; apex squarely angulated; hind margin gently rounded; blackish grey-brown, or olive-grey with a golden gloss; first line very obscurely black, nearly erect; second line bent very widely outward and then curved up, yellowish-white, expanding as it approaches the costa into a large, somewhat triple, yellow-white spot; lying within the curve of the second line is a still larger, rounded, clear yellow-white spot; and between two black dots which represent the orbicular and reniform stigmata is a rather squared spot of the same pale colour, having another, smaller, beneath it; hind-marginal region faintly clouded with yellowish-white, and edged with black dots; cilia shining black-brown. Hind wings not elongated but well rounded; black-brown with a golden gloss; in the middle area are three large whitish spots; and following

these is a dotted yellow curved transverse line ; cilia shining black-brown. Female similar.

Underside of the fore wings a repetition of the upper, but rather paler, and the yellow-white markings a little expanded ; in the hind wings these pale markings, with the addition of a large basal yellowish blotch, almost absorb the whole area. Body as on the upper side ; legs yellowish-white.

A little variable in the size of the pale spots on the upper surfaces. On the wing in June, July and August, in one generation.

LARVA rather spindle-shaped, and having the appearance as though stretched ; anal prolegs extended ; head also somewhat so, rounded and flattened, semi-translucent, white, antennal papillæ distinctly noticeable ; general colour whitish-green ; dorsal stripe dark green, edged on either side with cloudy white, which, however, is interrupted and shaded to green on every segment ; below the subdorsal line the whole surface is paler green, shading still paler below, except that a faintly darker spot appears at the sides of the third segment ; raised dots white ; legs, ventral prolegs, and also the whole extended anal prolegs semi-transparent white.

August and September on elder (*Sambucus ebulus* and *S. niger*), feeding on the leaves ; living extended on their undersides, where it draws the portion between two side-ribs into a hollow, in which it remains covered by a broad transparent shining white web.

PUPA light brown ; not more fully described ; in a silken cocoon among fallen leaves or on the bark of the tree ; the winter being passed in this cocoon, as a larva, and pupation taking place in the spring.

The moth sits during the day on the undersides of the leaves of its food-plant, the common elder, and is easily shaken or beaten out, when it flies lazily to a similar hiding-

place. In the evening it is a familiar object, flying gently in almost every garden. Very common in those of the suburbs of London, and also to be found in plenty throughout the Southern, Eastern, Western and Midland Counties of England; less common or even rare in the North, and I do not find any record of its occurrence in Scotland—though it can scarcely be altogether absent. In Wales I know it to be plentiful in the Southern Counties but except at Colwyn Bay have no information as to North Wales. In Ireland it is widely distributed but is said not to be common. Abroad it is widely distributed throughout Central Europe, becoming larger and paler in colour in Swiss Mountain districts; and is found in Sicily, Livonia, Finland, Dalmatia, Greece, Bithynia, Armenia, Siberia, Tartary, and Northern Africa.

12. *B. stachydalis*, Zinck.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). All the wings shining dark olive-grey or blackish-brown; the fore wings having *two* yellowish-white spots before the second line, and the apical region dotted with the same colour; two similar spots and a row of dots appear on the hind wings.

Antennæ of the male simple, bronzy brown; palpi conspicuously porrected, blunt, dark brown; head and thorax black-brown; abdomen grey-brown with a slender whitish edge to each segment; anal tuft rather pointed. Fore wings not elongated; costa arched beyond the middle; apex rather squarely angulated; hind margin nearly perpendicular, but curved off below; black-brown with a faint golden sheen: first line hardly perceptibly blacker; second line much curved outwards, formed of small whitish dots or crescents edged with black; embraced in its larger curve is a yellowish-white spot of fair size, and between the very obscure blacker stigmata another, rather squared; before this a small pale dot lies in the discal cell: subterminal line a faint curved series of whitish dots; cilia shining black-brown. Hind wings rather ample, rounded behind, but the apex angulated;

black-brown with three large dull white spots near the middle, followed by a curved transverse series of similar dots; another series of still smaller dots lies along the hind margin; cilia shining black-brown. Female similar.

Undersides of all the wings very like the upper, but there is an additional white spot on the dorsal margin of the fore wings, and much more white in the basal half of the hind. Body dark grey, slenderly barred with white; legs grey and white.

On the wing in June, July, and the beginning of August.

LARVA spindle-shaped, the anal segment produced, and the anal prolegs extended behind; head small, rather projecting, pale brownish-yellow; body greenish-white with bright green dorsal and subdorsal stripes uniting in a green bar on the second segment; ventral prolegs slender and rather splay; raised dots white and the skin very glassy in appearance. When quite full grown the head becomes faintly brown, the body pale primrose-yellow and the lines almost transparent.

August to October on *Stachys sylvatica*, *S. arvensis*, and *S. ambigua* (species of woundwort), feeding on the leaves, eating out wide spaces from the underside, where it forms an open tube or chamber by partially rolling the soft portion of the leaf. It spins its silken cocoon in a hollow or rotten stick, or a bit of dead stem of the food-plant or of an umbelliferous plant, and there lies unchanged until the following May or June.

PUPA apparently undescribed.

The moth has unusually secret and retiring habits. It spends the day in the midst of a thick tuft of *Stachys* close to the ground, very often in a ditch, or in the thickest tangle of a mixture of bramble and woundwort, and even when disturbed keeps fluttering timidly closer into the same hiding-place, and creeping in among the rubbish and dead leaves. If driven out of this patch it flies hastily to the

next. Even at early dusk it is hardly to be seen away from these plants. First noticed and recorded in this country in 1875, when I took it in Pembrokeshire; but it had simply been overlooked, since specimens were at once found mixed with *B. sambucalis* in several collections. Attention being thus drawn to this species, it has since been found locally in Kent, Sussex, Hants, Dorset, and rarely in Norfolk and Suffolk. In Pembrokeshire, where it was first noticed, it proved to be fairly common, but I have no other record for Wales, nor for any other portion of the United Kingdom. Abroad it is widely distributed in Central Europe, and inhabits Northern Spain, Sardinia, Greece, and South Sweden.

13. *B. crocealis*, *Hüb.*—Expanse  $\frac{7}{8}$  to nearly 1 inch (21–24 mm.). Fore wings shining rich ochreous-yellow, with two brownish-yellow transverse lines, the second bending and curving gently outwards. Hind wings yellowish-white with faint smoky clouding.

Antennæ of the male simple, yellow-brown, the back of the shaft white; palpi rather long, deeply tufted, pointed; yellow; head and thorax orange-yellow; abdomen slender, yellowish-white with grey dusting, and the anal tuft yellow. Fore wings not elongated; costa arched; apex angulated; hind margin rather perpendicular, but curved off below; colour rich yellow, tinged along the costa with ochreous, and finely dusted all over with the same; first line very slender, nearly erect, but curved above the middle, orange-brown; second line of the same colour, erect from the dorsal margin, but just below the middle bent broadly outward and then curved up to the costa; discal spot an orange-brown crescent; cilia shining greyish-yellow. Hind wings rather long; apex angulated; hind margin sinuous; shining white with smoky clouding, and a faint ill-defined smoky border; cilia white. Female similar.

Underside of the fore wings dark smoky-yellow, shining white along the dorsal margin: the discal spot and second

line faintly indicated. Hind wings smoky-white, dorsal portion white, apex dark; a faint indication of a smoky line crosses the middle. Body and legs shining white.

On the wing from the end of June till August; in one generation.

LARVA rather plump, sluggish, very pale green with darker dorsal and subdorsal lines; head black; dorsal plate pale green with a black bar at each side; spiracles and centres of the raised dots black.

October till June, on *Inula dysenterica* (fleabane) and *I. conyza* (ploughman's spikenard), feeding on the young leaves and eating out the heart; making a chamber by uniting two young leaves together, or when young by turning down the edge of a leaf, and hibernating in such turned-down portions.

PUPA slender, the wing- and leg-covers rather long and projecting a little in front, their surfaces rather dull but quite smooth and without sculpture; dorsal surface also dull and almost without punctures; abdominal segments more glossy and very smooth; cremaster rather long and projecting, spud-shaped, tipped with minute curled bristles; whole surface deep pitchy-brown except the interstices of segments and edges of wing-covers, which are paler. In a loose cocoon between leaves upon its food-plant. The transformations in this species are not retarded.

The moth sits constantly upon its food-plant during the day, resting on the underside of a leaf, on a leaf-stalk, or anywhere upon the beloved plant, hauging back by its slender legs as though on tiptoe. If disturbed it readily flies, but only to a short distance, to another plant, but is not much inclined to conceal itself near the ground. At early dusk it flits gently about the same patches of plants. Common throughout the Southern, Western, and Eastern Counties of England, wherever its food-plants are found, but apparently

very much less so in the Midlands, where the only record that I find is in Staffordshire. Also occurring in Yorkshire, Lancashire, Westmoreland, and very rarely in Durham. In Wales it is pretty common in Pembrokeshire, and doubtless has a wide distribution. In Scotland the only record that I find is at Rothesay, Bute. In Ireland, near Dublin, and in Wicklow and Galway. Abroad it seems to be common throughout Central and Southern Europe, and to occur in Bithynia and Armenia.

14. **B. ferrugalis**, *Hüb.* — Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (19-22 mm.). Fore wings narrow, fawny, with dark brown stigmata and slender transverse lines. Hind wings pale smoky-brown or smoky-white.

Antennae of male simple, shining, light-brown; palpi long, pointed, almost porrected or else drooping a little, red-brown; head and thorax chestnut-red; abdomen slender, pale grey-brown, each segment edged with paler; anal tuft pale yellow-brown. Fore wings narrow; costa arched beyond the middle; apex angulated; hind margin oblique, almost straight; colour orange-brown; first line faintly suggested by small blackish clouds; immediately beyond is a large flattened ring of black dusting forming an orbicular stigma; reniform stigma deeper black, but much obscured by its inclusion in a large smoky black discal spot; second line an oblique series of cloudy black dots or crescents between nervures; subterminal line a faint shade of similar dots; cilia shining leaden-brown with a row of black dots along their base. Hind wings rather long and ample, rounded behind; smoky brown with a large paler central blotch, through which runs an obscure irregular darker line; margin also darker brown; extreme hind margin dotted with black; cilia shining smoky white with a yellowish line along the base. Female similar, or often of a paler shade of colour.

Underside of the fore wings smoky brown, with darker nervures; also paler spots along the costa and hind margin

and with three or four black spots near the apex of the costa. Hind wings smoky white with four black dots in the anterior half and a row of the same along the hind margin; between are two partial transverse lines of dark dusting. Body and legs whitish-brown.

Variable in the ground colour of the fore wings, from dark tawny-brown to pale yellow-brown.

On the wing in June, July, August, September and October, even rarely in December. Most irregular in times of appearance. Usually a few specimens are seen in June, but in 1880 it was abundant in that month; usually far more common in the autumn, at which time in certain years it appears in multitudes. It is still quite uncertain whether there are two or even three generations in the year, or even whether the latest autumn specimens hibernate and reappear in June; but very probably there is only one generation emerging at intervals.

LARVA moderately stout along the middle of the body, and attenuated at both ends; head flattened, widest near the mouth, which is prominent, pale drab, front margins of the lobes freckled with brown, and a group of similar freckles on each cheek; mouth and a transverse streak above it light brown; the ocelli black; dorsal region opaque, cream colour or very pale yellowish-drab, this colour narrow and faint on the third or fourth segment, widening and strengthening along the middle segments, and narrowing towards the end; dorsal stripe dark translucent green; thoracic segments broadly tinged on the back with similar green; dorsal colouring banded on each side by a very fine line of dark translucent green, and this by an opaque whitish line which originates on the second segment; well relieved below by a broad stripe of the darker green or greyish-green; spiracles creamy-white; undersurface and legs clear watery-green with also a faint tinge of flesh colour; on either side of the second segment are two velvety black spots, one in front elongate-

oval, one behind it small and round; raised dots green at the top, bearing a fine hair. (Condensed from Mr. Buckler's description.)

September and October, on *Eupatorium cannabinum* (hemp agrimony), *Stachys palustris* (woundwort), burdock, strawberry and other plants; noticed abroad on a thistle (*Cirsium palustre*) and on *Aster amellus*. Feeding on their leaves and living on the undersides.

PUPA about five-sixteenths of an inch in length; eyes prominent; thorax well developed; wing-, leg-, and antenna-cases long; cremaster small, pointed, furnished with two curled-topped spines crossing each other; four rows of minute warts with single hairs pointing forwards are visible down the back of the thorax and abdomen; the surface of the head, thorax, and wing-covers, and the last ring of the abdomen are brilliantly glossy; the other segments dull; colour black, save in the segmental divisions, which are shining brown. In a cocoon formed of a portion of a leaf cut out and drawn round, and lined with silk. (W. Buckler.)

The moth hides during the day in hedges and bushes, particularly in sallow-bushes growing in marshy places, and does not seem to attach itself to any particular food-plant. At dusk it flies freely, and in autumn is exceedingly fond of the juice of blackberries, sitting upon them at night to feed, but dashing wildly at the light when approached with a lantern.

The uncertainty in its times of appearance, and in its abundance, seems to call for some further remark. The sea-coast is perhaps its favourite resort, but even there the same uncertainty prevails. In my own recollection this insect had been so uncommon at all times of the year, for a number of years, that when in 1865 it suddenly appeared in abundance flying out of every hedge in answer to the beating-stick, it was welcomed as affording a good opportunity for filling my own series and helping my friends. This occurred in the

autumn, particularly in September and October, and it had then only been found in single casual specimens in the early summer. Afterwards it was by no means so scarce for several seasons, and twelve years later it suddenly appeared in numbers in *June*—then disappeared, so that on its appearance again in plenty in August and September a second brood was announced and believed in, and when another fresh emergence, of *darker* specimens, took place in October and November, it was recognised as a *third* generation. This may have been correct, but also may only have consisted of specimens retarded in cocoon in the larva state; or, on the other hand, it is possible that immigrations may have taken place. This last view is supported by the fact that this species has been taken at sea in the act of migration. The belief in hybernation seems to arise from the circumstance that June specimens are usually paler and yellower than those that appear later in the year, yet they have not a worn appearance, and when, as in 1877 and in 1880, an abundance of the moths was taken in June, there had been no corresponding abundance in the preceding autumns. The larva seems to have been noticed only in the autumn months, and of those reared a portion have assumed the pupa state and appeared as moths within a few days, while others have laid over until the following year, even remaining eleven months in cocoon, as larva and pupa. In addition to all its other irregularities, I have known it to be attracted by a strong light in *December*.

In the uncertain and irregular manner detailed above, found in almost all parts of England, most plentifully in the south, and on the coast to Yorkshire; scarce in Durham, possibly absent from the other three Northern Counties, yet found in Scotland, in Fife, Aberdeen, Ayrshire, Wigtownshire, and Kirkcudbright. In Wales, in Glamorganshire, Pembrokeshire, Carnarvonshire and Flintshire; in Ireland on the Dublin Coast, at Cork, Monaghan and Tyrone. Abroad it has a wide range, through Central and Southern Europe, Syria, Asia Minor, India, Afghanistan, Japan, Madeira, the

Canaries, the Azores; Egypt, Morocco and other parts of Northern Africa, the Congo State and Natal.

15. **B. forficalis**, *L.*—Expanse 1 to  $1\frac{1}{4}$  inch. Fore wings rather narrow and pointed; pale straw-colour with long oblique pale brown shades and lines. Hind wings dull white with a faint slender brown transverse line.

Antennae of the male simple, pale brown, back of the shaft white; palpi not very long, slightly drooping, tufted and pointed; head and thorax pale brownish-drab; abdomen long and slender, tapering, whitish-drab. Fore wings long and pointed; costa arched beyond the middle; apex angulated; hind margin very oblique and slightly curved; the usual lines altered into three double red-brown stripes running very obliquely outward, the middle one proceeding straight into the apex of the wing and there being blackened; discal spot elongated, red-brown, with a whitish streak in its base; through this runs the altered first line, the second, quite parallel, being that which runs to the apex; the third, fainter, more slender, and almost parallel, evidently represents the usual subterminal line; another pale brown line lies along the hind margin; cilia straw-colour. Hind wings short but broad and fully rounded; yellowish-white, with a partial transverse brown line beyond the middle, and a slender one along the hind margin; cilia yellowish-white. Female similar, but with the body shorter.

Underside of the fore wings smoky whitish-brown, browner along the costa; discal spot smoky-brown; beyond it is a line of black dusting placed in the *usual* position of a second line, not in that of the upperside. Hind wings yellowish-white with a complete brown line beyond the middle. Body and legs yellow-brown.

On the wing in May, June, July, and August, probably in two generations.

LARVA stout, fusiform, slightly hairy; head shining brownish-green, mouth dark brown; a brown horny plate

on the second segment; general colour yellowish-green, the dorsal stripe pulsating, darker green; spiracular stripe rather broad, pale yellow, edged above with a dark green shade; raised spots black, each centred with a white dot emitting a long pale hair; a dark green line lies above the legs and prolegs. (C. Fenn.) Before spinning up it changes to an almost uniform glossy pale green, but with the dorsal stripe narrower and more distinct. (G. T. Porritt.)

September to November (and Kollar says May to July), on cabbage, horseradish, turnip, hedge-mustard and other Cruciferæ. It has also been found on currant (*Ribes*), and was reared by the Rev. Hugh A. Stowell from green peas. Schmid says, "in July in companies on *Sisymbrium alliaria*, on the undersides of the leaves, in which it eats holes. Then in autumn on varieties of the cabbage, especially the coleworts; hibernating unchanged in the leaf-stem or in a swelling of the stem." It feeds only at night.

PUPA rather stout, anal extremity without projection; dull opaque yellow. In a strong silken cocoon on the surface of the earth. (C. Fenn.)

The moth hides among herbage or bushes in the daytime, and is not then very willing to fly, but makes its appearance at early dusk, and is a common inhabitant of every garden in the London suburbs, and throughout England, Wales, and Ireland; also in Scotland to Moray, Perthshire and Argyle. Abroad it is found almost all over Europe, to Turkey, where it is common; also in Armenia, Central Asia, the Himalayan and other hill districts of India, and in Japan, where it is quite normal.

16. **B. lutealis**, *Haw.*—Expanse  $\frac{7}{8}$  to 1 inch (21–25 mm.). Fore wings rather wide behind, shining creamy-white, with soft yellow-brown lines and discal rings. Hind wings white, shaded and tipped with smoky-black.

Antennæ of the male simple, ciliated, shining white with

the cilia brown; palpi elongated, pointed, porrected, dark brown, the inner side white; head and thorax brownish-white; abdomen shining silvery-white. Fore wings rather broadened; costa flatly arched; apex angulated; hind margin very little oblique, straight but rounded off below; creamy-white with a faint browner tinge toward the costa and especially along the subcostal nervure; the markings all yellow-brown and very delicate; first line indented and rather erect but faint; second line erect from near the anal angle, then bending sharply inward and out again so as to form a wide loop, thence direct to the costa; subterminal line just beyond it, faint and rather straight, but towards its upper end forming an oblique brown streak which runs into the apex; orbicular stigma a large ring; reniform stigma broad and filled up by a faint tint of the same yellow-brown; along the extreme hind margin is a brown line; cilia creamy-white. Hind wings broad and ample; apex angulated; hind margin rather sinuous; smoky-white, with a curved smoke-coloured transverse line beyond the middle; and a broader and more obscure similar cloudy band before the hind margin, which last is edged with a brown line; cilia white. Female similar but a little smaller and its body rather shorter and thicker.

Underside of the fore wings smoke-colour with darker nervures and whitish cilia. Hind wings smoky-white, much clouded with darker at the base, in the middle, and toward the apex; cilia white. Body and legs creamy-white.

Very little variable, but occasionally a specimen has the brown colour of the markings distributed over the anterior wings.

On the wing in July and August.

LARVA three-quarters of an inch long, tapering in front and a little behind; segments well defined and plump beneath, each divided across the back by a deep wrinkle; head pale, semi-pellucid yellowish-brown, blotched with a

deeper tint of the same ; second segment bright transparent yellowish-green, and near the end of this two subdorsal yellowish stripes begin to appear as mere lines, broadening in the following segments and becoming broad opaque primrose-yellow stripes, edged above by a narrow, transparent green dorsal stripe, and below by another such stripe, melting off into greenish-white on the undersurface ; anal flap sulphur-yellow ; spiracles small and pale ; skin glossy ; raised dots either of the ground colour, or tipped with green on the yellow stripe. When quite full-fed it loses its distinctive colours and becomes uniform light amber-yellow. (Condensed from Mr. Buckler's description.)

May and June, on thistle, bramble (*Rubus corylifolius*), *Stachys sylvatica*, knapweed, sorrel, coltsfoot, strawberry, plantain, buttercup, and other low-growing plants ; feeding under a slight web on the underside of a leaf. There seems to be no evidence as to the condition in which the winter is passed—whether in the egg or as a young larva.

PUPA broadest across the thorax, which is well formed ; wing-covers of moderate length ; leg- and antenna-cases a little longer and free at the end ; the fixed segments of the abdomen slightly keeled at the back, and having very large spiracles, while those on the movable and tapering segments are of ordinary size ; each segment has five or six transverse ridges, the most prominent being at the hinder edge ; cremaster pointed and flattened, furnished with curly-topped converging spines ; dull black, glistening a little on the back, and becoming glossy on the two hinder segments. In a cavity formed by folding down the side of a leaf or joining two leaves, in an oval cocoon of thin, but strong, white silk. (W. Buckler.)

The moth flies commonly late in the summer among rough herbage, especially among thistles, on hill-sides, coarse pastures, quarries, and rough ground generally, and looks very white as it flits about in the early dusk. During

the day it hides among the same plants and is easily disturbed by the passing footstep, flying but a short distance, and often settling again upon a grass-culm, from which it swings loosely at the length of its legs, and then has a very graceful appearance. Generally distributed throughout England, and very common in Northern and Western districts, less so in the South; also probably to be found in most parts of Wales, though the only records seem to be my own in Pembrokeshire, and the statement by Mr. G. O. Day that it is "generally common" in North Wales; in Scotland to be found throughout the Lowlands, and in the valleys of the Highland Counties, extending to Moray, Perthshire, and Dumbartonshire, and also found in the Orkneys. In Ireland in the districts north of Dublin and Galway, extending to Derry and Donegal. Abroad its range is a little uncertain, but it is found in Switzerland and throughout the Alpine districts to the Hartz Mountains; also in Western Russia, the Caucasus, and Mongolia.

17. **B. decrepitalis**, *H.-S.* — Expanse  $\frac{3}{4}$  to 1 inch (18–25 mm.). Fore wings not elongated, brownish-white clouded with dull pale umbreous; stigmata and lines obscure, confused with the pale-brown shading. Hind wings dusky white with a narrow brown hind-border.

Antennæ of the male simple, pale yellow-brown; palpi porrected, rather thin, brown; head and thorax pale yellow-brown; abdomen slender, brownish-white, with a shining whiter edge to each segment. Fore wings moderately broad; costa flatly arched; apex bluntly angulated; hind margin rather oblique, hardly curved; dorsal margin somewhat full; colour pale yellow-brown or whitish-brown; first line scarcely indicated in darker clouding; second line oblique, much indented, but direct and very little curved, pale brown; a brownish cloud occupies the hind-marginal area and is darker below the apex; orbicular stigma when visible, round and faintly brown; reniform stigma of the same colour, very

faint and cloudy; between them is often a whitish cloud; extreme hind margin dotted with brown; cilia brownish-white. Hind wings rather elongated; apex bluntly angulated; hind margin sinuous, brownish-white; a faint brown transverse line lies beyond the middle, and a darker cloudy shade along the hind margin; cilia dull white. Female similar but rather whiter, especially so in the hind wings; body shorter.

Underside of the fore wings smoky-brown, shading more to yellow-brown at the margins; at the apex are several black streaks, and a row of black dots lies along the hind margin. Hind wings dusky white dusted with brown; along the hind margin is a series of black dots. Body and legs shining brownish-white.

On the wing from May till August, probably in a single generation.

LARVA five-eighths to three-quarters of an inch long and rather slender; head polished, broader than the second, but about as broad as the third segment, pale straw-colour, the mandibles brown and the ocelli darker brown; body cylindrical and of almost uniform width throughout; skin semitransparent; ground colour pale yellow, but the green internal parts make it appear at first to be of that colour; dorsal stripe a medium shade of green, edged on each side by a broad whitish stripe. subdorsal stripes of the same green colour, followed by a whitish line above the spiracles, and then by a waved whitish stripe along the spiracular region; ventral surface, legs and prolegs green, of the same shade as the dorsal stripe. After ceasing to feed, and before spinning up, it becomes bright brownish-yellow, dorsal stripe browner and the former whitish stripes lemon-yellow. (G. T. Porritt.)

July and August, on *Lastrea spinulosa*, *Athyrium filix-femina*, and probably on *L. filix-mas*, and other ferns. In confinement Dr. Chapman has induced it to feed also on *Trifolium filiforme*. It lives in a slight web on the underside of a frond. The winter is spent in a strong silken

cocoon, in which the change to pupa takes place in the spring.

PUPA apparently undescribed.

The habits of this moth are shy and secret; when disturbed it quickly slips away to another retreat close at hand. It usually hides in dense tufts of male fern, brake and other ferns in mountain ravines, or among the thick masses of neighbouring whortleberry, especially frequenting damp hollows. Mrs. Fraser found it also hiding in the bushes of hazel overhanging such spots, and noticed that when disturbed it usually flew to another similar bush. It is said at times to sit by day upon the bracken and spread its wings to enjoy the sunshine. Always confined to mountain districts, and at present known only to occur in Scotland. in Perthshire, Argyleshire, Dumbartonshire, Aberdeenshire, Invernesshire, Argyleshire, and Sutherlandshire. Hitherto it seems never to have been noticed among the mountains of England, Wales, or Ireland. Abroad it inhabits the Alpine districts of Central Europe, the mountains of Silesia, Norway, Lapland, and North-West Russia.

18. **B. olivalis**, *Schiff.*—Expanse  $\frac{7}{8}$  to 1 inch. (21–25 mm.). Fore wings broad and not pointed; dark olive-brown, with white central and costal spots. Hind wings smoky-white, margined with pale brown.

Antennæ of the male simple, shining, brownish-white; palpi porrected, brown; head and thorax olive-brown; abdomen slender, shining, pale grey-brown. Fore wings moderately broad; costa flatly arched; apex angulated; hind margin rather oblique but scarcely curved; colour dull olive-brown; the first and second lines hardly perceptibly darker; in the middle of the wing is a squared white spot in the discal cell, and before this a small white dot; beyond it are two yellowish-white dots on the costa, and beneath them, in a line with the discal white spots, is another, equally

white, and rather elongated; another is, in some specimens, obscurely visible near the base of the dorsal margin; cilia shining brown. Hind wings rather angulated at the apex, rounded behind; dusky-white, the hinder half shaded with faint smoky-brown, and a cloudy band of blacker brown lying along the hind margin; cilia white, intersected by a brown line. Female similar.

Underside of the fore wings olive-brown; costa white to the middle, where is a long squared discal white spot; beyond are several white costal streaks; hind margin edged by a yellowish-white line in which is a series of black streaks. Hind wings shining white; the central spot a slender crescent, smoky-black, as also is a dot at the end of the cell; beyond the middle is a slender curved transverse smoky-black line, and along the hind margin a series of black streaks in a yellowish line. Body and legs shining white.

Not very variable, but the smaller white spots of the fore wings are not unfrequently absent.

On the wing from the end of May till July.

LARVA nearly an inch long, and of proportionate bulk; cylindrical, tapering very slightly at the extremities; segments plump, but with a depression across the middle; skin glossy and semitranslucent; head shining, the lobes rounded, grey marbled with black, the mandibles brown; general colour pale bluish-grey, sometimes with an under-ground of pale green; dorsal line dark green; and a pale greyish stripe, almost a ridge, lies along the spiracular region; raised dots large, glossy and intensely black; ventral surface and prolegs of the same colour as the dorsal area; legs black, highly polished; immediately below the spiracular stripe is a series of oval black spots, one on each segment; yet lower, each placed a little behind, is a similar series of spots; and lower still one at the base of each leg and proleg, whilst those segments which have neither legs

nor prolegs have three similar transverse spots. (G. T. Porritt.)

Before spinning up it becomes of a pale yellow colour.

April, May, and June, on ground elder, nettle, hop, dog's-mercury, woundwort, dock, *Lychnis dioica*, *Galeobdolon luteum*, and other herbaceous plants; drawing together a leaf, or two leaves, which it joins with silk, and living therein. There seems to be no evidence as to the condition in which the winter is passed—whether as a young larva or in the egg.

PUPA rather slender and attenuated behind; wing-cases long and well defined; eye-covers also distinct, and there is a sharply defined ridge along the thorax; colour of these portions dark chocolate-brown: of the underside of the abdomen paler brown; and of the divisions yellow. In a silken cocoon between the leaves used as a larval habitation. (G. T. Porritt.)

The moth usually hides in the hedges and bushes under which it has fed as a larva, and is easily beaten or shaken out, when it buzzes away to a similar hiding-place, often alighting on a leaf, quite visibly, before again entering the hedge. Exceedingly common throughout England and Ireland, and doubtless Wales—though there so nearly disregarded that I find only my own record in Pembrokeshire, and Mr. Day's that it is generally common in North Wales; found also in the South of Scotland to Edinburgh and the Clyde Valley; but beyond this records appear to be wanting. Abroad it seems to be restricted to Central Europe, Livonia, Finland, and Armenia.

19. **B. prunalis**, *Schiff.*—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings broad, blunt, dark grey-brown with obscurely darker stigmata and lines. Hind wings pale grey-brown.

Antennæ of the male simple, shining, brown; palpi rather slender, porrected, dark-brown; head and collar reddish-

*PYRAUSTIDÆ—BOTYS.*

umbreous; rest of thorax dark brown; abdomen slender, glossy grey-brown with rather noticeable lateral tufts. Fore wings moderately broad; costa arched; apex angulated; hind margin rather oblique but nearly straight; dorsal margin filled out; colour grey-brown or dull umbreous; first line scarcely perceptible; second line indicated by a series of black dots edged with paler dusting; orbicular and reniform stigmata just visible by their darker brown margins; cilia glossy brown. Hind wings broad; angulated at the apex; rounded behind; rather paler brown with an obscurely black central crescent and marginal dots; cilia shining brown. Female similar.

Underside of the fore wings smoky-brown, shading paler toward the base; costa yellowish-brown, having, from the middle to the apex five black spots; also two black clouds in the discal cell. Hind wings brownish-white; central spot a small black crescent; beyond the middle is a curved black transverse line, and along the hind margin a row of triangular black dots. Body and legs brownish-white.

Rather variable in the distinctness of the markings; and in occasional examples the alternate yellowish-brown and black spotting of the costa beyond the middle is visible on the upperside of the fore wings. Sometimes the brown colour of these wings is found to lean more distinctly toward grey.

On the wing from June till the beginning of August.

LARVA seven-eighths of an inch long, tapering a little at each end; segments plump, and each divided by a deep wrinkle; head of an opaline tint; mouth and tips of the papillæ brown; a black mark in the second segment is somewhat after the form of a dumpy ninepin with a projecting knob at the end; dorsal region bright deep transparent green relieved by two brilliant broad opaque white subdorsal stripes; on these the raised dots show half green and half white, each with a whitish hair; spiracles minute, round and

cream-coloured, united by a visible whitish tracheal thread; below these the sides and legs watery translucent grey-green, very pale, and like the rest of the skin, brilliantly glittering. (W. Buckler—condensed.)

September and October, till April or May; on various species of dead-nettle (*Lamium*), wound-wort (*Stachys*), wood-sage, stinging-nettle, common campion (*Lychnis*), marjoram, dog's-mercury, honeysuckle, elder, bramble, elm, and probably many other plants, drawing together leaves, and living on their undersides; eating the leaves; passing the winter upon the plant in a white silken hybernaculum at the edge of a leaf.

PUPA rather slender, tapering to each extremity; eye-covers prominent; wing, antenna, and leg-covers long; back of the abdomen keeled on the four upper segments, and having a row of minute raised dots on either side; spiracles prominent, cremaster furnished with two curly-topped, crossing, spines; head, thorax, and wing-covers pitchy black and glossy; abdomen dull, black above, brown on the sides and below; the divisions orange-ochreous. (W. Buckler.) In a silken cocoon within a folded and joined portion of a leaf.

This moth has one singular propensity. It hides during the day, constantly, indeed almost exclusively, in bushes and hedges of *blackthorn* (*Prunus spinosa*)—hence doubtless its name. There does not appear to exist any record of the finding of the larva on this plant, yet the attachment of the moth thereto is notorious and self-evident, and I do not remember an instance of its being found hiding among any one of its numerous *known* food-plants. Wherever blackthorn is found in the hedges it is abundant, easily disturbed in the day-time, when it constantly returns to the same dense shelter. Abundant almost throughout England, Wales, and Ireland, though less common in Durham and Northumberland; and found in Scotland in Fife, Perthshire, Dumbartonshire, the Clyde Valley, Argyleshire, and, curiously

enough, in the Orkneys. Abroad found throughout Central Europe, temperate Northern Europe, Northern Italy, Southern France, and also in India and Japan.

#### Genus 4. PIONEA.

Antennæ simple, palpi minute; tongue present; face squared and smooth; head rough; thorax smooth; abdomen not very long, not banded. Fore wings broad and blunt, the discal cell narrow. Hind wings broad; the cell short; cross-bar sharply angulated. Legs not very long.

We have two species, readily distinguished.

A. Fore wings yellow; hind cloudy white.

B. Markings of fore wings reticulated in lines.

*P. stramentalis.*

B<sup>2</sup>. Markings of fore wings obscurely clouded.

*P. margaritalis.*

1. ***P. margaritalis***, *Schiff.*; ***extimalis***, *Staud. Cat.*—Expanse  $1\frac{1}{8}$  inch. Fore wings creamy-yellow with two cloudy red-brown oblique lines; and, extending in from the hind margin, a broad lurid-brown cloud. Hind wings smoky-white with a brown edging.

Antennæ of the male simple but rather thick and densely ciliated, yellow; palpi short and small, rather drooping, yellow-brown; head and thorax yellow, faintly tinged with brown; abdomen shining, pale greyish-yellow, moderately slender. Fore wings rather broad; costa straight to beyond the middle, then arched; apex bluntly angulated, almost rounded; hind margin very gently curved, and but little oblique; creamy-yellow; first line obscurely clouded, deeply bent, rust-red; second line of the same colour, equally obscure and clouded, very oblique; beyond it the hind-marginal region is broadly shaded with purple-brown, a cloud thereof running inward in the middle; cilia shining pale purple. Hind wings broad, rounded behind; semi-transparent.

white, with a faint smoky tinge, and edged with yellow-brown clouding; cilia yellowish-white. Female similar, but with the body a little stouter.

Underside of fore wings shining pale straw-colour, with a purple tinge around the discal cell, and a faint partial transverse line beyond it; hind margin tinged with purple. Hind wings shining yellowish-white; the front edge tinged with orange. Body and legs straw-colour.

On the wing in June and July.

LARVA. Head narrower than the second segment, into which it can be partially withdrawn, slightly notched on the crown, rough; body attenuated behind, segments of the body divided each by a transverse fold. Head black, mouth and papillæ white; a narrow ring round the neck pure white, as also is the dorsal plate; dorsal stripe yellow, intersected by a narrow orange-yellow dorsal line; on each side of this stripe is a broad purple subdorsal stripe followed by a broad yellow lateral stripe extending to below the spiracles, which are black; ventral surface smoky flesh-colour; legs and prolegs of the same colour; raised dots black; a black rough plate is on each side of the second segment; and a series of black warts just above the prolegs. (E. Newman—condensed.)

August on *Sinapis alba* (white mustard), and *S. arvensis* (charlock), feeding on the green seed vessels; living in a silken tent during the day and coming out at night to feed. Schmid adds, on *Sisymbrium officinale* and *Thlaspi arvense* in a transparent web on the flowers and green seeds. When full grown it descends to the earth and constructs a tough cocoon of silk and earth, in which it lives unchanged throughout the winter; assuming the pupa state in May.

PUPA undescribed.

The moth hides during the day among its food plants and is noticed especially to frequent those which grow among standing corn. At dusk it flies about their blossoms, and has

been known to come to light at night. Scarce and excessively local, usually even rare, with us, but it is said to have been, in one season, forty years ago, common in Cambridgeshire, especially around Wicken Fen. This district has since then been usually its principal haunt though it has been seldom taken. Formerly it was reported to occur at Deal, and more recently at Folkestone, both in Kent; also in the Isle of Wight; a single specimen was secured at light at Newbury, Berks, and one at Mile End, London. Others have recently occurred at Tuddenham, Suffolk—where Mr. E. Sparke tells me that it is not rare—at Woodstock, Oxfordshire; and in Norfolk; and now it is found, as Mr. A. E. Gibbs informs me, in Herts. In many recent years, nevertheless, it has certainly been generally a rare insect; and I have no knowledge of its existence in any other portions of the British Isles than those just mentioned. Abroad it seems to be found all over Europe, except in the Spanish Peninsula and the polar regions; also in Lydia, Siberia, Tartary, Japan, and apparently some portions of North America.

2. **P. stramentalis**, *Hüb.*; **straminalis**, *Staud. Cat.*

—Expanse 1 to  $1\frac{1}{8}$  inch. Fore wings shining straw-yellow, clouded with brown behind, the nervures, transverse lines, and edges of stigmata reddish-brown, giving it a latticed appearance. Hind wings white, edged with brown.

Antennæ simple, finely ciliated, brown; palpi small and slender, brown, the maxillary pair perceptible, pointed; face brownish white; top of the head spotted with black; thorax pale yellow, tinged in front with yellow-brown; abdomen slender, dull white. Fore wings broad; costa arched; apex squarely angulated; hind margin rounded and very full; dorsal margin also filled out; colour straw-yellow; nervures all tinged with red-brown, and there is between them some dusting of the same colour; first line oblique, slender, strongly waved, red-brown; second line similar in colour, slender, more direct, bent back at the costa; near the hind

margin is a cloudy stripe composed of reddish-brown or olive-brown atoms, placed in crescents, and bending away from the margin above the middle to return below the apex; orbicular and reniform stigmata faintly ringed with red-brown; extreme hind margin edged with a line of the same colour; cilia yellow, intersected and dashed with a similar tint, all these markings combining to produce a prettily latticed effect. Hind wings broad, angulated at the apex, and rounded behind; white with faint grey shading; along the hind margin is a distinct brown line, broadened toward the apex; near it but within is a slender similar transverse line; cilia cloudy white. Female similar.

Undersides of the fore wings whitish-yellow; nervures reddish-brown; costa, second line, discal spot, and a broad hind-marginal stripe dark brown, the latter ceasing below the middle. Hind wings shining yellowish-white with a very delicate curved line of small brown dots beyond the middle and a similar but more clouded line along the hind margin; cilia dashed with the same colour. Body and legs pale yellow.

On the wing from June till the beginning of August.

LARVA seven-eighths of an inch long, thick in proportion but tapering a little at each end; anal prolegs extended behind in a line with the body; head glossy black; mouth green edged with black; papillæ colourless; side margins of the dorsal plate glossy black; hair-bearing raised dots similar; dorsal area dark green; spiracular stripe bright deep yellow; immediately below it is a pale primrose or whitish stripe; spiracles round, yellowish brown with the centres shining black; undersurface dingy drab-green; legs greenish; prolegs almost colourless. When full fed it contracts a little, the dorsal region becomes bright purplish-violet, more shining than before; but two days later it ceases to eat, the spiracular stripes lose their brilliancy, and in a few hours it spins up. (W. Buckler—condensed.)

August and the early part of September, on *Barbarea vulgaris*, *Sinapis arvensis*, and other *Cruciferæ*, especially those which grow in wet woods; feeding upon the leaves, and resting contentedly, side by side, on the leaf, near to the stalk, when not eating. A suspicion that it does mischief to corn by feeding in the stalks proves to be quite erroneous, and apparently unfounded.

PUPA rather thick, with the wing-cases long; surface smooth and glossy; eye-covers and abdomen dark brown; wing-covers light yellow-brown marked with dark brown, and having the nervures in high relief; remaining surfaces brown; last segment of the abdomen a little prolonged and rounded off at the tip. In a broad oval cocoon, in which the larva remains unchanged through the winter, pupating in the spring. (W. Buckler.)

This is a somewhat gregarious species, widely distributed yet restricted to small localities, such as wet woods, bushy marshes, bottoms of wooded valleys, and among tall undergrowth full of grass and herbage. In such places it may sometimes be found in abundance, not another specimen occurring, outside the favoured spot, for many miles. Here it is easily disturbed in the day time, fluttering from one hiding-place to another. At dusk it flies freely; and later at night may be attracted by light. Formerly to be found close to the suburbs of London, whence it seems now to have departed. Still existing, and sometimes abundant—if only in one wood in a county—in Kent, Surrey, Sussex, Hants with the Isle of Wight, Berks, Cambridgeshire, Suffolk, Norfolk, Herefordshire, and Worcestershire; but so far as I know not extending beyond these limits in England, nor recorded from Wales nor Scotland. In Ireland locally abundant in Cork, Kerry, Westmeath, Sligo, Fermanagh, Cavan, and Tyrone.

Abroad it has an extensive range through Central Europe, Southern France, Italy, Dalmatia, Livonia, Finland, and

Southern Russia; also in North America, through New York State, New England, and Nova Scotia, to Esquimalt.

Genus 5. **NASCIA.**

Antennæ thick, simple; palpi drooping, slender; tongue long; head rough; thorax with long scales; abdomen moderately thick, tapering. Fore wings broad and blunt; cell short; hind wings broad, with the cell wide, and the cross-bar angulated. Legs not long, rather thickly covered with scales.

We have but one species.

1. **N. ciliaris**, *Hüb.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings pale yellow, with all the nervures purple-red, the costal and hind margins clouded with the same colour, and extreme hind margin purple-black. Hind wings white.

Antennæ simple, ciliated, pale yellow-brown; palpi slender, drooping, orange-brown, white above; head shining white; thorax yellow-brown, darker in front; abdomen tapering, yellowish-white. Fore wings rather broad; costa arched; apex angulated; hind margin gently rounded; colour yellow; costa broadly shaded with purple-red; all the nervures of the same colour, and the hind margin clouded with the same, but narrowly edged with purple-black or lead-black; sometimes the usual second line is faintly indicated, purple-red, and very oblique; cilia glossy white. Hind wings broad; rounded behind; white, with a very faint brownish dusting between the nervures; cilia shining white. Female similar.

Underside of the fore wings yellowish-white; the nervures leaden-brown; hind wings white. Body and legs white.

A little variable in the depth of colour of the nervures, and in the presence or absence of the oblique line.

On the wing in June and July.

LARVA one inch long; slightly spindle-shaped; the anal prolegs rather extended behind, and the whole aspect as

though drawn out to extreme length; head rather flattened, the lobes rounded, pale drab, the dorsal and subdorsal stripes expressed, the former as a slender edge to each lobe, above, and the latter as a stripe along its middle; general colour bright yellow; dorsal stripe narrow, dark purple, edged on each side by a thin white line; these are closely followed by the subdorsal stripes, broad, and of a rich crimson-purple, in which the raised dots are distinctly visible and shining; below this the whole lateral surface is bright primrose-yellow, wrinkled and showing a faint ridge; undersurface, legs, and prolegs paler yellow, the latter shaded in front with purple. (From larvæ furnished for the purpose of this work by Mr. W. H. B. Fletcher.)

August to October; on *Cladium mariscus*, *Carex riparia*, and other sedges. Very sluggish, remaining during the day on a leaf of the food-plants, closely pressed to it, and out-stretched; if disturbed, moving very slowly. More lively at night, eating into the edges of the leaf-blades. When young more active, and if touched disposed to wriggle and throw itself about. At this time its colour is a far paler yellow, and the purple-pink stripes are narrow and less extended.

PUPA 10 mm. long, the wing-cases well marked, those of the posterior wings projecting beyond those of the anterior; the antennal cases curve outwards at their tips round those of the wings; the thirteenth segment ends with a long, red, flattened, horny process which bears four pairs of hooked spines; head, thorax, limb-cases, and upper abdominal segments nearly black; posterior segments yellowish below, shading into dark brown on the back. In an opaque papery cocoon in an old reed-stem, in which the larva passes the winter, assuming the pupa state early in June. (W. H. B. Fletcher.)

This moth was formerly a very great rarity here. Confined to the fens of Cambridgeshire, the captures were

almost limited to the casual specimens which at rare intervals were disturbed from among the sedges by the footstep, or by the scythe of the mower; though Mr. F. Bond is said to have taken specimens at one time at sugar; and a very few have been noticed to fly at sunset in especially favourable weather. But in the year 1874 Dr. F. D. Wheeler commenced to use powerful movable lamps, for the attraction of moths at night, in Wicken Fen, and in that year took twenty-one specimens. From that time to the present the same method of capture has been used with success, and it has become evident that though so seldom seen, the insect must have long been common in this fen. It was formerly taken, though rarely, at Yaxley and in other Cambridgeshire fens, and has been found quite near to Cambridge; but it has, so far as I know, no other haunt in these Islands. Abroad it is found in France, Piedmont, Germany, Lower Austria, and Livonia, and is reported from Tartary.

#### Genus 6. **PERINEPHILE.**

Antennæ simple, slender; palpi very small; head flattened, rather rough; thorax slender and smooth; abdomen very long and thin. Fore wings very long, narrow, pointed at the tips. Hind wings also long, narrow, and pointed. Legs long.

We have but one species.

1. **P. lancealis**, *Schiff.*—Expanse 1 to 1¼ inch. Fore wings very long and pointed, dusky white, almost wholly clouded with pale grey-brown; markings of the same colour. Hind wings narrow, similarly clouded and marked.

Antennæ simple, shining brown; palpi short and inconspicuous, grey-brown; head and thorax shining, yellowish-grey, the latter thin and weak; abdomen very long and slender, shining grey-brown; segments faintly edged with white. Fore wings of unusual length, narrow; costa arched;

apex sharply angulated; hind margin extremely oblique, almost one half the length of the wing; dorsal margin rather full; colour whitish-grey, much clouded, especially near the margins, with pale brownish-grey; markings all of the same colour, not very distinct; first line erect; second formed into crescents between the nervures, widely bent outward in the middle and edged on the outside with white; from it whitish lines run along the nervures through the clouded hind marginal area; orbicular and reniform stigmata represented by dusky dots, between which is placed a rather squared dull white spot; cilia shining grey-brown. Hind wings very narrow, especially shortened toward the anal angle; yellowish-grey, broadly clouded behind with pale grey-brown, and similarly clouded in a less degree from the base and along the dorsal margin; a similar, slender, looped transverse middle line partly encloses a large spot of the whiter ground colour above it, and is itself edged below with white; cilia shining greyish-white. Female very similar yet having the fore wings and the abdomen decidedly shorter, and the hind margin of the former consequently more filled out.

Underside of the fore wings smooth, pale yellowish-grey, with the markings of the upper side faintly visible, and a whitish cloud in the bend of the second line. Hind wings similar, with a central transverse grey line, and much rippling of the same colour; all the wings shining. Body and legs pale yellow-brown.

On the wing from the end of May till July.

LARVA seven-eighths of an inch long, tapering at each end; head small, rather flattened, glossy light drab, speckled with dark brown, and having the papillæ tipped with brown; segments of the body plump and well defined, deeply divided on the undersurface, very tumid at the setting on of all the legs; second segment glossy green above, the boundary of a dorsal plate being defined on either side by a series of four

black dots decreasing in size from the front ; on the rest of the back a dark green dorsal stripe, which is attenuated a little towards each end, is relieved on either side by a broad stripe of opaque pearly greyish-white, followed by a broader semi-transparent green stripe, distinct without hardness, margined below by a threadlike opaque whitish line, which thickens as it approaches each segmental division : spiracles round, black ; the undersurface and all the legs have a pale watery greenish tint ; the raised dots have each a fine silky hair ; the whole skin is tense, shining, and more or less translucent.

When it is full fed and about to spin up it becomes of a beautiful opaque rose-colour on the back, destitute of any line or stripe, the head alone remaining unaltered in colour or markings. In a triangular web of whitish silk enclosing a space of one inch in length within which is a hammock-like cocoon of finer silk ; in some corner. In this the larva remains quiescent and unchanged through the winter, and till the end of April. (W. Buckler, condensed.)

August and the beginning of September, on *Eupatorium cannabinum*. Hofmann adds *Senecio nemorensis*. Feeding on the leaves, living in a chamber formed by folding down the top or side of a leaf. Very active when young.

PUPA three-eighths of an inch long, moderately slender ; wing and antenna-cases long ; cremaster furnished with four or five minute bristles converging at their extremities ; shining pale brown. In a cocoon as above described. (W. Buckler.)

This species is local, inhabiting wet woods and marshy ground where the hemp-agrimony is plentiful, and even lanes in such districts. It hides usually in the thick masses of this plant, on which it has fed, and is easily disturbed in the daytime ; but flies slowly and soon hides itself again, sometimes among tall grass and other herbage. At one time it could be obtained close to the outskirts of London, but that

is no longer the case, though it may still be found in suitable spots in Kent, Surrey, Sussex, Hants with the Isle of Wight, Devon, Cornwall, Somerset, Gloucestershire, Monmouthshire, Herefordshire, Essex, Suffolk, Norfolk, and Northamptonshire. Except that Major Robertson reports it, in Wales, from Pembrokeshire, this seems to be the extent of its recorded range in these Islands. Abroad it is found in most parts of Central Europe, with Denmark, Livonia, Italy, and Northern Spain; also in Tartary and Japan.

### Genus 7. **SPILODES.**

Antennæ simple; palpi small; head rough, face prone, tufted; thorax not very slender; abdomen not very long, tapering to the tip; fore wings moderately elongated, pointed, cell narrow; hind wings ample, cross-bar curved, cell short; legs slender, not long.

We have five species, not difficult of recognition.

A. Fore wings dark brown, with a yellow submarginal line.

*S. sticticalis.*

A<sup>2</sup>. Fore wings sulphur white, with rather dark kernervures.

*S. palcalis.*

A<sup>3</sup>. Fore wings bright yellow, with black markings on the underside.

*S. cinctalis.*

A<sup>4</sup>. All the wings pearly yellow-white, with pale grey markings.

*S. verticalis.*

A<sup>5</sup>. All the wings white, with leaden-black borders and markings.

*S. urticalis.*

1. **S. sticticalis**, L.—Expanse  $\frac{7}{8}$  to 1 inch (21–25 mm.). Fore wings dark olive-brown; a white spot in the discal cell, and a straight yellow line before the hind margin. Hind wings smoky brown; cilia all glossy.

Antennæ long, simple, shining, dark brown; palpi small, rather drooping, black-brown, white inside; head and thorax

dull brown; abdomen glossy grey-brown; anal tuft pale yellow. Fore wings rather narrowly trigonate; costa only arched beyond the middle; apex bluntly rounded; hind margin oblique, very straight; dorsal margin unusually straight; colour dull blackish-brown, or dark olive-brown, dusted in patches with pale yellow; stigmata obscurely blacker; between them in the discal cell is a squared yellowish-white spot; second line dull black, slender, angulated inwards above the dorsal margin, then much curved and broken up into crescents which are shaded outwardly with the yellowish dusting, and on the costa edged by a yellow spot; along the hind margin is a straight slender yellow stripe, regularly divided by the dark nervures; cilia shining black-brown. Hind wings broad, the apex bluntly angulated, and hind margin rather sinuous; colour shining smoky-brown; in the middle is a faintly darker transverse line, edged outwardly with paler; and along the hind margin is a blacker line with pale edging inside; cilia very shining black-brown. Female similar.

Underside of the fore wings pale yellow along the costal and hind-marginal regions; remainder black-brown; stigmata both black; beyond are two black-brown cloudy stripes crossing the yellow area; cilia smoky-black. Hind wings pale smoky-yellow, with two angulated black-brown transverse stripes beyond the middle. Body and legs pale yellow.

On the wing in June, and in a partial second generation from the end of July till the beginning of September.

LARVA scarcely an inch long; slightly tapering toward each end from the stoutest part, which is at the fifth segment; head black and shining; plate on the second segment either similar or of the ground-colour—which is dull leaden-grey—dorsal line sometimes paler, always edged with darker lines, which run together to form a stripe having a paler line on either side; subdorsal lines paler than the ground colour; spiracular stripe pale sulphur-yellow, deeper above, paler

below, and intersected by an interrupted dark grey line; raised dots shining and large, centre paler but ringed with black; spiracles black; undersurface pale olive-grey with shining raised spots. A variety has the ground-colour pale grey, with the lines faintly yellow; giving it a greenish appearance.

End of June and beginning of July, and a partial second generation in September, on *Artemisia campestris*, *A. vulgaris*, and probably other species of wormwood, eating the upper surface of a leaf, avoiding the mid- and side-ribs, and leaving the under surface untouched. Very active, walking rapidly; and if disturbed would jump backwards an inch at a time. (Rev. J. Hellins.)

PUPA in the ground, apparently undescribed, except that Hofmann says that it is yellow.

The moth sits during the day among short herbage close to the ground or even on the earth in bare sandy fields. Alert and active, starting up on the approach of a footstep and flying swiftly, and near the ground, to a similar spot at a short distance. Rather indistinct upon the wing from its almost uniformly dark colour. At dusk it flies voluntarily, but not wildly, and still keeps near the ground; but later at night it certainly roves higher and more generally, since it is sometimes taken at gas lamps in quite unexpected places. Occasionally, when the sunshine is bright and the weather hot, it seems unable to rest quietly during the day, and flies about in a lively manner. A very local species with us, found most frequently in the district of loose sandy soil known as the "Breck-sand" in Norfolk, Suffolk, and Cambridgeshire; elsewhere it is to be found in suitable places in Kent, Sussex, the Isle of Wight, Devon, and Essex, and rarely in Dorset, Middlesex, Gloucestershire, Lancashire, and Cheshire; once taken in Durham; formerly rather frequent in Yorkshire and in Sherwood Forest, Notts. A specimen, about which there is no question, was taken

in Gray's Inn Gardens, Holborn, London, by Mrs. Meldola; and on the Surrey side of the metropolis I myself took a specimen, forty years ago, at a gas lamp at Dulwich. The only records that I possess for any other portions of the United Kingdom are, in Scotland, that of one taken by Professor Traill at Old Aberdeen; in Ireland, one at Howth, near Dublin, by Dr. Percival Wright, and one at Derry by Messrs. Campbell.

Now while this is still in manuscript a specimen has reached me, caught last summer, by Mr. W. Evans, at Luffness, near Edinburgh; and Mr. John Ross, formerly of Anstruther, now of Kirkealdy, has sent me another—one of twelve specimens—taken by him in Fifeshire in July 1901.

Abroad it seems to be found all over Continental Europe except the coldest portions, Asia Minor, Armenia, Siberia, and Tartary; and in North America, in Wisconsin, Illinois, and Colorado.

2. **S. palealis**, *Schiff.*—Expanse  $1\frac{1}{4}$  inch. Fore wings sulphur-white, with the nervures often faintly pale brown, frequently also a pale brown cloud lies at the end of the discal cell. Hind wings silky white.

Antennæ of the male simple, dark brown, back of the shaft yellow; palpi small, dull chocolate; tongue broad and prominent; face chocolate-brown; head and thorax pale sulphur-yellow, the latter rather thick; abdomen not very slender, yellowish-white. Fore wings elongated, narrow at the base; costa almost hollowed before the middle, much arched beyond; apex bluntly angulated; hind margin straight and oblique, rounded off toward the anal angle; colour pale sulphur-yellow or sulphur-white; nervures narrowly browner; beyond the middle an ill-defined small black-brown cloud lies on the junction of nervures at the lower angle of the discal cell; cilia yellow-white. Hind wings not very ample; bluntly angulated at the apex, somewhat rounded behind; semi-transparent white with a smoky

tinge on the nervures and along the hind margin and apex; cilia pale sulphur. Female similar. In absolutely fresh and just emerged specimens the fore wings are often devoid of the brownish colour on the nervures, which then are of the same sulphur-white.

Underside much more strongly marked; fore wings pale sulphur-yellow; the costa, nervures, discal spot, and a short bar beyond it all dark brown. Hind wings white with the subcostal nervure brown, and a cloudy brown spot where it divides; hind margin faintly clouded with brown and having short similar streaks on the nervures. Body and legs yellow-brown, the latter browner in front.

On the wing in July and August.

LARVA rather stout, but fusiform; head large and broad, with the labium projecting, and the antennal papillæ distinct; lobes shining black, face greenish-white, with black bars in the middle and over the mouth; dorsal plate very broad, black, but having a greenish band spotted with black in front; body whitish-green; dorsal stripe smoky grey, broadened and narrowed on every segment; subdorsal stripes very broad, smoky grey; all the ordinary raised dots large, flattened, shining black; undersurface greenish-white with rows of similar black dots; spiracles small black; anal segment greyish-white, much spotted with black; legs and prolegs black, and a large black spot lies on the outer side of each of the latter. Much contracted when at rest. (Described from individuals furnished by Mr. C. W. Watts.)

August and September on the flowers of wild carrot (*Daucus carota*), feeding upon the flower-heads and green seeds, living in a tough tube of white silk in the flower or seed-head; rather sluggish, yet moving if necessary to another umbel. Abroad it is said to feed also on *Peucedanum palustre*, *P. oreoselinum*, and *Laserpitium latifolium*, all umbelliferous plants.

PUPA rather stout, the thorax full and slightly keeled, as

also is the back of the abdomen ; head, eye, leg and antenna covers well developed ; tip of abdomen rather blunt with a few minute points ; rather shining ; colour a light warm brown. (W. Buckler—condensed.) In a compact oval cocoon in the earth ; in this the larva remains unchanged through the winter and till late in the spring. Unfortunately only a very small proportion of the moths seems to survive and emerge. One curious trick of this species is that of occasional companionship in cocoon of two sociable larvæ.

I think it uncertain whether this species is a permanent resident with us. To me its habits seem to be those of an immigrant which succeeds for a few years in maintaining itself, and then dies out, to be reintroduced in some future more favourable year. When present it frequents dry fields, railway embankments, downs, and sometimes lanes near the sea-coast, flying about the wild carrot, which is so plentiful in such places, at early dusk and also in the daytime, when disturbed by the footstep. Here also at considerable intervals its larva is found, much more plentifully, yet it is only in some especially favourable season that the moths show a corresponding increase of numbers. It seems to have been long known as British, for Haworth speaks of it as very rare. This continued to be the case till about 1858 when a great many specimens were obtained in the Warren and adjoining coast at Folkestone. Two years later it had spread to Herne Bay, Deal, and other parts of the coast of Kent. From that time for some years it spread rather widely over the county of Kent, and to Sussex, Hants with the Isle of Wight, where it has been taken at light ; to Devon, Essex, Suffolk, Norfolk, and Cambridgeshire ; also casual specimens were taken in Berkshire, and even in Lancashire, while one specimen found its way to Brockley in the South London suburbs. A great falling off occurred after 1877, and for a time it seemed to have very nearly died out ; but in 1898 it reappeared in Kent, and in the following two years in

Essex, and may still be found in these two counties—indeed the larva was found in some numbers in 1901. Some of these were kindly sent me by Mr. C. W. Watts, have hibernated in my own possession, and have now (1902) happily emerged. There is also a record of capture last year by Mr. A. E. Gibbs in Herts.

Abroad it has a rather wide distribution through Central and Southern Continental Europe, South Norway, Corsica, Madeira, the Canaries, Morocco and other parts of Northern Africa, Asia Miur, Syria, Persia, Tartary, Northern India, China, and Japan.

3. *S. cinctalis*, *Tr.*; *verticalis*, *Staud. Cat.*—Expanse 1 to  $1\frac{1}{4}$  inch. Fore wings rich shining ochreous yellow; transverse lines and edges of the stigmata deeper ochreous. Hind wings yellowish-white with faint smoky transverse lines. Underside very strongly marked in black.

Antennæ long, threadlike, pale yellow; palpi very small, triangular, pale chocolate; head and thorax yellow; abdomen yellowish-white. Fore wings elongated, narrow at the base; costa arched throughout; apex angulated; hind margin oblique but very little rounded; shining silky yellow; the markings faintly of a richer yellow; first line erect, second very oblique, but nearly straight and rippled; subterminal line broad and a little more distinct; orbicular and reniform stigmata of the same richer yellow, but indistinct; cilia pale yellow. Hind wings broad, rounded behind; apex very bluntly angulated; yellowish-white with faint indications of cloudy smoke-coloured transverse stripes in the middle, and at the hind margin; cilia pale yellow. Female very similar, yet having the fore wings a very little shorter and more blunt, and the body thicker.

Undersides of all the wings pale yellow with the nervures black-brown; the transverse stripes, and the stigmata, dull black, and a clouding of the same round the latter; margins of all the wings finely scalloped with leaden black. Body

barred with smoky black ; legs yellow above, smoky black beneath.

On the wing in June and the beginning of July ; and in the South a partial second generation in August.

LARVA apparently still undescribed. Ragonot says : " Schrank found the larva on *Sarothamnus scoparius* but did not describe it. Herr A. Gartner found it at the end of June spun up in a leaf of *Atriplex patula*, the moth appearing early in August. Herr v. Nolcken has bred it from a handsome larva feeding on *Cirsium arvense*, and gives a good description." This description is as follows : " Pale green with three black warts on each segment. Head pale brownish dappled with darker nut-brown." But from the well-known habits of the moth it is difficult to believe that it feeds on thistle or on orache, while broom is altogether absent from the clover fields in which it so constantly lives. I feel little doubt that it will be found upon clover.

The moth, as just stated, is constantly found in clover fields, sitting among the clover (and apparently upon no other plants) by day, flying up vigorously if disturbed, and mounting much higher in the air than is usual in the *Pyralidæ*, travelling to some distance, yet settling again among the clover. Also to be found on downs, hillsides, and rough fields where trefoils abound. At night it will fly to a strong light, even to a gas-lamp along a road, and I have taken it at the sugar used as a bait for *Noctua*. Although I have met with it commonly in various districts, this has never occurred among broom or thistles, but only as just described. It was formerly found in the suburbs of London, but has apparently retired or been expelled ; it is still moderately common throughout the South of England and the Eastern counties to Norfolk, reaching also Cambridgeshire, Northamptonshire, Oxfordshire, Gloucestershire, Herefordshire, and Worcestershire. In Wales I have found it commonly in Pembrokeshire, but have no reliable records,

beyond these limits, in the British Isles; those received being probably referable to the next species—the present never being found “among nettles.”

Abroad it has a considerable distribution through Central Europe, South Norway, Sweden, the Pyrenean region, Italy, Corsica, Russia, Asia Minor, Tartary, Northern India, Afghanistan, and Japan.

4. **S. verticalis**, *Schiff.*; **ruralis**, *Staud. Cat.*.—Expanse  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inch. All the wings pale yellow, or yellowish-white, with a bluish pearly lustre; the transverse lines smoky brown, all curved, rippled, and bent.

Antennæ long, simple, shining yellow; palpi short and very blunt, pale chocolate; head pale reddish-yellow; thorax straw colour; abdomen shining yellowish-white. Fore wings elongated, broad behind; costa arched beyond the middle; apex bluntly angulated; hind margin gently curved, rather oblique; yellowish-white with a faintly blue and very pearly gloss; first line rather straight, nearly erect; second erect from the dorsal margin but strongly angulated, then below the middle bent very widely outward, rippled and curved up to the costa; orbicular and reniform stigmata small, obscure and cloudy; beyond the latter is a series of cloudy dashes; all these markings are smoky grey or smoke colour and rather faint, and a cloud of the same tint lies along the hind margin; cilia concolorous, shining. Hind wings of the colour and pearly gloss of the fore pair with two very irregular rippled cloudy transverse stripes, and a row of similar dashes inward from the hind margin; cilia shining pale yellow. Female similar.

Undersides of all the wings of a white shade of yellow and similarly pearly; all the markings faintly represented, except that the reniform stigma becomes a more distinct black discal spot. Body and legs pearly pale yellow.

Variable in the tint of ground colour from pale yellow to pearly white, and more so in a smoky shading which some-

times pervades the greater portion of the area of all the wings.

On the wing from the end of June till August.

LARVA rounded, tapering to each extremity; the sides puckered and wrinkled; head small, greenish; the mouth dark brown or black; body very glossy light green; dorsal line darker green; spiracular line yellowish, inconspicuous, usual spots slightly raised, each emitting a pale hair; anal prolegs extended backwards. (Chas. Fenn.)

March till June or July—but probably from the preceding autumn—on stinging nettle, rolling up the leaves; very active, wriggling backwards when disturbed. When young the raised dots are dark green, but at each moult they become paler until they agree accurately in colour with the skin.

PUCHA three-quarters of an inch long, moderately slender; head well developed; thorax somewhat ridged; wing-covers long; flexible rings of the abdomen well cut and gradually tapered; cremaster furnished with two curly-topped converging spines crossing each other near their extremities. Colour pitchy black; abdominal segments dark ochreous-brown; not very glossy except on the head and thorax. (W. Buckler.)

Between two leaves of nettle, in a chamber lined with silk. Not more than two or three weeks are passed in this condition.

This moth may be found, in the South of England, in almost every bed of nettles, and is often so abundant as to be a positive nuisance to a collector at dusk. In the daytime it flutters out of the nettle-bed if one walks through, but endeavours at once to conceal itself in a similar place, and often very close to the ground, also loves to hide in dense herbage, such as clematis, when this grows close by. Its peculiarly pearly appearance instantly catches the eye, and to this species doubtless is due the common name—

Pearl—which is ordinarily given to the group of species to which it belongs. It is found in the London suburbs, though not in such numbers as formerly, but is sufficiently plentiful throughout the Midland, Eastern, and Western, as well as the Southern Counties of England; less common in the more Northern districts, apparently not observed in Cumberland or Northumberland, and very rare in Westmoreland. In Wales it exists in southern districts, but not always commonly; in the north, perhaps, in plenty, but confused with the last species; in Scotland it has been taken in Perthshire and near Aberdeen, but is certainly scarce; in Ireland it is common in the County Cork, yet with the exception of a specimen at Sligo, scarcely seems to be known elsewhere.

Abroad it is common throughout Central and Southern Europe, including Corsica, and is found in Northern and Western Russia, Asia Minor, Armenia, Tartary, Syria, and Japan; and I have received it—rarely—from South Africa.

5. *S. urticalis*, *Schiff.*; *urticata*, *L.*—Expanse  $1\frac{1}{4}$  inch. Thorax yellow; all the wings silky white, broadly banded and spotted with slate-black.

Antennæ rather long, simple, dull dark brown; palpi very short and blunt, black-brown, head and thorax light yellow; abdomen glossy, smoky black, with each segment edged with yellow; anal tuft pale yellow. Fore wings rather narrow; costa nearly straight three-fourths of its length, then a little arched; apex angulated; hind margin faintly retuse, then obliquely rounded; silky white; costa slate-black dusted with yellow; on the basal portion of the nervures is a thick yellow frosting, which rather breaks up a slate-black basal blotch; first line a broad, sometimes broken, slate-black irregular bar, beyond this is a large cloudy discal spot of the same colour; the second line arises on the discal margin as a large similar cloudy blotch, attenuated and interrupted as it bends outwards, it makes a beautiful curve up and broadens again as it approaches the costa, being also much indented on

the way; hind margin occupied by a broad band of still blacker slate colour, often divided by pale nervures; cilia concolorous with it. Hind wings silky white; at a short distance from the base, and near the costal margin is a small slate-black spot; beyond the middle an irregular, often broken, transverse stripe, and along the hind margin another broader and more even, both these stripes or bands are of the same dark colour, and both much divided by pale nervures; cilia black at the base, tipped with white. Female similar.

Undersides of all the wings exactly as on the upper sides. Body yellow, barred with black; legs slate-grey.

Usually constant in colour and markings; but occasional—rare—specimens have been taken in gardens in South London, in which the two outer bands, on both fore and hind wings, are united, and even more blackened, until the wings are quite one-half black. One such was taken a few years ago by Mr. R. Adkin at Lewisham, and I took another at Nunhead—also an intermediate example.

On the wing from June till August.

LARVA smooth and semi-transparent, rather shining; head black, with three white spots on the face; body whitish-ochreous, dark green on the back, with a double, pale green, whitish, or yellowish dorsal stripe, divided by a green line; dorsal plate horny, having a black spot on each side; the usual raised dots and spiracles black, very minute.

Or—Unicolorous bright pink, or pale carmine; under-surface paler; head black with three pink spots on the face, the middle one larger and elongated; the usual black spots on the dorsal plate.

When young pale bone colour, with a bright green dorsal line. (Chas. Fenn.)

August till September or October, on nettle (*Urtica dioica*), also occasionally on *Stachys sylvatica*, *Marrubium vulgare*, *Mentha*, and many other Labiate plants, both wild and cultivated; living in a drawn-together, or rolled, leaf.

When full fed it leaves its food-plant and spins a pretty, transparent, coffin-like cocoon under loose bark or in any convenient corner, and here remains, as a larva, perfectly visible, until the following May or June, when the pupa state is assumed. But occasionally it happens that the larva is brought indoors with herbs for drying, and having formed its cocoon in a warm portion of the house, its transformations are forced on, and the moth emerges in January or February.

PUPA light chestnut colour; not more fully described; in cocoon as mentioned above.

The moth is abundant about beds of nettles and also in laes and gardens, and is one of our most familiar insects. It hides among herbage and in hedges and bushes, and is easily disturbed by day, flying lazily to a similar hiding-place. At dusk it is conspicuous from its rather hovering horizontal flight. Found in plenty in the London suburbs and throughout England except that it becomes scarce in the most northern counties; also common throughout Wales and Ireland; scarce in Scotland though found near Edinburgh and in Clydesdale. Abroad it is common throughout the Continent of Europe except the coldest portions; and in Corsica; also in Asia Minor, Armenia, Tartary, and Western China.

#### Genus 8. **MECYNA.**

Antennæ simple; palpi pointed, projecting; tongue large, head prominently rough; thorax elongated, rough in front; abdomen long, tapering, pointed; fore wings elongate, trigonate and pointed, discal cell of the usual width; hind wings moderately broad, the cell short and broad, cross-bar angulated; legs rather short.

We have but one species.

1. **M. polygonalis**, *Hüb.*—Expanse 1 to 1¼ inch. Fore wings elongated; purple-brown, with black stigmata, and pale second line. Hind wings yellow with a black border.

Antennæ simple, purple-brown; palpi long, porrected, pointed, pale chocolate, with a white tuft of scales beneath; head and thorax chocolate-brown; abdomen tapering, pale ochreous. Fore wings elongated, very narrow at the base; costa faintly arched throughout; apex angulated; hind margin a little retuse, then gently curved and very oblique; anal angle prominent; dorsal margin somewhat hollowed; pale purple-brown, shaded with darker; first line hardly perceptibly blacker, rather oblique; second line an obscure series of cloudy blackish dots lying in a paler shade; in the discal cell are two cloudy black spots, the outer rather squared; cilia purple-brown. Hind wings rounded behind; bright yellow; along the hind margin is a smoky black band, broadest towards the apex; cilia pale yellow. Female larger, similar, or with the colour of the fore wings deeper, and the markings more distinct.

Undersides of all the wings ochreous-yellow shading into pale purple-brown toward the apex and hind margin; discal spot distinct, smoky black. Body and legs yellow.

On the wing in June; and possibly as a second generation in August and September.

LARVA slightly over one inch in length, of an elongate fusiform shape, somewhat narrow in proportion to its length; head round, rather flattened in front, black, with a few short white hairs; second segment small, black, with three pale lines, the two outer extending to only one-half its length; the middle one joins a broad pale dorsal stripe which reaches the anal segment in small spots; there is a narrow yellowish-white, spiracular line, adjoining the upper side of which is a row of bright yellow blotches; the space between the latter and the dorsal stripe is black, with, on each segment, three brighter black warts, each of which emits a rather long white hair. (Mrs. T. V. Wollaston.)

June and July on *Cytisus nigricans*, *C. laburnum*, *Ulex nanus* (flowers), and probably other Papilionaceous plants. Mr. G. F. Mathew says—as to the Mediterranean region—

“Larva common and gregarious, feeding on a species of *Cassia*”; and at Gibraltar Mr. J. J. Walker found it similarly, feeding on *Retama*.

PUPA apparently undescribed, in a white cocoon under a stone, or attached to the stem of the plant. (A. Schmidt.)

The moth is said by Mrs. Wollaston to love the grassy slopes of hills, where sometimes it occurs in abundance. In this she refers to St. Helena, where it is common. With us it is so rare that its habits are scarcely observed. In South Africa my sister takes it at the blossoms of peach and apricot in the evening.

Excessively rare in these Islands; first recorded as British by J. F. Stephens in his “Illustrations” under the name of *diversalis*. He says: “The only example I have seen of this beautiful and distinct species is in the collection of the British Museum, it was taken near Bristol, in July 1815.” In the year 1856 one was taken in the Isle of Wight and another in Sussex; in 1869 one by the Rev. A. H. Wratistlaw at Bury St. Edmunds, Suffolk; in 1877 two were taken near Deal, Kent, by Mr. W. H. Tugwell, both at night, one on a flower of rush, the other on that of hemp-agrimony. With the addition of a specimen obtained in Somerset in 1885, this is the whole number of captures known to me in the British Isles. There is nothing in them to indicate that it is a constant resident—these captures seem to indicate only a casual and occasional immigrant. Abroad it has an immense range including almost all Europe, Palestine, Asia Minor, Syria, India, Ceylon, Aden, St. Helena, the Canaries, Madeira, Egypt, Morocco, Algeria, and South Africa; Mr. E. Meyrick records it in Australia, and speaks of it as “cosmopolitan.”

#### Genus 9. **MARGARODES.**

Antennæ simple; palpi broad, flattened at the sides; head much flattened above; thorax smooth; abdomen shining,

elongated, anal tuft spreading. Fore wings long, pointed, sub-diaphanous, cell small; hind wings short, with the hind margin straight; cell wide; cross-bar angulated; legs long and slender.

We have but one species.

1. **M. unionalis**, *Hüb.*—Expanse  $1\frac{1}{8}$  to  $1\frac{1}{4}$  inch. All the wings semi-transparent white with a brilliant pearly lustre; costa of the fore wings edged with orange-brown.

Antennæ of the male rather long, simple, light brown; palpi short, pale chocolate; head and thorax shining white; abdomen pearly white, but the anal tuft in part smoky black. Fore wings long and narrow; the costa straight to beyond the middle, then strongly arched; apex angulated; hind margin oblique and very nearly straight; colour shining diaphanous white, very pearly, the nervures opaque; costa narrowly edged with light orange-brown; occasionally a black dot is visible at the base of the discal cell, and another at each of its outer corners; cilia pearly white, Hind wings broad; angulated at the apex, hind margin but little curved and anal angle prominent; transparent pearly white with similar cilia. Female hardly differing except that the anal tuft is wholly white; body a little stouter.

Undersides of all the wings pearly white with a more opaque white stripe down the costa of each. Body and legs white except that the black tuft is visible in the anal extremity of the male.

On the wing in June and in September and October, but whether in two generations is doubtful.

LARVA yellow-green with green stripes and a yellow-green head. In autumn on olive. (Millière.)

PUPA apparently undescribed.

This moth is so rare with us that very little is known of its habits. It has been taken at light at night, and also at flowers. The first known British specimen was obtained at

Torquay, Devon, in the year 1859, and Mr. Stainton recorded the capture of two more in that year. In 1861 another occurred, at Torquay; in 1869 four more, one of them in Camberwell in the London suburbs, the others in Kent and the Isle of Wight; and in 1877 five more—two taken by Mr. Tugwell at Deal, the others at Torquay, Dartmouth, Devon, and the Scilly Isles, respectively. In June, 1880, a specimen was found in the daytime, hanging to a grass blade, on the sandhills at Great Yarmouth, Norfolk, by the late Mrs. F. D. Wheeler, and this specimen, by the kindness of Dr. Wheeler, is now in my own collection. The only subsequent records within my knowledge are, one in Hants in 1884, and one in Dorset in 1900; all being therefore captured upon the coast and all but one on the *South* coast of England. Apparently not known elsewhere in Central Europe; but found in Southern Europe including Turkey, Corsica and Gibraltar; also in Bithynia, Syria, Southern India, Nepal; Egypt, Tangier and elsewhere in Northern Africa; the Canaries, Madeira, Mauritius, and South and Central Africa, even extending to the Congo.

#### Genus 10. **ANTIGASTRA.**

Antennæ simple, rather thick; palpi very broad, flattened at the sides, tongue thickly scaled; head, thorax, and abdomen smooth, the latter not very long; fore wings narrowly trigonate, sharply pointed, the cell narrow; hind wings small, narrow, thin and weak; the cross-bar faint, legs very long and thin.

We have but one species.

1. **A. catalaunalis**, *Dup.*—Expanse  $\frac{3}{4}$  inch. (18 mm.). Fore wings very narrow and pointed, pale yellow, with all the nervures, the costa, and the hind margin reddish-buff. Hind wings yellowish-white.

Antennæ of the male rather thick, simple, reddish-drab; palpi of the same colour, short, porrected and pointed,

trigonate; eyes purple-brown; head reddish-drab; thorax the same colour, very slender; abdomen thin, pale straw colour. Fore wings narrow, pointed, costa only arched beyond the middle; apex sharply pointed; hind margin just beneath it retuse, and very gracefully curved off; colour pale yellow-drab, with the costa and all the nervures shaded with reddish-buff or fulvous, and the hind margin edged by a line of the same colour; cilia white. Hind wings narrow, with the hind margin rather flatly rounded; semi-transparent yellowish-white with a faint tinge of fulvous round the apical margin, and the costal area rather opaque; cilia white. Female similar.

Undersides of all the wings pale straw colour, and their middle portions more thickly clothed with scales; all the costal margins edged and clouded with fulvous and having two or three faint brown dots. Body and legs pale yellow, the hind legs very long.

On the wing in August and September.

LARVA light yellow-green, with slender reddish lines and black raised dots; head small, glossy black; dorsal plate with two black spots.

In the spring upon *Linaria spuria* (Millière).

PUPA undescribed.

We have no more rare species than this. A specimen was taken at Cheshunt, Herts, in September 1867, by Mr. W. C. Boyd, and is still in his collection. It was captured while flying at dusk, with an oscillating motion like that of a house fly, in his father's garden, and is absolutely reliable. It seems that no means by which it could have been accidentally introduced existed near the place, whereas its food-plant grew in a neighbouring field. Whether at the time a slight immigration of this species took place there is no evidence to show. It is a delicate little species, extremely slender and inconspicuous, and very easily overlooked.

Abroad it has a wide distribution through Southern and Western Europe, Italy, Dalmatia, Austria, Asia Minor, Aden, Arabia, India, Tropical Africa including the Congo and Nyassaland; and also South Africa.

Genus 11. **DIASEMIA.**

Antennæ simple, densely ciliated; palpi tufted, long and drooping; head rough, thorax smooth; abdomen very thin; fore wings long, narrow, pointed, but the discal cell of the ordinary form; hind wings long and pointed, the cell wide and the cross-bar deeply angulated; legs very long and thin.

We have two species, readily discriminated.

A. White second line of fore wings erect. *D. literalis.*

A<sup>2</sup>. White second line of fore wings oblique.

*D. ramburialis.*

1. **D. literalis**, *Schiff.*; **literata**, *Staud. Cat.*—Expanse  $\frac{5}{8}$  to  $\frac{7}{8}$  inch (15–22 mm.). Fore wings very narrow, dark brown, streaked with bronzy brown; stigmata and lines white, the second line once angulated but erect; hind wings blackish brown with angulated white stripes; cilia chequered.

Antennæ of the male simple, brown; palpi slender, pointed, drooping, dull brown; head and thorax dark brown, the shoulder lappets long and paler; abdomen blackish-brown, each segment edged with white. Fore wings narrow costa straight but much arched beyond the middle; apex sharply angulated; hind margin oblique and faintly retuse; dull umbreous with bronzy brown shading and the markings sharply white; first line an abbreviated stripe from the dorsal margin to the median nervure, having before it a white spot, and beyond it another, larger and somewhat diamond-shaped; beyond this, but above the median nervure is a triangular white spot, and beneath it a large whitish

blotch, intersected by the brown second line; this last is nearly erect, but throws out a bend towards the anal angle and thence lies almost prostrate on the dorsal margin; cilia dark umbreous dashed with white. Hind wings long and rather pointed at the apex; the hind margin sinuous; colour dark umbreous; basal area shaded with white and having a round white dot at the costal edge; in the middle is a white transverse stripe, and beyond this another, narrower, and placed in a different direction; cilia umbreous dashed with white. Female similar, ground colour rather darker.

Undersides of all the wings rather more dull brown with all the white markings repeated. Body brown with white rings. Legs brown above, white below.

Usually not variable, but I possess a specimen, taken in South Wales, in which the white markings are so enlarged and spread as to occupy the greater portion of all the wings.

On the wing at the end of May and June, and as a second generation in August and September.

LARVA and pupa unknown.

The moth frequents dry hilly pastures, hillsides and downs, hiding among the scantiest herbage, flying up from the footstep to settle again in the space of a few yards, and hang gracefully to a blade of grass, or if there is any wind, to creep into some slight shelter of a thicker tuft. The time of greatest activity seems to be from 5 to 6 P.M., but doubtless there is also a night flight, since it comes occasionally to light, flying apparently some little distance for that purpose. From its alertness during the day and from its general appearance it might reasonably be expected to fly naturally at that time, and possibly this may be the case in the early morning or the forenoon, but in my own experience it seemed never to fly by day except when disturbed. Abroad it is common in dry pastures and *vineyards*. Usually a rare species with us; formerly found in the New Forest, Hants; and near Sanderstead, Surrey; but from these places it

has, I think, disappeared. More than forty years ago it was found near Plymouth, and more recently in other parts of Devon, also near Bristol, and rarely in Sussex, Dorset, and Cornwall. In Wales it was taken in Carmarthenshire thirty years ago, and a few years later I found it in some plenty in Pembrokeshire, but here after two seasons it became scarce or else shifted its locality, and I cannot say that it can now be found with certainty in any one of these localities. On the other hand, it seems worth while to look for it in any hilly district, of very poor pasturage, in the South-west.

Abroad it seems to be found all over the Continent of Europe except the coldest portions also in Bithynia, Southern and Western China, India, Ceylon, and Japan.

2. **D. Ramburialis**, *Dup.*—Expanse about  $\frac{3}{4}$  inch (18–20 mm.). Fore wings narrow; grey-black clouded with black; discal spot and the oblique second line white; hind wings of the same colour, with two white stripes; all the wings dusted with white; cilia chequered.

Antennæ of the male simple, dark brown; palpi very small, pointed, black-brown; face and head light brown edged on either side with white; collar white; rest of thorax black-brown; abdomen brown. Fore wings very narrow; costa faintly arched at the base, more so beyond the middle, but almost hollowed between; apex bluntly angulated; hind margin hardly curved, but oblique and faintly bent in the middle; black brown, dotted with shining white; first line faintly suggested by a white clouding; second line a shining white stripe, very oblique, divided in the middle, and below this spread into a white patch with black clouding; orbicular stigma round, white; reniform stigma less distinct, broken up into two or three small whitish dots; along the hind margin is a faint line of white dots margined with black; cilia white clouded and chequered with black. Hind wings narrow, with the apex bluntly angulated; the hind margin sinuous and not rounded; black-brown, having at the base a broad

silvery-white transverse stripe, and in the middle another, more distinct, and partly divided by a black line; before and beyond this are some elongated white dots, and some similar clouds and streaks lie along the hind margin; cilia white, chequered and interrupted with black. Female similar.

Undersides of all the wings smoky-brown, with the white markings of the upper side more obscurely reproduced. Body and legs black brown.

On the wing in June and July and probably in a second generation in October. These are the months in which it has been taken *here*. Ragonot states that it flies "in April and August in marshy places."

LARVA and PUPA unknown.

This is one of our most rare species, and cannot be looked upon otherwise than as a casual immigrant. The first specimen noticed in these Islands was taken on June 16th, 1858, by Mr. Thomas Boyd, flying at dusk in a swamp near Probus, Cornwall. The second was taken at Lewes, Sussex, on a bank at the edge of some meadows, in October 1866 by Mr. G. H. Verrall. A third was found in September 1877 near Ashford, Kent, by Mr. W. R. Jeffreys. He says, "it was flying in the afternoon in *Pyrausta* fashion over some brambles and other dense undergrowth in a wood near the top of one of our chalk hills; so dense was the undergrowth that it was with great difficulty that I used my net." In the following year Dr. R. C. R. Jordan took a specimen at "sugar" on an apple tree in his garden at Teignmouth, Devon; and Mr. W. Purdey captured another at Folkestone, Kent, "among long grass and rushes in very wet ground in October." In September 1880 Mr. R. E. Salwey secured a specimen near Dover "by beating hemp agrimony," and in July 1889, the Rev. C. R. Digby obtained one in a grassy hollow at Portland, Dorset. This I think completes the record for these Islands, and it is worthy of notice that these seven specimens, occurred in five different counties—Kent,

Sussex, Dorset, Devon, and Cornwall—all situate upon the south coast of England. I have thought it well to give details in each case, where obtainable, because we have no opportunity to gain any general knowledge of its habits.

Abroad it has an extensive range—France, Italy, Austria, and Southern and Western Europe generally; Bithynia, Syria, all parts of India, and other portions of tropical Asia; South Africa, Nyassaland, Mashonaland; the United States of America; Queensland, New South Wales, and other portions of Australia; and indeed tropical regions generally.

### Genus 12. **AGROTERA.**

Antennæ simple; palpi short, blunt, triangular; head and thorax rough with raised scales; abdomen slender, smooth; fore wings rather narrow, pointed, retuse, scalloped behind; hind wings long, with undulating hind margin; the cell narrow, and the cross-bar oblique; legs rather long.

We have but one species.

1. **A. nemoralis**, Scop.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings pale purple, darker in the middle; basal region yellow; cilia chequered. Hind wings pale smoky-brown.

Antennæ simple, ciliated, bronzy-yellow, ringed with brown; tongue thickly covered in front with scales; palpi short, up-curved, chocolate-brown; head rich chocolate; thorax shining white tinged with orange-yellow, and having across the middle an orange-brown stripe; abdomen slender, orange-yellow clouded with white near the base, shading into dark brown behind. Fore wings rather narrow, apex sharply angulated; costa arched; hind margin sinuous or scalloped; from the base to the curved first line light yellow with faint orange lines; rest of the wing pale purple-brown except a yellow line along the costa; second line just perceptible, very irregular, brown; cilia bright pearly white interrupted by squared brown spots. Hind wings rather

elongated, the hind margin very sinuous; pale smoky-brown crossed by an exceedingly faint darker line; cilia pearly white clouded with smoky brown, and having a dark line along the base. Female similar.

Underside of the fore wings pale yellow with extensive smoky clouding in the middle; second line and cilia as on the upper side. Hind wings also as above. Body and legs dusky yellow.

Usually not variable, except that specimens of the second brood are more dull in colour.

On the wing in May and June; and as a partial second generation, at the end of July and in August.

LARVA three-fourths of an inch in length, slender, head rather flat and as wide as the second segment; the body thickest from the seventh to ninth segments, thence tapering to both head and tail; anal prolegs stretched out behind; the skin very glossy and glistening, though somewhat wrinkled; colour of the head pale orange-brown; the antennal papillæ paler still and tipped with black; the mouth brown; the ocelli black, and a black spot some distance behind them on the side of the head; the back to the spiracular region is of a rather brownish olive-green; the dorsal line darker olive-green; an undulating row of internal darker blotches runs along, in an interrupted manner, a little above the spiracles, showing plainly through the translucent skin; spiracles very small and inconspicuous, ringed with brown; below them the rest of the side and the undersurface and legs are of a uniform tint of very pale watery olive-green. (Rev. J. Hellins.)

End of June and in July on horn-beam (*Carpinus betulus*), feeding on the leaves, hiding at first on their undersides under the protection of a few threads of silk; afterwards joining two leaves together. In all probability a second generation feeds in late autumn, but on this point information is wanting.

Abroad it is said to feed also on oak, beech, and hazle.

PUPA undescribed. In a chamber formed by folding over and spinning down a portion of a leaf while still upon the tree.

The moth seems to confine itself to woods, where it flies in the evening, but may be beaten out during the day. Its discovery as a British species seems to have taken place in 1851, when a few specimens were captured near Henfield, Sussex; for twenty years it continued to be considered rare, but in 1873 it was found in plenty in Abbott's Wood, near Hailsham, Sussex. Here it continued for some years to be common, but from over-collecting or some other cause became after a time greatly reduced in numbers, and has, I believe, now been for some time scarce. Except for a single record in the adjoining county of Kent, this part of Sussex seems to be the extent of its range in these Islands. Abroad it is a common species in Central Europe, Northern Spain, Italy, Southern Russia, and Bithynia, and extends to China and Japan.

### Genus 13. **LEMIODES.**

Antennæ simple but bristly; palpi long and tufted; head rather rough; thorax slender; abdomen moderately long; fore wings broad and squared behind, cell also squared behind; hind wings broad and fully rounded, the cell pointed and cross-bar oblique; legs of moderate length.

We have only one species.

1. **L. pulveralis**, *Hüb.*—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings squared behind; all the wings pale buff or pale yellow-brown, transverse lines obscurely darker. Curiously resembling a Deltoid of the Genus *Herminia*.

Antennæ simple, ciliated, shining pale brown; palpi long, pointed, porrected, whitish-brown; head and thorax also of this colour; abdomen slender, yellowish-white, dusted with brown. Fore wings very obtuse, broad and short; costa very slightly arched; apex bluntly angulated; hind margin nearly

perpendicular and but little rounded off below ; dorsal margin filled out ; colour very pale drab, shining, dusted with yellow-brown ; first line rather erect but faint, curved and composed of brown dusting ; second line a little more distinct, sinuous, not very oblique, yellow-brown ; beyond it is a parallel shade of yellow-brown atoms ; cilia yellowish-white. Hind wings broad, rounded behind, the apex bluntly angulated ; shining pale yellowish-drab, dusted with brown, and having a faint central brown transverse line ; cilia yellowish-white. Female similar, or sometimes having the brown transverse lines more distinct and broadened into faint stripes.

Undersides of all the wings shining pale yellow-drab, with the faint markings of the upper side repeated. Body and legs yellow-drab.

On the wing in June and July. It has been reared indoors, abroad, in a second generation, in September.

LARVA. Ground colour grey with violet-red stripes ; six black, white-rimmed warts on each segment ; head marbled, dark and light brown ; thoracic segment black, divided down the middle, where it is paler ; anal segment pale brown. (Herr H. Disque.)

May and June, and a second generation in August and the beginning of September ; on *Mentha hirsuta*, *M. aquatica*, and *Lycopus europeus*.

Several attempts have been made here to rear this species from the egg, but from some unexplained cause all have failed ; in each case the larvæ have died while quite young and without assuming distinctive markings.

PUFA undescribed.

The moth frequents marshy places, and on the Continent is well known to be readily disturbed by day, in such places, from among the tall reeds, sedges, and marsh plants. In this country opportunities for observing it have been limited. It was erroneously recorded as British by J. F.

Stephens, who subsequently discovered that the specimens were only *Botys fuscalis*. The first genuine captures appear to have been made in the Isle of Wight and at Folkestone in the year 1869, in both instances in very marshy spots near the sea. In the following years considerable numbers were secured in these two very restricted localities, and then, as seems natural, the numbers declined, until one locality became quite unproductive, and the other was totally washed away by the sea.

On July 27, 1870, I myself was collecting, with the Rev. E. N. Bloomfield, along the bank of one of the long drains in Ranworth Fen, Norfolk, when a specimen of this species flew up from our feet and was secured. We worked hard for more without result, and so far as can be ascertained this is the only specimen which has ever been seen in any portion of our fen district or in any part of the Eastern Counties, and the occurrence of this specimen—which is in my cabinet—is one of the most perplexing experiences that has happened to me. The only recent captures of which I am aware are of a few specimens in the Isle of Purbeck in 1899, and the three subsequent years, recorded by Mr. Eustace R. Bankes, and of one in Surrey, in 1902, by Mr. R. South; and except for the strange capture in Norfolk, its range with us appears to be strictly limited to the coasts of Kent, Hants, and Dorset. Abroad it is found over the greater part of Europe, except the extreme western and northern portions; and it also occurs in Armenia.

#### Genus 14. **NOMOPHILA.**

Antennæ simple; palpi pointed, drooping; head rough with converging scales; thorax smooth; abdomen slender; fore wings long and very narrow, blunt; the cell also long and narrow; hind wings ample, cell short and pointed; cross-bar curved; legs long.

We have but one species.

1. *N. hybridalis*, *Hüb.*; *noctuella*, *Staud. Cat.*—Expanse 1 to  $1\frac{1}{8}$  inch. Fore wings long and very narrow, but not pointed; pale grey-brown with very large black-brown stigmata; hind wings ample, smoky brown.

Antennæ of the male simple, shining brown; palpi short, triangular, reddish-brown, paler inside; head and thorax dull brown; abdomen dull grey-brown or mouse-colour. Fore wings very narrow; costa straight for two-thirds of its length, thence arched, and the apex almost rounded; hind margin short, rather oblique and very little curved; dorsal margin gracefully undulating; colour pale umbreous or grey-brown, very dull; transverse lines darker brown, usually scarcely perceptible, the first erect, much angulated, throwing out a darker streak at the discal cell, second incomplete, toothed, and curved; subterminal line indicated by a series of faint hollowed clouds of brown dusting; the only conspicuous markings are the very large stigmata, the orbicular is duplicated, forming two black-brown rings which lie across the wing, the reniform also large, brown with a black edging, and extended by a large similar cloudy spot below; costa beyond the middle dotted with dark-brown; hind margin edged with minute black-brown crescents; cilia pale umbreous. Hind wings very large and broad; the apex bluntly rounded; the hind margin also broadly rounded, but the anal angle prominent; unicolorous smoky-brown; cilia paler. Female similar, but the two large stigmata often even larger and more strongly marked.

Underside of the fore wings very pale smoky-brown; costa more yellow-brown, and having several brown dots in its sub-apical area; discal spot small, smoky brown. Hind wings pale smoky brown, shining with a golden gloss. Body yellow-drab. Legs pale brown.

Variable, as already suggested, in the depth of the markings—which in some specimens are almost imperceptible—also in the ground colour, from grey-brown to pale drab.

On the wing from June till October, but whether in one or more generations is at present uncertain.

LARVA when at rest only three-fourths of an inch long and tolerably plump; when crawling one inch in length and has an attenuated appearance; head a little wider than the second, but hardly so wide as the third segment, highly polished, the lobes rounded, and the jaws prominent, varying from reddish-brown to dark sienna-brown, more or less marbled with black, and with the mandibles black; body attenuated a little toward the extremities, cylindrical, but the segmental divisions being deeply cut, and each segment plump and divided, uneven in appearance; a polished plate on the second segment is a little browner than the following segments; skin semi-translucent and glossy, with a tough appearance, warm olive-drab; dorsal line dark olive-drab, bordered with pale drab and very distinct; no noticeable subdorsal or spiracular lines, but there is a whitish waved stripe below the spiracles—which are black encircled with grey; raised dots large, round, black, and polished, each in a circle of pale drab; ventral surface uniformly semi-translucent, dark olive-green.

When young and till just before full growth, much more slender, and having the head even larger than the third segment.

These larvæ were about the liveliest creatures I ever reared; they wriggled backwards and forwards in all attitudes, reminding me more of young eels than anything else, in both colour and actions mimicking those creatures most wonderfully. They were, too, very pugnacious, as two coming in contact immediately showed fight, and bit each other with their mandibles most numercifully. (G. T. Porritt.)

August and September—doubtless also in other months—on clover, grass, knotgrass, and probably other low-growing plants. Mr. E. P. Felt supplies some interesting details as

to the history of this little-known larva, as observed in North America. In September he found among the grass and clover, in a pasture, several of these larvæ; he says: "Upon being disturbed, they quickly disappear with a peculiar wriggling, jerking motion, under the grass; they seem to move with equal facility either forwards or backwards; when not feeding they may be found under a slight web in the middle of a clump of grass. Later observations show that they live almost wholly upon clover leaves, eating out the soft parenchyma and leaving the veins; they will eat grass if clover is not within reach, and one larva was observed to seize an *Aphid* and devour it, though there was plenty of food within reach. In the autumn, as the cold weather advances, they begin to spin nests in the axils of the leaves, where they retire when not feeding, in which frass is allowed to collect, and around which the remains of partially devoured leaves are drawn, making a very complete hiding-place. These nests are lined with a thick layer of silk and are covered with a thick coating of particles of soil or bits of dried grass, making a thick warm nest in which the larvæ pass the winter. These hibernating larvæ come forth in the spring to complete their growth. As they become full-fed they may be seen wandering around and slowly assembling under chips and stones, where they pupate; when in pastures dried cows'-dung seems to be the favourite resort; ten pupæ were taken from a piece of cow-dung one-fourth the size of a man's hand. There seem to be three broods in a year. (Canadian Entom. 1893.)

PUPA five-eighths of an inch long; glossy and of the usual shape except that the case containing the head, eyes, and palpi is considerably narrower and smaller than the thorax; and there is a very peculiar and conspicuous tubercle on each side of the front of the thorax. Colour pale yellowish-brown, the eye-cases, dorsal stripe, and abdominal divisions dark brown; the hooked anal point, and the eye-like frontal

tubercles nearly black. In a tough, white, glossy silken cocoon, in a corner or among the leaves of the food-plant; changing to pupa a day or two after finishing the cocoon. (G. T. Porritt.)

The moth hides during the day among grass in fields, and especially on coast sands and cliffs, where often it is excessively abundant, starting up at every footstep, and retreating hastily to a short distance. It flies naturally at dusk and through the night, and there is reason to believe that it often migrates or moves about in large numbers at this time, since the morning will find it occasionally in plenty when there were few or none the night before. Thus I have known every bit of a suburban lawn to become suddenly populous, although it does not usually frequent such situations by any means so much as the dry fields and hill sides; while it especially favours the coast, and becomes there, from its numbers, absolutely bewildering. In England it is usually not very common in the Midlands, yet is found throughout the British Isles to the Shetlands in varying numbers. Abroad it seems to be spread over the temperate, sub-tropical, and tropical regions of the whole world.

## Family 2. **PYRALIDÆ.**

Proboscis present; maxillary palpi threadlike; labial palpi slender; vein 8 of hind wing not attached to vein 7; no long hairs along the upper surface of the median nervure.

### Genus 1. **CLEDEOBIA.**

Antennæ simple but with long cilia; palpi pointed, long; tongue small; thorax and abdomen smooth and slender; fore wings narrow and having a long narrow discal cell; hind wings long and pointed, the cell narrow and the cross-bar deeply angulated; legs long.

We have but one species.

1. *C. angustalis*, *Schiff.*—Expanse of male 1 inch, of female  $\frac{3}{4}$  to  $\frac{7}{8}$  inch. Fore wings narrow, dilated behind; costa rather hollowed, and dotted with white; pale purplish-brown with a broad darker central band. Hind wings pale smoky brown. Female with far narrower wings.

Antennæ of the male rather short, ciliated with bristles so long as to resemble pectinations, pale brown; palpi very long, porrected, faintly curved downwards, red-brown; head and thorax red-brown or drab-brown; abdomen long, rather flattened, silky pale brown. Fore wings long and narrow; costa unusually straight; apex angulated; hind margin hardly rounded; texture smooth; colour dull red-brown or drab-brown, having in the middle a broad transverse band of a deeper tone of the same colour, rapidly expanding from above the dorsal margin till it becomes extremely wide on the costa, its inner margin representing a much curved first line, its outer a very oblique second line, closely followed by a pale stripe; costa ornamented with about ten very short oblique white streaks; cilia pale purple-brown. Hind wings long and rather narrow; glossy smoky brown; cilia pale purple. Female rather clumsy in appearance; the abdomen equally long and decidedly thicker; fore wings much narrower, rather more pointed; pale drab with the margins only of the broad central band darker; hind wings also narrow, brownish-white.

Undersides of all the wings in the male dull purple, each with a purplish-yellow transverse band beyond the middle; of the female pale drab; body in each case of the same colour; legs drab, the hind pair very long.

Variable in the male, as already suggested, from red-brown to brownish-drab; and in the case of a specimen taken by Mr. Percy Richards in Richmond Park, to smoky-black; the hind wings also a little darker or paler.

On the wing from the end of June till August.

LARVA. Length about one inch; slender, and of almost

uniform width throughout; head glossy black, with the lobes rounded; dorsal plate also glossy, chocolate-brown; body cylindrical, segments clearly defined, the third, fourth, and fifth have several transverse depressions which give them a wrinkled appearance; the remaining segments have each one transverse depression; the skin altogether has a tough appearance; in one form it is dirty smoky black, with the dorsal line indistinct but perfectly black; the anal segment pale brown; undersurface and prolegs paler smoky black with a greenish tinge, and the legs black; in another the ground colour is pale chocolate-brown strongly suffused on the anterior segments with dirty smoke-colour; the dorsal plate edged in front with brown, and the side tubercles and spiracles smoke-colour; the ventral surface and prolegs pale chocolate-brown, with a greenish tinge; the legs, with the thoracic segments, black. (G. T. Porritt.)

June (but very probably from the previous autumn) on *Hypnum cupressiforme* and other mosses growing upon damp ground, living completely hidden in the moss but noticeable from patches of excrement thrown above and kept together by a few silken threads. Herr Anton Schmid found it in tube-shaped webs under plants of *Lotus corniculatus*, the flowers and leaves having apparently been eaten.

PUPA from one half to five-eighths of an inch long; of ordinary shape and with all the parts clearly defined; highly polished, the colour rich brown, the wing-cases bright yellow margined with brown; eye-cases and abdominal point dark chocolate-brown. In a cocoon, shaped somewhat like that of a *Zygæna*, formed of firmly spun white silk among the moss. (G. T. Porritt.)

The male moth is lively in the afternoon on warm days, flying over the grass of chalk hills and downs, extensive parks, and especially rough grassy places and salt marshes along the sea-coast; and it certainly flies again in the

evening. The female is far more sluggish, yet in very hot still weather may be seen in the same places, flying in the afternoon, or swinging by its long legs from a culm of grass; but this is by no means a usual sight; in ordinary weather it hides among the grass. Locally abundant in the more chalky portions of Surrey and Sussex, especially in Richmond and Arundel Parks and the Box Hill and Mickleham districts, also in other suitable places in Kent, Sussex, Hants with the Isle of Wight, Dorset, Devon, and Somerset, and in the Scilly Isles; and in more restricted numbers—and localities—in Essex, Suffolk, and even the borders of Cambridgeshire, but apparently not in any other part of these Islands. Abroad it is widely distributed and common throughout Central and Southern Europe, to Turkey, and Corsica; and is found in Sweden and Norway.

#### Genus 2. **PYRALIS.**

Antennæ simple, slender; palpi thin, upraised and pointed; tongue covered in front with scales; thorax smooth; abdomen tapering; fore wings trigonate but blunt, the discal cell elongated; hind wings moderately broad, discal cell short, cross-bar deeply angulated; legs not very long, the tibiæ thickened with broad scales.

We have four species, readily discriminated.

A. Fore wings blotched alternately with purple and yellow.

B. Hind wings white with smoky marbling.

*P. farinalis.*

B<sup>2</sup>. Hind wings brown with faint white lines.

*P. lienigialis.*

A<sup>2</sup>. Fore wings purplish-brown with slender yellow lines.

*P. glaucinalis.*

A<sup>3</sup>. Wings rich crimson or purplish-crimson with yellow spots and cilia.

*P. costalis.*

1. *P. farinalis*, *L.*—Expanse 1 to  $1\frac{1}{4}$  inch. Fore wings silky, dull yellow or reddish-yellow, with purple blotches at the base, apex, and anal angle, cut off by white lines; hind wings white, with smoky marbling.

Antennæ simple, shining purple; palpi slender, set apart, pale buff; head the same colour, tinged above with red-brown; collar dark purple; thorax purple; abdomen very silky, red-brown with a yellow-brown-blotch on the middle segments. Fore wings very silky, bluntly trigonate; costa rather straight; apex bluntly angulated; hind margin faintly curved and a little oblique; base to the first line deep purple, or purple-red; first line white, bent in the middle; second line also white, forming a large crescent from the costa, a rounded outward curve, and returning, with a short bend, to the dorsal margin just opposite to its costal extremity; central space between these two lines very broadly yellow or brownish-yellow, sometimes with a chestnut suffusion; space beyond the second line dark purple, often broken into rounded spots at the apex and anal angle by a paler cloud; cilia yellowish-white, intersected and shaded with smoky black. Hind wings broad, very fully rounded behind, shining white, abundantly clouded with broken and rippled bands of pale smoke colour; margin spotted with rather darker smoke colour; cilia dusky white. Female similar, rather larger; the hind wings often more darkly clouded.

Underside of the fore wings bronzy-yellow along the costa, dusky white along the dorsal margin, smoky purple between; second line obscurely white; beyond it the whole apical area is purple-grey. Hind wings smoky white, dusted with dark brown; beyond the middle a transverse white line is broadened, and in part extended to the hind margin. Body purple-brown. Legs pale purple.

On the wing from June till September, possibly in two generations—indeed Mr. F. H. Chittenden gives it as his opinion that under favourable conditions (in the United

States), there may be four generations in the year. He states that it was carried through all its stages in about eight weeks in the year in which he was writing (1897). On the other hand Mr. Buckler found its larva to live over two winters.

LARVA nearly an inch long; stout and cylindrical; head small and horny, shining chestnut-brown, with the mouth blackish; second segment, which is rather long, tapering rapidly forward, yellowish-brown; skin most delicately shagreened, bone-white with the undersurface whiter; there is, however, a blackish tinge over the anterior and posterior segments; dorsal vessel distinguishable by its darker tint; raised dots small and indistinct, surrounded by small depressions, and furnished each with a short brown hair; spiracles small, round, and margined with black; anal plate yellowish-brown; legs tipped with chestnut-brown; prolegs whitish with the cirlet of hooks dark brown. (Rev. J. Hellins.)

August or September till May, on flour, corn, maize, bran, and meal, and among refuse of these substances, living in long tubes of silk placed along boarding, or any wall or other solid substance in contact with the food: apparently attacking only *stored* food indoors—not corn when growing, nor even in the ricks.

PUPA very cylindrical and plump, the wing-cases reaching only one-half its length; the tail ending in a blunt knob, without a spike, but furnished with a group of six curled-topped spines, arranged in three pairs of different lengths, the largest pair being straight and the other two curved; skin glossy as though varnished; wing-cases yellowish-brown; the abdomen more red, and the segmental divisions still darker; in a closely fitting cocoon of tough white silk, well covered on the outside with rubbish. (Rev. J. Hellins.)

The moth is found about stables, corn-stores, mills, grain-warehouses, and in houses generally; it sits during the day on shaded walls and in obscure or dark situations, with its wings widely outspread and flattened to the wall, and the abdomen curiously curled up over the back; taking no notice of any intruder unless actually disturbed, but then running rapidly away. It has even been found in the corn stores of mines, more than a quarter of a mile underground. At dusk it flies, keeping as much as possible away from notice, and very seldom approaches a light. Extremely common in England, Wales, and Ireland, also in the south of Scotland, but more scarce and local in the north of that country, and apparently not found in the Isles. Abroad it is abundant throughout Europe, Asia, Africa, North America to California and Texas, Australia, and New Zealand, wherever the conditions are suitable; also being more plentiful in the non-tropical regions.

2. *P. lienigialis*, Zell.—Expanse 1 inch. Fore wings purplish-buff, with dark purple basal and apical blotches; lines yellowish-white; hind wings dark brown.

Antennæ of the male simple, light-brown; palpi small, slender, pale red-brown; head and thorax purple-buff; abdomen dull purple-brown. Fore wings rather narrowly trigonate; costa very faintly arched; apex bluntly angulated; hind margin short, little curved, but rather oblique; surface shining; colour purplish-buff or orange-brown; basal area dark purple to the first line, which is gently curved, yellowish-white; second line also yellowish-white, forming a conspicuous hook or curved triangle from the costa, thence obscure; beyond this line the apical region is dark purple or purple-brown, and the hind marginal region blackish-brown; cilia grey-brown. Hind wings not very broad, rounded behind; dark smoky-brown with two faint irregular curved white lines crossing in different directions; cilia pale grey-brown. Female similar.

Underside of the fore wings pale smoky-purple, with a dull yellow triangle before the apex. Hind wings rather paler. Body and legs purple-brown.

On the wing in August and September.

LARVA and PUPA apparently unknown.

Very little is known of this rare species. In August 1879 a single specimen was taken, and in August and September 1880 three more, all by Mr. W. Thompson, at Stoney Stratford, Bucks; and another collector was reported to have taken three or four more at the same place. All these seem to have been attracted by light, and those captured by Mr. Thompson came to the lamps between 11 P.M. and midnight. Strange to say no further specimens have been recorded here, and no cause seems to have been assigned for the presence of this scarce species in this country, yet the specimens, some of which I have seen, appear to be quite reliable. Abroad its range is very small, being apparently confined to Lapland, Finland, and Livonia.

3. *P. costalis*, *Fab.*; *fmbrialis*, *Schiff.*—Expanse  $\frac{5}{8}$  to  $\frac{7}{8}$  inch. (15–23 mm.). Fore wings rich shining crimson-purple with two yellow costal spots; hind wings more crimson; cilia of both broadly brilliant yellow.

Antennæ of the male simple, short, dull yellow; palpi slender and small, rather wide apart and upturned, purplish-yellow; head dull yellow; thorax and abdomen shining purplish-crimson. Fore wings narrowly trigonate; costa straight; hind margin a little rounded; apex bluntly angulated; colour rich shining purplish-crimson; on the costa are two large triangular rich yellow spots, from which proceed the first and second lines, of the same colour but slender and often exceedingly faint; extreme hind margin, with the cilia, conspicuously rich yellow. Hind wings rather short, rounded behind; rather brighter purplish-crimson, with two very

slender sinuous yellow transverse lines; hind margin and cilia broadly rich yellow. Female similar.

Underside of the fore wings dull crimson-purple, with the base of the costa, and the second triangular spot, yellow; hind wings whitish-purple with faint rippling whiter lines; cilia of all broadly yellow. Body and legs yellow, shaded with purple.

On the wing in June and July, and again from August to October, apparently as a partial second generation.

LARVA. Length  $\frac{3}{4}$  inch; general colour dark dull brown with an olivaceous hue. Thoracic joints much wrinkled, the rest each with two wrinkles. Raised dots lighter than the body, with a dark central shining spot emitting a dull white hair. At the extreme outer edge the body is generally lighter, with a dark irregular impressed longitudinal line, above which in front, and below it behind, is a small point also giving rise to a hair. Undersurface lighter than the back, with a row of dots and hairs on each side. Legs and prolegs of the same colour, the latter with a spot and hair outside.

When young lighter in colour, and with the head and dorsal plate paler. (Prof. C. V. Riley.)

Professor Comstock says of it: "The larva sometimes abounds in old stacks of clover hay, and especially near the bottom of such stacks. As the infested hay becomes covered with a silken web spun by the larva, and by its black gunpowder-like excrement, much more is spoiled than is eaten by the insect." Other observers confirm this statement. On the other hand the moth is said to have been reared from moss and lichens on the trunks of trees; and one observer states that he reared it from a larva feeding in June on *Cobæa scandens*.

That it is destructive to clover hay in stacks seems to be quite established; and there is reason to think that the straw of thatches is sometimes attacked and that in default of other food dead leaves are not despised.

PUPA undescribed.

The moth sits by day about stables, and out buildings which are thatched, on old palings, or among dead sticks and other lumber; but especially loves to hide in a dense hedge in which are entangled abundance of dead leaves. In such a hedge of elm-bushes I have found it in plenty, sitting low down in the thickest portions and when beaten out, hovering lazily close to the hedge and concealing itself again as quickly as possible. At night it comes readily to gas-lamps and lighted windows, and may at once be known, even from a distance, since it settles down with wings so widely spread out flat and pushed forward, that it appears to be two-thirds of a circular disk. I know of no other species which sits with fore wings so forward. It flies at dusk and on in the night, and will come sometimes to the sugar spread for *Noctua*. Especially attached to suburban gardens and lanes, but in London to be found also in squares, even to the vicinity of the Old British Museum. Also to be found locally in Kent, Sussex, Surrey, and Hants; rarely in Dorset and Devon; in Middlesex, Herts, Bucks, Essex, Suffolk, Norfolk, Cambs, Gloucestershire, Warwickshire, even in Yorkshire, and one specimen has been taken in Newcastle-on-Tyne. I find no record for Wales, except that it was said to have been taken forty years ago at Tenby, nor any for Scotland or Ireland. Abroad it has a wide range, through Central and Southern Europe, Western Asia; Northern Africa, and North America from New York to Georgia and Missouri.

4. *P. glaucinalis*, L.—Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch. Fore wings silky brownish-purple or purplish-drab with two yellow transverse lines. Hind wings pale smoky-grey with a transverse white line.

Antennæ simple, pale yellow; palpi very slender, yellow-brown; head and thorax pale ochreous-brown; abdomen whitish brown. Fore wings trigonate; the apex bluntly

angulated; costal and hind margins gently rounded; surface silky; purplish-brown, or yellowish-brown with a purplish gloss, especially toward the costa; first line slender, faintly curved but erect, pale ochreous; second line very erect and almost straight, slender but a little broadened at the costa; pale ochreous; costa between these two lines dotted with the same colour; cilia concolorous. Hind wings broad, rounded behind; smoky-grey dusted with shining white, and having two extremely slender sinuous white transverse lines, one near the base and obscure, the other in the middle; cilia smoky-white. Female similar but usually larger.

Undersides of all the wings nearly as on the upper, but the colour rather more smoky, the second line of the fore wings obscurely orange yellow, of the hind wings dull black. Body and legs pale purplish-brown.

On the wing from June till September.

LARVA moderately slender, cylindrical, nearly uniform in bulk throughout, but the hinder segments tapering a little at the sides; spiracular region puffed and wrinkled; segmental divisions deeply cut; colour of the back blackish bronzy-green, becoming of an olive or ochreous green tint along the spiracles and on the head, second and thirteenth segments, undersurface and legs; the plate on the second segment is margined in front with blackish-olive; a fine blackish undulating line, apparently caused by a deep wrinkle, runs below the spiracles; these are inconspicuous, of the surrounding colour, and merely outlined with black; the tubercular dots are a little raised, each bearing a fine hair; the whole surface is shining and bronzy-looking. (W. Buckler.)

April till June—probably from the preceding autumn—among dead and decaying leaves and similar vegetable substances. Lord Walsingham discovered it in the large dense bunches of twigs, caused by *Phytoptus*, so often found on the branches of birch-trees, apparently feeding on the entangled

dead leaves ; by other observers it has been reared from the pith of dead raspberry canes ; and from decayed thatch. It unites the *débris* of these materials together, forming tubes of silk in which it lives.

PUPA brown, nearly half an inch long, stoutest at the thorax ; anal point ended with a short spike. In a cocoon which at first is soft and very flexible, and of silvery whiteness, but after a day or two becomes firm and unyielding, rounded at each end, convex on the upper and under surfaces, acutely ridged along the sides. (W. Buckler.) This cocoon opens at one end to allow the escape of the moth, but closes again and shows no sign of disturbance, and in the case of the *Phytoptus* bunches on birch-trees, lies long in the same place.

The moth hides during the day among dead sticks, vegetable refuse, or in thatch, and occasionally may be seen sitting on an old paling or fence. It flies at dusk and in the night, and often comes to the sugar spread for *Noctue* ; it is also strongly attracted by light and often to be seen sitting upon a gas-lamp. When so sitting or when at rest in the daytime its forewings are deflected over the hind, and not placed forward as in the last species. Not very scarce in the suburbs of London, frequenting the gardens ; and with the exception of Cornwall, it seems to be found in suitable places throughout the Southern, Eastern, and Western Counties of England, and more sparingly in all the Midland Counties, extending northward to Yorkshire and Lancashire, but apparently not further north, except that one specimen has been taken in Durham. Neither is there any evidence for Wales, though it surely must there be present. In Ireland a single record for Wicklow is not confirmed, and seems doubtful. Abroad it has an extensive distribution, through Central Europe, the temperate portions of Northern Europe, North Spain, Gibraltar, Italy, Corsica, Southern and Eastern Russia, Bithynia, Persia, Japan, and Northern Africa.

Genus 3. **AGLOSSA.**

Antennæ simple, yet ciliated so thickly as to seem almost pectinated; palpi pointed, tufted below; tongue abortive; head smoothed down in front; thorax loosely scaled; abdomen tapering; fore wings blunt, elongate-trigonate, with the discal cell short; hind wings broad, cross-bar angulated; legs not very long, the front tibiæ thickened.

We have two species, at once separable by the colour of their hind wings, which in *A. pinguinalis* are pale smoky-brown, in *A. cuprealis* shining white.

1. **A. pinguinalis**, L.—Expanse 1 to 1½ inch. Fore wings rather broad and blunt; pale grey-brown dusted and spotted with black. Hind wings pale smoky brown. Whole surface of a greasy appearance.

Antennæ of the male thickly ciliated with distinct bristles, almost resembling pectinations, blackish-brown; palpi slender, porrected, brown; head pale brown, finely streaked with darker; thorax pale brown, the collar and shoulder-lappets edged with black; abdomen tapering, shining grey-brown. Fore wings rather ample; costa arched beyond the middle; apex bluntly angulated; hind margin smoothly curved; surface shining with a greasy gloss, pale umbreous or pale grey-brown, thickly dusted with black atoms; first line rather erect, much angulated and clouded, or broken up into clouded black spots; the basal space also clouded with black; second line black, much angulated and bowed out in the middle, spotted with black at all the angles, and followed by a more obscure parallel series of cloudy spots; discal spot black; hind margin dotted with black; cilia grey-brown. Hind wings very broad, rounded behind; pale smoky brown dusted with black; hind margin edged with black cloudy dots, cilia smoky brown. Female very similar but much larger, the antennæ simple, and abdomen stouter but more pointed.

Undersides of the wings wholly shining pale smoky brown. Body and legs pale yellow-brown.

Very variable in size; and in some degree so in the ground colour, paler or darker, or even occasionally having a red-brown, or olive-brown tinge; also in the size and depth of the black angles or spots of the transverse lines. One form is figured in which these are obliterated, and the dark colouring massed together along the hind margins. Of this two specimens exist in the collection of the late Mr. H. Doubleday in Bethnal Green Museum. In Mr. Sydney Webb's collection is one of a shiny pale grey without marking except the discal spot and basal darker band; and another wholly reddish-brown.

On the wing in June and July.

LARVA when full grown from 25 to 29 mm. in length; almost uniformly cylindrical throughout, though rather stoutest at the third and fourth segments, which have deeply subdividing wrinkles; and on each of the following segments to the twelfth is one deep transverse wrinkle a little beyond the middle; segmental divisions well divided, and the anal flap is plumply rounded off behind; above the spiracles a tumid ridge is very prominent, the undersurface being flattened and deeply wrinkled; the dorsal raised dots are arranged rather in a square than a trapezoidal figure; colour black or black-brown, sometimes a little bronzy; the head having a pale bar of greyish-drab across the upper lip, and the papillæ of the same colour; all the legs drab; spiracles black and difficult to discern, undersurface of a worn bronzy appearance. (W. Buckler, condensed.) When young more slate-grey with the head and plates black.

August to May or June, hibernating when well grown; on bran or any refuse of corn; also apparently on the dried seeds and husks of some grasses, such as *Holcus lanatus*, in stables; always carefully concealed in a silken tube which it spins on the floor, or on any solid surface in contact with its food.

Mr. Buckler took particular trouble to ascertain whether fatty substances or greasy materials of any kind were eaten; and from the evidence obtained, no doubt need exist that this larva restricts itself wholly to corn *débris*, ground corn, waste grass-seed or dried vegetable refuse of a similar nature. It appears never to leave its silken covering tube until full fed, at which time it travels about on walls and among rubbish of all kinds before settling down to make its cocoon. Apparently it is at this restless season that it has usually been noticed.

PUPA about half an inch long, and of the usual form; the movable segments of the abdomen are deeply cut, and the anal segment is furnished at the tip with four fine curly-topped spines; surface dull; colour dark brick-red. In a cocoon firmly attached to some solid substance; broad-oval, composed of greyish silk, and covered externally with particles gnawed from the surface of its surroundings, whether of rubbish, or of mortar, or even of paper. (W. Buckler.)

The moth frequents stables and outhouses, also corn stores and corn warehouses; sitting during the day upon the darker walls and in obscure corners; if disturbed running rapidly to another spot—very fond of hiding behind a corn or bran-bin. At dusk it flies, keeping still to the darkest corners and most shadowy places, and looking itself like a moving shadow; if noticed, hastily hiding again, and running into some obscurity. Abundant almost everywhere in England, Wales, and Ireland, and common in the south of Scotland, but scarce at Aberdeen and Moray, and apparently not yet noticed in the Scottish Islands. Abroad it seems to be plentiful all over the Continent of Europe, and Northern Asia, also found in Palestine, Persia, Western India, China, and Northern Africa.

2. **A. cuprealis**, *Hüb.*—Expanse  $\frac{7}{8}$  to  $1\frac{1}{4}$  inch. Fore wings narrow, blunt, very glossy, reddish-drab or purplish-

white, much clouded with dark brown; discal spot and the two transverse lines paler; hind wings smoky-white.

Antennæ of the male simple but shortly ciliated, purple-brown; palpi very slender, porrected, light brown; head short and broad, shining dark chocolate; thorax reddish-brown blotched with black; abdomen shining pale red-brown. Fore wings narrow, elongated; costa flatly curved; apex and hind margin rounded; surface shining with a greasy lustre; reddish-white, or pale reddish-drab, much clouded with black; a roughly edged black-brown transverse band precedes the first line, which is sinuous, and of the ground colour; second line similar, much rippled, preceded by a large black-brown costal blotch, and a still larger similar blotch on the dorsal margin, or else by a complete central black-brown band, and followed by broad black-brown clouding; hind margin dotted with black; cilia reddish-drab. Hind wings broad, rounded behind; smoky white, edged with a brown line; cilia smoky white intersected by a dusky line. Female similar, but larger.

Underside of the fore wings smoky yellowish-brown, with the second line distinct and broad, pale yellow; and a similar dot in the middle of the costa; hind margin edged with a brown line. Hind wings as on the upper side, or rather darker. Body and legs red-brown.

On the wing in July and August.

LARVA about an inch long, cylindrical, and even in bulk, a little tapering in front; the subspiracular ridge less prominent than in the last species; skin brilliantly glossy all over, but under the microscope it is seen to be very finely and beautifully shagreened; head rounded, deep chestnut-red; collar deeper red, and edged narrowly in front with black; general colour, from the sheen of the surface, difficult to describe, bronzy-invisible-green-black being the combination of words which suggests itself; the hinder segments having a rather paler tint, and the anal plate a reddish or

yellowish tint; there is a double dorsal thread to be seen under the skin with a lens; spiracles small, oval, flat, and of the ground colour; raised dots hard to detect, slightly darker than the skin, and each has a fine hair which shines golden in the sunlight. (W. Buckler, condensed.)

August till May—or the following May—usually feeding during a large portion of two years—on wheat-husks, the refuse of wheat stacks and clover ricks, and in old thatch of sedge (*Cladium*), always spinning together the refuse and forming a silken tube; or making use of a straw, bean-husk, or folded leaf of *Cladium*, as a private retreat; only thriving when its food is in a somewhat damp condition.

PUPA cylindrical, all the outlines rounded, wing-cases short and rounded, and the abdomen also rounded at the end, having there a very short blunt spike furnished with four curly-topped spines; the skin rather glossy; the colour pale mahogany brown on the back, paler on the under surface; the anal tip and spike dark brown. In a tough cocoon of white silk, the outside of which is stuck all over with bits of the straw and husk among which it has lived. (W. Buckler.)

The metropolis of this local species with us seems to be the district lying around Wicken Fen in Cambridgeshire. It does not seem to be found at all, or only casually, in the Fen, but sits on and in old stables, barns, and outhouses, even in oil-cake stores, at the farms of that district, and has also been shaken out of thatch. From this locality most of our cabinets have been supplied. Elsewhere it seems usually to occur rarely or even singly, but is recorded from Kent, Dorset, Devon, Berks, Middlesex, Herts, Essex, Suffolk, Cheshire, and Lancashire. So far as I know this is the extent of its range in these Islands. Abroad it inhabits Central Europe, many parts of Southern Europe including the Island of Corsica; Asia Minor, Syria, Armenia, the Canary Isles; North and South Africa, North and South America, and Australia.

Family 3. **HYDROCAMPIDÆ.**

Legs very long and thin; proboscis present; maxillary and labial palpi both slender, pushed forward; vein 7 of the fore wing arises from the discal cell; upper side of the median nervure of the hind wings devoid of long scales. The species are all very slender and weak in structure.

Genus 1. **CATACLYSTA.**

Antennæ threadlike, naked, ringed, bent near the base, and upraised; palpi slender, curled up; thorax and abdomen very thin; fore wings trigonate, blunt, the discal cell short and outwardly squared; hind wings long, having a jewelled-like edging behind; legs very long and thin. Sexes differing in size and markings.

We have but one species.

1. **C. lemnalis**, *Schiff.*; **lemnata**, *L.*—Expanse of the male  $\frac{5}{8}$  inch, of female  $\frac{7}{8}$  (15–23 mm.) All the wings of the male glossy-white, with small black central dots and faint lines; of the female, fore wings larger and clouded with brown, hind wings more distinctly lined; in both sexes having a jewelled blue-black hind marginal stripe.

Antennæ of the male long, slender, golden-brown, ringed with white; palpi small, slender, projecting from below, white; face smoothed down, white, as is the top of the head; thorax and abdomen very thin and weak, white. Fore wings narrowly trigonate, very blunt behind; costa gently arched; apex squarely angulated; hind margin almost perpendicular and very little curved; colour porcelain-white; the extreme edge of the costa dark brown; from it arise small, excessively faint, similar clouds, from two of which proceed still fainter yellowish lines, apparently suggesting the usual second and subterminal lines; discal spot a black dot; hind margin edged with yellow-brown; cilia white, shaded in part with

yellow. Hind wings rather long and narrow, rounded behind, and especially so where the anal angle should exist; shining white; central spot black, elongated, preceded and followed by faint blackish-brown lines, which are duplicated; along the hind margin is a black-edged yellow stripe, containing a blue-black stripe, in which is a series of brilliant silvery-white dots; cilia white. Female considerably larger, with the body stouter; fore wings white, much clouded with brown, showing vague indications of a double first line, and also the other lines, which sometimes are very prettily developed; hind wings larger, having the markings more definite, and the jewelled black border larger.

Underside of the fore wings of the male white clouded with brown, and showing an obscure black discal spot; the hind wings white with a blackish central spot; of the female, pale brown, with the hind wings white; body and legs white.

On the wing from June till September, probably in a single generation.

LARVA thickest in the middle, the first five segments tapering towards the head, which is partially retractile into the second segment, shining pale olive-brown, darkest at the mouth; second segment long in proportion, while the third and fourth are short, dorsal plate black, very lustrous, margined behind with pale olive-green; tapering also behind from the tenth segment; divisions and sub-divisions of the segments deeply defined; the whole surface deep sooty olive-black, soft and velvety, except that the anal tip is a little browner and less velvety; a black dorsal stripe can just be discerned; the puffed spiracular region is a little puckered; and the small circular blackish spiracles are raised in the least degree above the surrounding surface, and slightly glistening; legs well developed, pale olive; ventral prolegs full and fleshy, but with small feet; the anal pair small, the tip rounded and but little sloped. (W. Buckler, condensed.)

September till April or May; on duckweed (*Lemna*), frog-bit (*Hydrocharis morsus-ranae*), and other water-plants. Living entirely in the water, either at the surface or deeper, in a case formed of leaves of duckweed, or pieces bitten from the leaves of some other water plant; readily protruding its anterior half in order to feed or examine its surroundings; and when thus visible appearing as though silvered over from a film of air which covers it. The case is oval, half an inch long, and not readily noticeable among the floating weed.

PUPA a little more than three-eighths of an inch long; the wing, antennæ, and leg-cases well developed, the latter projecting a little, free from the body, which is smooth and shining, head and thorax rounded off; anal tip rather blunt, and having on each side a rather angular projection; spiracles flat, circular, button-like; colour worn shining brown. In an oval cocoon, thickly and smoothly lined with white silk. (W. Buckler.) In the larval habitation, or among fresh bits of leaf in the water; often upon the surface, where a few leaves of the *Lemna* drawn together form little raised nodules.

The moth hides during the day among vegetation on the borders of ponds, lakes, rivers, and especially wherever the water is sufficiently still for the growth of duckweed. Here it is readily disturbed by day, and flutters lazily away to a similar hiding-place, the female being less willing to fly at this time than the male. At about sunset and onward till dusk every male is buzzing gently about over the water, and in the most favoured spots, such as the broad ditches which drain the fens of Norfolk, quite an extraordinary sight is presented by the snow-white males flying in thousands over the water, all at the same elevation over the surface, and all buzzing in the same gentle manner. Later at night the females fly higher and more over the country, coming willingly to a strong light. Common throughout England and Wales, to Yorkshire and Durham at least, and also all over Ireland;

very local in Scotland, and apparently not extending further north than the Clyde Valley and one locality in Perthshire. Abroad found throughout Central Europe, the temperate portions of Northern Europe, Italy, and Southern and Eastern Russia.

### Genus 2. **PARAPONYX.**

Antennæ long, notched, bent at the base; palpi pointed, curved up, body not very slender; fore wings elongate, rather narrow; discal cell also long and narrow; hind wings somewhat elongated, not very ample, cross-bar angulated; legs long. Sexes differing in size and appearance.

We have but one species.

1. **P. stratiotalis**, *Schiff.*; **stratiotata**, *L.*—Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch. Fore wings narrow, brownish-white with dark brown clouded lines and a white discal spot; but in the female entirely clouded with light brown. Hind wings white with a cloudy stripe.

Antennæ of the male simple, light brown, barred with white; palpi small and slender, white clouded with brown; face white; top of head, thorax, and abdomen pale golden-brown with white shading. Fore wings narrowly oblong, blunt behind; costa almost straight; apex bluntly angulated; hind margin short, not very oblique, bent and curved off below the middle; brownish-white or pale brown; first line faintly indicated in obscure brown dusting, but blackened on the middle nervures; second line very oblique, umbreous, edged outside with white; discal spot a white dot ringed with black; subterminal line faint, white with a brown edging; cilia glossy pale brown. Hind wings long, the hind margin flatly rounded; white, with a sinuous black-brown stripe beyond the middle, which does not attain to the front margin; hind margin narrowly and faintly tinted with pale brown; cilia white clouded and dotted with the same. Female larger, the body decidedly stouter, the fore wings

longer and slightly more pointed, light umbreous or pale wainscot-brown; hind wings broader, the sinuous stripe more distinct, and often another, more slender, lies nearer the base.

Underside of the fore wings brownish-white, more tinged with brown toward the apex, the discal spot and second line faintly indicated; hind wings whiter in the male, similar in the female, showing in a faint degree the markings of the upper side. Body and legs pale brown.

Variable in the depth of colour of the fore wings, in the male from pale brown to white, in the female from pale to deep umbreous; also in the distinctness of the markings of both fore and hind wings.

On the wing from the end of May till the beginning of September, probably in a single generation.

LARVA cylindrical though tapering a little on the four anterior segments, and also on the two hinder; the legs and anal prolegs well developed, the ventral prolegs moderately so; skin soft and smooth, and furnished with eight rows of flexible branchiæ composed of tufts of six, or less, slender fleshy filaments of unequal length, tapering to rather fine points, all radiating from a short thick basal stem, and occupying the positions of the usual warts or raised dots. To the unassisted eye they resemble the spines of some butterfly larva. Head pale brown, the lobes delicately outlined with dark brown; the mouth and ocelli blackish-brown; the branchiæ dirty whitish-grey; body semitranslucent, pale olive-ochreous, or whitish-ochreous, generally tinged with olive, and marked with a few small purplish freckles; dorsal stripe broad, dark grey, or brownish, or greenish-grey; spiracles small, black, each situated on the flat centre of a swelling eminence; a small wart-like tubercle, near the base of each ventral proleg, bears a single hair-like filament. (W. Buckler.)

August till May, June. or July; on *Anacharis alsinastrium*,

*Hydrocharis morsus-ranae*, and some of the species of *Potamogeton*. Curtis says on *Stratiotes aloides*, and Hofmann *Trapa nutans*. In a habitation formed of threads of silk joining together stems or leaves of the water plants and completely submerged, usually at some depth, in the water.

Of its habits Mr. Buckler says: "Night and day, at intervals varying from one to three minutes apart, the larva, holding to its web by the anal legs, rapidly undulates its body upwards and forwards with considerable vigour and energy, while the three hinder segments appear motionless; this intermittent movement lasts about twenty-one seconds at a time, and is followed by a period of rest—longer, that is for two or three minutes—when the larva is quiet, and shorter when it is feeding, at such times not exceeding one minute. That this energetic undulation is connected with the respiration of the larva is evident from the fact that the branchial filaments are then all in strong action, for instead of radiating as they do in repose, they become depressed a little, and point forwards in the direction of the head.

The smaller larvæ ate only the green substance from the leaves, thus bleaching them; but the larger ones ate completely through the leaves, cutting out circular pieces. The excrement was ejected with such great velocity that it was carried about an inch outside the opening of the silken residence."

PUPA half an inch long, rather slender, widest from behind the thorax, whence the abdomen tapers to the rather blunt tip; head rather square; eyes large and prominent; wing, antenna, and leg-cases well developed, the latter extending free from the eighth to the end of the twelfth segment; only the spiracles on the sixth, seventh, and eighth segments are distinguishable, but these are large, circular, and projecting considerably, like knobs or warts from the sides; at first the pupa is unicolorous, of a delicate yellowish-flesh tint, but as it approaches maturity the wings appear, of a dark grey-

brown and show the darker outlined central spot; the eyes become dark; the thorax and legs light brown; the abdominal segments barred with the same; there is a faint dorsal line of dusky spots, and a light brown spot on each side of the three segments before the last; the spiracles are light orange-brown, ringed with black at the base. In a truncated silken cocoon, attached for its whole length, by the back, to a piece of the stem of the food-plant, and further moored by strong threads from the upper part to the stem. (W. Buckler.)

The moth hides during the day among the herbage at the edges of streams, rivers, fen and marsh drains, ditches, large shallow ponds, and lakes. It is at this time unwilling to fly, and if disturbed prefers to flutter down—the female especially—into the dense herbage. It flies naturally at rather late dusk about the water, and on through the night, not then confining itself to the vicinity of water, but roaming abroad; and is much attracted, in both sexes, by light, settling constantly upon any gas-lamps at country roadsides.

Formerly common in the outskirts of London, now much less so; common in the Southern and Western Counties of England, even more plentiful in the Eastern, and to be found through the Midlands to Yorkshire and Lancashire, but I find no records from the Northern Counties, or from Scotland—nor indeed from Wales, though it can scarcely be absent from the Principality. In Ireland it is widely distributed, abundant on the Grand Canal at Athy, and tolerably common in Galway and Monaghan. Abroad it inhabits Central Europe, Northern Spain, Southern France, Italy, Livonia, Finland, and Southern Russia.

### Genus 3. **HYDROCAMPA.**

Antennæ simple; palpi short, tufted above; thorax narrow; abdomen long and slender; fore wings elongate,

trigonal, and rather pointed, the discal cell very narrow; hind wings elongated, ample, the cell narrow, and cross-bar angulated; legs long and thin.

LARVÆ and PUPÆ aquatic.

We have two species, readily discriminated.

A. Wings clear white with golden-brown stripes.

*H. stagnalis.*

A<sup>2</sup>. Wings clouded with brown, with darker stripes and white spots.

*H. nymphæalis.*

1. **H. nymphæalis**, *Schiff.*; **nymphæata**, *L.*—Expanse 1 to 1¼ inch. Fore wings light bronzy brown with numerous pearly white spots; hind wings shining white, with a large central crescent, and before the hind margin a broad brown band.

Antennæ of the male simple, dark brown; palpi minute, brown tipped with white; head white, with a brown line down the face, and another across the back portion; thorax pale brown, or white barred with brown; abdomen slender, glossy, brown, each segment shaded and edged with white. Fore wings elongate, rather retuse; costa very flatly arched; apex angulated; hind margin curved and a little oblique; pale golden brown; base irregularly clouded with white and showing no definite first line; in the middle area are three large white spots edged by slender double brown strigæ; just beyond them is the second line, undulating and indented, white; along the hind margin is a row of small white spots sometimes joined into a slender stripe, edged outside by a yellow line; cilia shining pale brown. Hind wings pearly white; crossed near the base by a double golden-brown line; central spot lunate, golden brown, followed by a broad, irregular double stripe of the same colour, dusted with darker, its outer section by far the broader and throwing out several projections, of which one near the middle touches the hind marginal stripe; this last is yellow, edged on either side by a

golden-brown line ; cilia shining brownish-white. Female much larger, with the abdomen stouter, shorter, and more pointed.

Undersides of all the wings as on the upper, except that the golden-brown ground colour of the fore wings, and the markings of the hind, are richer and darker. Body and legs pale golden brown, shaded with white. The hind legs longer than the body.

Variable in both sexes in depth of the brown colour, or in clearness of the white spots ; the latter sometimes obscured by a suffusion of brown colour, or darkened till the fore wings become almost uniformly brown, and the hind wings still darker with the spots brown. This last form is more particularly noticeable in specimens from the Fen districts, and from the same districts occasional specimens are obtained having both fore and hind wings broadly and irregularly banded with white, the usual central markings being obliterated. Similar forms are sometimes taken in Ireland.

On the wing from June till September, probably in one generation.

LARVA rather stout in proportion, thickest in the middle and tapering rather suddenly toward each end ; head small, light olive-brown, the lobes and mouth darker brown ; dorsal plate pale olive, shining, margined in front with a fine black line, and within it, after an interspace of the pale ground, there is in the middle a transverse fusiform brownish-black mark, dorsally divided by a thin pale line ; the rest of the body above light olive-brown with a darker dorsal stripe, and fainter indications of a subdorsal stripe less dark ; the body beneath much paler, light buff, very faintly tinged with olive ; spiracles small, roundish oval, delicately outlined with reddish-brown ; anterior legs well developed, but the ventral and anal prolegs mere fleshy swellings, with a flat process at the extremity, fringed with fine dark brown hooks ; the whole skin soft and velvety, appearing darker in the depths

of the segmental divisions, and paler at the folds. (W. Buckler.)

September till June or July, on *Potamogeton natans*, *P. polygonifolius*, *P. pusillus*, *Sparganium simplex*, *Myosotis palustris*, *Hydrocharis morsus-rance*, *Catabrosa aquatica*, *Alisma plantago*, *Nymphaea*, and other aquatic plants; living in a case composed of portions of its food-plant, and floating at, or near, the surface of the water. Mr. Buckler observed that it cut out an oval piece from a leaf and conveyed this cut piece under the leaf in order to add a similar piece on the other side, thus forming the case, and cutting it completely adrift so as to float freely. When feeding the case was moored by a silk thread to the food-plant. After casting a skin the case was discarded leaving the distended old skin within, and the naked larva proceeded to form a new shelter.

PUPA half an inch long, the thickest portion being across the wing covers; abdomen tapering to the anal tip, which is bluntly rounded off without any projecting boss or spike, but having instead a horny wart, cleft and bilobed, furnished with a few small bristles; wing covers long; antenna and leg-cases very long, projecting at their ends free from the abdomen; wing covers, ventral surface, and anal tip shining light warm brown; thorax and back of the abdomen a little darker and rather reddish-brown, without gloss; spiracles large and projecting, like nipples, each on a slight eminence, shining dark brown, each with a paler ring at the base; in a chamber formed by drawing together two leaves of *Sparganium* or some other water plant, and spinning together a space situated at an inch or two above the surface of the water. (W. Buckler.)

The moth hides during the day among coarse herbage at the margins of rivers, streams, ponds, lakes, fen drains, and wet ditches—everywhere indeed where aquatic herbage is in any plenty, and is readily disturbed, flying in a lively

manner to some similar hiding-place. At dusk it flies voluntarily about the same situations, but does not seem so much disposed as the last species to roam abroad. Generally distributed, and usually common in suitable situations, throughout England, Wales, and Ireland, except that records are wanting for one or two of the northern counties of England; yet found in Scotland in Wigtownshire, Ayrshire, the Glasgow district of the Clyde Valley, Berwickshire, Midlothian, Perthshire, Aberdeenshire, and Moray. Abroad it is common throughout Central Europe, and found in the south of Sweden and Norway, Livonia, Italy, Southern and Eastern Russia, Bithynia, Syria, and Tartary.

2. **H. stagnalis**, *Gn.*; **stagnata**, *Don.*—Expanse  $\frac{3}{4}$  to 1 inch. All the wings shining porcelain-white, divided into spaces by double, bronzy, orange-brown, curved stripes.

Antennæ of the male simple, brown with a silvery gloss; palpi slender, dark brown, white within; head snowy-white; thorax slender, of the same colour, with a brown spot on the dorsal surface and a similar edging at the back; abdomen slender, white, the basal and hinder segments edged with brown. Fore wings trigonate; costa nearly straight; apex bluntly angulated; hind margin very little oblique and the anal angle well formed; colour pearly white, with beautiful orange-brown or golden-brown markings; the basal line single, oblique, and curved; first line a double stripe, hardly complete, yet throwing out, above the middle, a long point which joins the second line; this last is double and broadly branched, forming a figure somewhat like the letter Y, which rests on the dorsal margin and there spreads so as to form a foot. These double stripes are unusually pretty. Along the hind margin is a golden-brown stripe, and a similar line intersects the white cilia. Hind wings rounded, pearly-white; central spot comma-shaped, golden brown; before it is a similar partial transverse stripe, and beyond the middle a more complete, partly double one; hind wings

edged with a golden-brown stripe; cilia white. Female similar, often rather larger.

Undersides of all the wings white, with the markings of the upper side accurately repeated, though in a fainter tint of colour. Body and legs white.

Usually very constant in its delicate colour and lovely markings, but liable distinctly to local races. In the fens of Norfolk, and sometimes occupying most restricted areas in these fens, specimens are found having all the markings less distinct, sometimes all present but faint, or only partially present, or only in single or double lines instead of stripes, and decreasing in distinctness till some of the specimens are pure silky white, wholly destitute of markings.

In Ireland a somewhat similar race is found, but in it the discal and central spots of the fore wings, and a fine brown line along their hind margins remain usually quite visible as the other markings disappear; and every intermediate shade of distinctions or obliteration occurs, till at Lough Oughter, Co. Cavan, the purely white form again appears. When the partially obliterated form was first found, it was mistaken for the allied (non-British) species, *H. rivulalis*.

On the wing from the end of June till August—apparently in a single generation.

LARVA seven-eighths of an inch long; rather slender, tapering from the third segment to the head and from the tenth to the anal extremity; head small, flattened, and tapering towards the mouth, translucent pale brown, the lobes marked with a reticulation of darker brown, and a similar streak in the middle of each, mouth blackish-brown, ocelli large and black; segmental divisions and sub-divisions moderately well defined; the skin a little puckered and dimpled along the sides; dorsal plate yellow, or olive-yellow, sometimes with a few freckles, and a thin transverse streak of brown along the hind margin; rest of the body deep bright yellow, or olive-yellow, so translucent as to show

distinctly the internal dorsal vessel, and the tracheae with all their ramifications; on the more olive-yellow examples there occur two parallel brown streaks, low on the sides of the second to fifth segments; spiracles ringed with brown; ventral and anal prolegs well developed.

August till May or June; on *Sparganium simplex*, *S. ramosum*, *Nuphar lutea*, and *Nymphaea alba*; Ottmar Hoffman adds *Potamogeton*, and Linnè duckweed (*Lemna*); mining in the leaves, or when these are young, or too slender, eating them through, but hiding itself then under fragments connected together with silk. (W. Buckler, condensed.)

PUPA three-eighths of an inch long, slender, the head well produced, the back of the thorax gently rising from it; width thence uniform to the end of the wing-covers; leg-covers long, projecting, free from the wing-covers, to the tenth segment; abdomen regularly tapering, and terminating in a hook, curved downwards; colour deep bright yellow, inclining to orange-yellow; a narrow brown streak obliquely crosses each eye-piece; three spiracles on either side are conspicuously prominent on circular swellings, paler than other parts, and are like nipples of brownish-red with rather darker orifices; the hinder spiracles flat, brown, and very obscure. In a slight elongated cocoon composed of two pieces of leaf, either floating in the water or fastened at the surface to the side of a growing strong leaf. The cocoon is of white silk, and apparently quite dry within. (W. Buckler.)

The habits of the moth are almost precisely the same as those of the last species; haunting the margins of rivers, streams, ponds, lakes, broad ditches, and any pieces of water in which water plants abound; but it is by no means so common nor so universally distributed. It is tolerably frequent throughout England and probably through Wales, since I have found it in Pembrokeshire, and Mr. Day records it as

“fairly common” in North Wales. In Ireland it is generally common; but in Scotland seems to be mainly confined to Berwickshire, Midlothian, Fife, Ayrshire, Arran, Perthshire, and Aberdeen. Abroad distributed over Central Europe, the temperate parts of Northern Europe, Southern France, Northern Spain, Italy, Asia Minor, Armenia, Siberia, and Tartary.

#### Genus 4. **STENIA.**

Antennæ simple; palpi long, projecting, broadly tufted; neck long; thorax and abdomen extremely slender, the latter elongated; fore wings narrow at the base, blunt behind; hind wings short and broad, with the cell short; legs remarkably long and slender.

We have but one species.

1. **S. punctalis**, *Schiff.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings rather short and blunt; dull light brown or reddish-brown, with two rather darker transverse lines and a white discal dot; hind wings brownish-white. Abdomen and legs long and thin.

Antennæ of the male long, slender, simple, light brown; palpi elongated, straight, porrected, light chestnut; head and thorax reddish-brown; abdomen long and very evenly slender, darker brown, but the edges of the segments faintly paler. Fore wings rather narrow, but short and very blunt; costa nearly straight; apex angulated; hind margin almost perpendicular and very little curved; anal angle well defined; colour light reddish-brown; first and second lines slender, very sinuous, rather darker brown; discal spot small but elongated, white; cilia shining, pale brown. Hind wings rather short, rounded behind; pale smoky-brown with very faint indications of two incomplete darker transverse lines; cilia concolorous. Female more yellow-brown, the abdomen much shorter yet very little thicker, otherwise similar.

Underside of the fore wings very pale reddish-brown, shading to dirty white along the dorsal margin; second line faintly visible; discal spot white. Hind wings of the same colour with the faint transverse lines just visible. Body and legs light brown.

On the wing at the end of June and in July and August, but whether in one or two generations is not yet clearly made out. I made a journey of one hundred miles in August 1902 to search for a second brood in a place in which the insect had been locally common earlier in the summer, but was unable to find a specimen.

LARVA slender, stoutest at the eighth segment, with the back tapering each way, slightly in a curve; the head narrower than the second segment, glittering clear reddish-chestnut; collar of a much darker brown, reaching on the back across the whole length of segment 2, but curving forward at the sides, divided by a pale line; there is a border of darker brown on each side of this line and for a short way along the front and back edges; skin glittering, rather translucent, of a pale yellowish-stone tint, but all the middle space of the back shows ashy-grey from the internal vessels, and through this space runs the darker interrupted pulsating dorsal vessel; the segmental folds are also darker; spiracles prominent but indistinct, ringed with brown; usual dots very tiny, jet black, placed on large shining warts; on each of segments three and four there is a pair of large roughly triangular warts near the front edge, and four rounder ones on each side; all these are noticeably darker than those on the other segments, and appear to form a distinguishing feature. (W. Buckler.)

September till May on the leaves and blossoms of bird's-foot trefoil and clover, especially when dead and decayed, also on the dead leaves of knapweed, plantain, grass, and other herbage close to the ground; even on the dead tangle of *Zostera marina* under stones at high-water mark, but

feeding indifferently on living vegetation. It was only after long and hard searching that Mr. W. H. B. Fletcher discovered the curious habit of this species, of feeding on dead leaves under stones, even when they are wetted with seawater.

PUPA long and slender; the eye-cases rather prominent; the tongue, antenna, and leg-cases soldered together and attached to the body so far as the end of the wing-cases, thence free, and reaching quite to the end of the abdomen, over-reached by the spike only; this spike is slightly curved, and furnished with six curly topped spines; skin smooth, not shining, yellowish-brown; the eyes, the tip and rings of the abdomen, and the tip of the tongue-case, chestnut; the spike still darker. In a rather tough cocoon, lined with a fabric of white silk, and coated externally with leafy rubbish; on the ground.

This is a most curiously local species with us. It may be found on some grassy spot on the slope of a chalk-hill quite commonly, but only for a few yards of space, and outside this not for long distances, even miles, but is more frequent where grass grows among the shingle close to the sea; indeed it may sometimes be found among herbage at the *base* of a cliff, and again at the top, in the grassy places. On the Continent it does not seem to be so very select in its tastes, but is said by M. Ragonot to frequent pasture-land and hill slopes. It is attracted by a light if placed in its usual haunts. Possibly climate has something to do with its selection of situations, at any rate it is clear that it cannot exist here at any great distance from the sea, except where some slope of a chalk hill furnishes exactly what it requires. Its range with us is therefore restricted to Kent, Sussex, Hants with the Isle of Wight, Dorset, Devon, both north and south, Cornwall with the Scilly Isles, and Somerset. Abroad it occurs over Central and Southern Europe except Holland, and in Asia Minor, Syria, and Northern Africa.

Genus 5. **ACENTROPUS.**

Antennæ of the male notched in front, of the female simple; palpi small, blunt, drooping; head broad; thorax smooth, small; abdomen short, suddenly pointed; fore wings narrow, pointed, the discal cell long and narrow; hind wings narrow, the cell open; legs short; wholly covered, very thinly, with small mealy looking scales.

We have but one species.

1. **A. niveus.** *Oliv.*—Expanse, male  $\frac{1}{2}$  inch, winged female  $\frac{3}{4}$  inch (12–19 mm.) Fore wings finely scaled, white, the costa and nervures tinged with brown. Hind wings white. Body and legs short.

Antennæ of the male simple but notched, rather thick, dark brown; palpi almost concealed, drooping; face broad, white; head and thorax greyish-white, with the appearance on the latter of a soft bloom; abdomen short, suddenly pointed, brownish white. Fore wings narrow and pointed; costa straight; apex sharply angulated; hind margin very oblique and but slightly curved; colour dull white or brownish-white with a mealy look; costal margin and nervures tinged with brown; no other markings; cilia white. Hind wings very narrow, hardly wider than the fore wings, apex rather pointed; pure white; cilia of the same colour. Female, when winged, nearly double the size, but otherwise similar, abdomen a little thickened; but often the wings are absent or aborted.

Underside of the fore wings white, tinged on the costa and apex with brown. Hind wings white. Body and legs brownish white, the latter remarkably short.

On the wing from June till September, apparently in two generations.

LARVA rather stout but tapering to each extremity, and of quite ordinary form; head somewhat rounded, the lobes well defined, pale brown; dorsal plate of the same colour,

divided broadly in the middle; body pale green or whitish-yellow, with a broad, ill-defined and cloudy, dorsal smoky-black stripe, which is interrupted on the eleventh segment and does not appear on the thirteenth; no visible lines; spiracles small, black; raised dots very indistinct; legs smoky-black, prolegs of the colour of the body.

October till May, and a second brood in July; on *Potamogeton pectinatus*, *P. perfoliatus*, *P. erispus*, *P. lucens*, *Trapa nutans*, *Hydrocharis morsus-rance* *Ceratophyllum demersum*, and other submerged water plants; living only under water.

PUPA apparently not described. In a white silken cocoon in the axil of a leaf of one of its food plants, under water. Mr. Edwin Brown says that it possesses the usual Lepidopterous characters, and that three spiracles on each side are remarkably prominent.

The moth sits during the day upon weeds close to the surface of water, under stones at its edge, or especially upon partially submerged sticks, sometimes congregating thickly on the undersides of the latter. When so sitting it quite disregards the necessary immersion caused by drawing the weeds or sticks through the water towards one, but if shaken or knocked off will buzz along the surface till it finds something to cling to. In crossing one of the Norfolk "broads" or lakes I have been much interested to see the disturbed males, a dozen at a time, making short zigzag tacks, as they buzzed over the water in pursuit of the boat by which they had been disturbed, till they overtook and climbed up its stern-post and rudder. These were all males, and subsequent close searching of the floating and surface weeds, and of the submerged plants, furnished but one female, and that of the wingless form and moribund. Possibly the females fall from the plants to the bottom of the water when disturbed. They seem to be quite at home in that element. Winged females were formerly taken at

Hampstead Ponds and in various other localities, though in less numbers by far than the other sex ; yet within the last year or two, in one at least of these localities, the most careful search for them has been useless, although the males could be found in plenty. The natural time of flight is at about 8 or 9 P.M. when the males may be seen in abundance keeping close to the surface, and when the winged females, if present, may be secured, but after dark a more vigorous flight appears to be indulged in, since a specimen—usually a male—is now and then found flying, late at night, to some light situated far from any suitable water. I have even known such a specimen enter the open window of a well-lighted room and fly round it in the wildest and most vigorous manner. Usually found about ponds, canals, slow rivers, and the open broads of fens ; most plentifully in the Southern and Eastern Counties ; more scarce in the Midlands and apparently hardly noticed in the Western counties, except that northward it has been taken in Westmoreland, as in many other counties, only at light as I have described. It is abundant on the Trent in Nottinghamshire, and is found in Yorkshire. In Scotland it has been taken in two or three localities in Fife. In Wales there appears to be no record ; but in Ireland it is found on Lough Oughter, Cavan ; Lough Erne, Fermanagh ; and Lough Neagh, Antrim. Abroad it is common in Central Europe and in Russia, but the records are somewhat tangled with those of, possibly, other species.

Although one of the smallest and most insignificant looking of our Pyralites, this species—and indeed genus—is of peculiar interest from its strong divergence from the rest, in the direction of relationship with the Order Trichoptera. The vigorous controversy of thirty years ago, as to whether it should, or should not, be included among the Lepidoptera, is still pleasant reading.

Family 4. **ENDOTRICHIDÆ.**

Proboscis present; antennæ simple; maxillary and labical palpi small; thorax and abdomen slender; the shoulder lappets very long and conspicuous; fore wings with veins 7 and 8 springing from vein 9; hind wings with veins 7 and 8 joined; upper side of the median nervure not fringed.

Genus 1. **ENDOTRICHA.**

Antennæ simple; palpi pointed, very small; head smoothed forward; thorax and abdomen slender; shoulder lappets extended; anal tuft long; fore wings narrow, pointed, and rather retuse; hind wings somewhat narrow, hind margin sinuous, cell wide; legs rather long.

We have but one species.

1. **E. flammealis**, *Schiff.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore and hind wings yellowish-purple or pale yellow-brown; the two transverse lines white, the space beyond the second purple-brown; costa and cilia of the fore wings dotted with white.

Antennæ of the male simple, pale brown; palpi short, erect, the base thickly tufted, dark brown; head and thorax pale yellow-brown; the shoulder lappets lying back in long tufts which reach the abdomen; this last is also pale brown, very slender; the anal tuft long. Fore wings elongated, rather retuse; the apex pointed; costa a little arched beyond the middle; hind and dorsal margins somewhat rounded; colour yellowish-purple or pale yellow-brown; the base to the first line dusted with brown, the line itself curved, white; second line also white, forming an oblique double curve and edged inwardly with brown dusting; the area beyond it bright purple or crimson-purple, except that in the cilia below the apex is a shining white crescent, rest of cilia purple, shaded with brown; discal dot black; costa

dotted with white. Hind wings elongated, the hind margin sinuous; colour pale purple, interrupted in the middle by a broad pale yellow transverse band, in which are parallel purplish-brown lines; cilia shining white. Female similar.

Underside of the fore wings similar to the upper, so far as the discal spot, costal dots, and second line are concerned, but more strikingly shown; middle area smoky-purple; dorsal area white; the cilia as on the upper side. Hind wings smoky-white with black dusting, the hind-marginal region purple; near the base is a transverse black line, and in the middle a double one. Body and legs pale purple-brown.

Rather variable in colour. Specimens taken at Folkestone, Kent, are sometimes of quite a different tone in this respect, all the usual purple or crimson purple areas on fore and hind wings being of a silky purple-grey; on the other hand some of those taken near London are of very light yellowish-purple; and one, in the cabinet of Mr. A. F. Griffiths, is yellow, the markings remaining normal. Almost all intermediate dark and light shades occur.

On the wing from the end of June till the beginning of August.

LARVA rather slender to the sixth segment, thence gradually thickening to the ninth and as gently decreasing to the end of the eleventh, thence more tapering; head narrow, dark brownish-red, body segments divided by *two deep wrinkles very close together*, which is a distinguishing character from a very early stage; dorsal plate blackish-brown; body chocolate-brown above, dingy pink or brownish-ochreous beneath; anal plate edged in front and on the sides with dull black; legs pale greyish-drab; prolegs similar, the anal pair extended. (W. Buckler, condensed.)

August till May; while young on tender leaves of hazel, oak, willow, hornbeam, privet, *Lotus major* and *Agrimonia*

*eupatoria* ; but when well grown preferring leaves which are more discoloured and softened with blotches of incipient decay, ultimately fallen and decaying leaves, among which it passes the winter. In confinement a confirmed cannibal.

PUPA very much of ordinary form ; the head- and eye-covers well developed ; the thorax, with distinct subdivisions, is slightly keeled ; the wing-covers slant off toward the ends of the antennæ and leg-cases, which are long ; the spiracles are rather prominent, especially on the twelfth segment : abdominal segment a little punctate, the tip rather prolonged, rounded, and furnished with two curly-topped bristles, surrounded by four others of shorter lengths : colour, dark mahogany brown, glossy, and approaching to black at the anal tip. In a cocoon of oval figure, of greyish-drab silk and earth, or leaf-refuse, on the earth, attached to the underside of a dead leaf. (W. Buckler.)

The moth hides during the day among stunted bushes, especially oak bushes, in heathy places, or among bracken fern, or furze, and other undergrowth on sea-sandhills : or, indeed, about hedges and bushes in waste places generally ; sometimes—as in the London suburbs—it makes itself at home in gardens, hiding in the bushes, or even sitting upon the wooden palings. It is restless, and flies willingly enough when disturbed, but only to seek a similar hiding place near by. When at rest on a fence its long legs are extended so that it hangs back at such an angle as to present an edge to the intruder and to be almost invisible. It flies naturally at dusk and into the night, and will come occasionally to light. It occurs every year in my own garden, and is rather common in the outer portions of the southern suburbs of London, and in all the more Southern Counties, except perhaps Cornwall, also in the Eastern Counties to Norfolk, and in Middlesex, Herts, Bucks, and Gloucestershire. With the exception of a single record in Derbyshire, it seems to be known no further north ; and in Wales the

only records that I have are that of Mr. Porritt upon Penmaenmawr, and my own on the coast of Pembrokeshire. In Ireland it was taken by the late Mr. E. Birchall in Galway. Abroad generally distributed through Central and Southern Europe, including Corsica, and in Finland; also through Asia Minor, Syria, and Northern Africa.

#### Family 5. SCOPARIIDÆ.

Proboscis present; labial palpi porrected; maxillary palpi upraised and noticeable, somewhat fan-shaped; fore wings narrow, very blunt, vein 7 arising from the angle of the discal cell; vein 10 free; veins 7 and 8 of the hind wings almost joined; upper side of the median nervure not fringed.

#### Genus 1. SCOPARIA.

Antennæ simple; palpi rather long, pointed, the maxillary tufted above; scales on the top of the head converging; thorax smooth; abdomen slender; fore wings elongate, rather even in width and somewhat squared behind; the discal cell long; hind wings broad; veins 7 and 8 closely parallel three-fourths of their length, almost joined; cross-bar oblique; legs not very long.

This is a large genus of species very similar in colour, and of a somewhat uniform pattern of markings; many of them so variable that it is still a contested point which are reliable species and which mere varieties. We have, in my own opinion, fifteen species, each certainly recognisable, yet by such fine points of difference that tabulation becomes difficult, and such tabulation as would enable a reader to *discriminate* them satisfactorily perhaps impossible. Probably it is, therefore, better not to attempt it.

The larvæ of some of the species are known to feed in moss; of others, although it has been frequently asserted

that they feed in the same manner, no amount of searching among moss seems to furnish them; and the comparatively recent discovery of one species as a *root-feeder*, seems to point to the possibility in others of some quite different mode of life.

The pupæ, so far as is known, are enclosed in rather tough silken cocoons, in the substance in which the larva has been feeding.

1. **S. cembræ**, *Haw.*—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings elongated, dull brownish-grey; the two transverse lines even and rather direct, darker grey; discal spot absent, or sometimes X-shaped. Hind wings shining smoky white.

Antennæ of the male rather short, simple, ciliated, brownish-drab; both pairs of palpi distinctly visible, grey-drab; head brownish-white; thorax not thick, brownish-drab; abdomen silky, very pale drab, having lateral tufts. Fore wings elongated; costa very flatly arched; apex bluntly angulated; hind margin short, a little oblique and very little curved; colour grey-drab or brownish-grey, rather brown along the costa; markings black but all obscure; first line dusted with grey, nearly erect, and placed in contact with a short thick horizontal streak—the claviform stigma—beneath the median nervure; orbicular stigma indicated by a black dot, and the reniform by a broad X-mark, often indistinct; second line rather direct and not very oblique, angled inwards a little above the middle, dotted and edged outwardly by a whitish line or shade; hind margin faintly dotted with brown; cilia grey-brown with paler dappling. Hind wings ample, the apex rounded, and hind margin sinuous; silky, pale smoky brown; cilia whiter. Female similar, but rather larger, and the fore wings slightly broader; sometimes also having the markings more distinct.

Underside of the fore wings shining smoky grey-brown, with the costa rather paler. Hind wings smoky white. Body and legs pale drab.

Variable in the distinctness of the markings, and also to some extent in the ground colour, this last being in some degree climatal. In Scotland a form having the ground colour whiter in varying degrees—sometimes very white—received the name of *scotica*, and was for a time supposed to be a distinct species. Abroad another form of typical or greyer ground colour, but with the markings all distinct and sharply defined was similarly separated, under the name of *zelleri*, but this arose apparently more from want of knowledge abroad of the variation of this species than from any strong opinion. Both forms are intimately combined with the normal by intermediate gradations. In specimens from the Orkney Isles a tendency is shown toward olive-brown colouring.

On the wing from June till August.

LARVA long and rather slender, tapering but slightly, and more in front than behind; segments plump, with the divisions and the ordinary transverse wrinkles across the back well marked: head clear shining brown, with a darker mouth; dorsal plate shining pale brown; anal plate also shining, pale ochreous; colour translucent white, allowing the food canal to be seen, especially in the anterior segments, to which it communicates a black or purple line; dorsal vessel black, visible at intervals; raised spots large and flat, glistening pale ochreous, the hairs dark and bristly; spiracles round, black.

April and May, on the fleshy root of *Picris hieracioides* (yellow succory), feeding on the superficial portion of this large fleshy root beneath the surface of the ground, sometimes working down to a depth of five or six inches; scoring and channelling the surface, and occasionally cutting short tunnels through it when the root is small and tender. (Dr. John H. Wood.) There is excellent reason to believe that it also attacks the roots of coltsfoot (*Tussilago farfara*) and other fleshy roots of Composite plants.

PUPA without any peculiarity of form, pale red with yellowish wing cases. In a cocoon of a short oval shape with blunt ends, formed of gnawings of root mixed with particles of soil and attached to the root on which it has fed. (Dr. Wood.)

The moth is particularly fond of rough stony hill-sides, and waste places where coltsfoot is plentiful, also of quarries, field-walls, and rough rocky surfaces. It seldom sits upon tree trunks, but greatly prefers walls and rocks, sitting with its head straight up and also a little raised, and the wings closed tightly down in a narrow triangle—as is the general habit of this group—though this habit needs to be varied when, as occasionally happens, it sits on a flat rock or the bare stony ground. From any resting-place it is easily disturbed and flies very swiftly off to settle at some distance on a similar spot. At dusk it flies close to the ground and often settles on plants. Later at night it has been known to come to sugar. Quarries seem to be especially favoured haunts, and to one such place I paid repeated visits in search of the larva, arguing to myself that where the insect was so common it *must* be found. As I searched only in *moss*—in all sorts of situations, but to no purpose—my disappointment was fully and satisfactorily explained when Dr. Wood discovered the true food of the creature. Plenty of *Picris* grew in that quarry!

In localities such as I have indicated it is found throughout England, and doubtless Wales, since it is very common in Pembrokeshire; also in many parts of Scotland, in Perthshire attaining an elevation of 2500 feet above the sea-level; and being recorded from the Edinburgh district, Hawick, Renfrew, Dumbartonshire, Aberdeen, Moray, and, as before remarked, the Orkneys. In Ireland it has been found on the coast near Dublin, and Cork; and in Armagh, Antrim, and Derry.

2. **S. basistrigalis**, *Knaggs*.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.).—Fore wings broad with a much arched costa;

light grey with black markings, the first line produced along the costa and repeatedly indented; discal spot **8**-shaped. Hind wings smoky white.

Antennæ of the male rather thick, simple, shining blackish-brown, faintly barred with white; labial palpi somewhat long, drooping, black-brown, pale grey inside; maxillary palpi small, pale grey; head and thorax greyish-white, dusted with black; abdomen silvery greyish-white. Fore wings rather broad, somewhat ovate or bell-shaped, the costa much arched; apex squarely angulated; hind margin almost straight and scarcely oblique; colour pale slate-grey, or greyish-white; first line very conspicuous, deep black, repeatedly indented but erect, running a little toward the base on the costal margin; to it is united a small short black claviform stigma, and also, by a cloudy loop, the dot which represents the orbicular stigma; reniform stigma formed like an **8** or the letter **X** with attached faint grey rings; second line slender, dark grey, rather direct but bent above the middle into a decided angle where it turns back to the costa; it is edged outwardly by a grey-white line; outside this is a series of grey-black clouds; hind margin dotted with black, the largest dots in the middle; cilia white dotted with grey clouds. Hind wings ample, fully rounded behind, shining smoky white, clear and somewhat transparent; cilia white. Female very similar but a little larger, and sometimes with the markings intensified.

Underside of the fore wings shining smoky grey; the costa paler. Hind wings also shining, smoky white. Body and legs smoky greyish-white.

Variable in the ground colour from white to dark smoky grey; in the intensity of colour of the markings, from grey-black to deep velvety black; and in the latter case, often by the extension of the black colour over the wings and consequent suffusion of the markings. In the collection of Mr. B. A. Bower, along with many specimens which are much blackened, is one in which this blackening extends only to

the second line, the outer area being strikingly greyish-white.

This species is always recognisable by its broad fore wings, much arched costa, and the extension of the black first line upon the costa toward the base.

On the wing from the middle of June till the beginning of August.

LARVA and PUPA unknown. Food-plant also unknown; Mr. B. A. Bower records his endeavour to obtain eggs, by placing females in pots of growing moss, but entirely without success.

The moth frequents woods, sitting during the day upon the trunks of trees, more especially oak trees, with its head raised and in a perpendicular position; here the breadth of the bell-shaped closed wings and its robust build is very noticeable, and serves to separate it obviously from the next species. Not very restless, and if disturbed flying generally to a neighbouring tree, or where possible sometimes to a rock face. Uncertain in its appearance, in some seasons plentiful, in others very scarce. Its natural flight is at dusk, and occasionally it will come to light at night.

Recognised as a distinct species and described by Dr. H. Guard Knaggs in the year 1866, having previously been regarded as a variety of *S. ambigualis*. Very local but found in woods, as already stated, in Kent, Surrey, Sussex, Hants, Devon; rarely in Cornwall, Somerset, and Gloucestershire; more frequently in Berks, Suffolk, Norfolk, Cambridgeshire, Herefordshire, and Worcestershire; in Edlington Wood, Yorkshire, where it abounds in certain years; around Morpeth, Northumberland, and also in Cumberland. I have no record for Wales or Scotland; and in Ireland the only one is in the County Cork. Abroad it seems to be little known, but has been recognised in Germany.

3. *S. ambigualis*, *Tr.*—Expanse  $\frac{3}{4}$  inch (18–20 mm.). Fore wings rather broad, grey; costa gently arched; first line rather perpendicular, with deep black indentations, not produced on the costa; second line bluntly angulated, edged with white; discal spot X-shaped. Hind wings smoky white.

Antennæ of the male short, simple, dark grey, faintly barred at the back with white; labial palpi long, rather slender, bent down, black-brown outwardly, grey within; maxillary palpi visible, but small and obscure; head and thorax whitish-grey, the collar rather browner; abdomen silvery grey. Fore wings rather squared behind; costa but little arched; apex bluntly angulated; hind margin very little oblique and faintly curved; colour greyish-white, or white dusted with grey-brown; first line black-brown, shaded off behind, slightly curved, but erect, indented in the middle where it is almost joined by the claviform stigma as a thin black streak; second line black, indented but tolerably direct to above the middle, where it makes a square angle, returning to the costa: outside it is a white edging, followed by two large grey-brown clouds which occupy almost the whole hind-marginal space; orbicular stigma represented by a black dot in the shading of the first line; reniform stigma X-shaped, often with a brown cloud in the upper and lower spaces; cilia white, dotted with grey-brown. Hind wings ample, blunt at the apex, rounded behind; opaque-looking but silky, smoky white shading to a brown tint near the hind margin. Female similar.

Underside of the fore wings shining smoky brown; costa browner. Hind wings white, with smoky apical clouding. Body and legs greyish-white.

Not very variable in colour or markings, though specimens are found having a browner tint or in which the markings are more, or less, distinct. There is considerable variation, however, in size; specimens from wooded heaths situated upon high hills, as at Cannock Chase, Staffordshire,

SCOPARIIDÆ—SCOPARIA.

and the high hills of Perthshire, being distinctly larger than usual—well marked and handsome forms—while those found in low-lying bogs and marshes sometimes—as in Norfolk and also in some parts of Ireland—dwindle to little more than one half the size, and are sometimes confounded with the next species.

On the wing from May till July.

LARVA practically unknown. The late Mr. Buckler received eggs from Dr. F. Buchanan White. His note says: “The young larvæ began to hatch on August 20; they were at first very pale drab with brown heads and plates.” But no indication is given further, or as to food, and there is little doubt that moss was given to them and refused—with fatal consequences. M. Ragonot wrote in 1880: “The larva, still undescribed, feeds in the beginning of April in moss on tree-trunks,” and this statement is confirmed by Herr Anton Schmid. Yet it is certain that the moss on tree trunks has been examined scores of times—I have done it myself—actually on the very trees upon which the moth is to be found, in its season, in abundance, and although larvæ of other *Scoparia* are not scarce, no instance seems to be known of the rearing of this species, and the actual food, and method of its feeding, still remain a problem.

PUPA unknown.

The moth may be found sitting upon the trunks of trees everywhere in woods, on heaths, in hedge-rows, and practically wherever there are trees, but in especial abundance on oaks in woods, and on scattered large birch trees growing upon heathery hills, and is one of our most abundant species. It is alert and rather shy, flying off—sometimes in scores—at the approach of an intruder, to settle again on the same tree, or another close by, or among heather or herbage. It seems to fly more naturally at late dusk, but may at all hours be found on the trees.

Abundant throughout the United Kingdom to the Shetland Isles; also all over the Continent of Europe, and Northern Africa; and found in Bithynia.

4. *S. atomalis*, *Dbl.*.—Expanse  $\frac{3}{4}$  to  $\frac{1}{2}$  inch. (15–18 mm.). Fore wings narrower and of more even width than in the last species, and markings rather similar but more compressed; first line with two attached black streaks, discal spot filled with black-brown clouding; hind wings smoky brown or brownish-white.

Antennae of the male simple, glossy, black-brown, faintly dotted along the back with white; labial palpi long, depressed, thickly tufted with scales; maxillary palpi visible, grey-white, blackened at the sides; head and thorax greyish-white, dusted with black or brown; abdomen glossy whitish drab. Fore wings narrow but not elongated, blunt behind; costa flatly arched; apex very bluntly angulated; hind margin short, faintly rounded; colour white, dusted all over with grey or brown-grey; first line black, erect, almost straight, but minutely indented, shaded outwardly, united with the orbicular, and almost with the claviform stigma, both represented by short black streaks; reniform stigma a rather forked horizontal black streak clouded above to the costa with black; second line composed of black dusting, elbowed above the middle and there indented; followed by a black cloud from the costa, and another from the anal angle, which almost unite in the hind-marginal area; beyond this is a marginal row of faint black dots; cilia grey-brown. Hind wings not very ample, flatly rounded behind, pale smoky brown, rather darker toward the margin; cilia shining brownish-white. Female similar, but with the hind wings darker.

Underside of the fore wings smoky yellow-brown; costa and hind margin yellowish-white. Hind wings smoky white. Body and legs yellowish-white.

Variable in the ground colour from white to grey or grey-

brown ; and in the intensity of the markings. Those of the North of England are not usually by any means so strongly marked as those from Scottish hill and mountain districts—though these last show considerable diversity in their dark markings. One in my own collection has the spaces before the first line and beyond the second uniformly dark grey.

On the wing from July till the beginning of September.

LARVA and PUPA quite unknown. The late Dr. Buchanan White stated that he had been unable to find the larva in any moss, even in the places in which the moth was most abundant.

This is a hill and mountain-frequenting species. It usually avoids trees and exists only on the open portions of the hills among heather, sitting upon the heather, flying up readily from the footstep only to return to a similar resting-place. In England it is only found in the north, the most southern records being at the Longridge, near Preston, Lancashire, and the Blackhills, Yorkshire. It is also locally common on mountains in Cumberland and Westmoreland, but so far as I know has not yet been noticed in Wales. In Scotland it is found on the hills of Roxburghshire and Fife ; in Renfrew, and other hill localities near the Clyde Valley, including Dumbartonshire ; in Perthshire, Aberdeenshire, and Inverness, and doubtless all the suitable hills of the north ; also in Orkney and Shetland, in the last-named Isles being found all over the moors. In Ireland it seems to be confined to the more northern portions—Fermanagh, Sligo, Derry and Donegal. Its range abroad seems to be quite uncertain ; specimens sent to Professor Zeller before his death were pronounced to be a form which he had never seen, rather similar to *S. petrophila*, but distinct.

5. *S. ulmella*, Dale, Knaggs ; *conspicualis*, Hgkn.—  
 Expanse  $\frac{3}{4}$  inch (16–19 mm.). Fore wings silky, rather thinly scaled, narrow at the base, white ; first line smoothly

and evenly curved; other markings faint. Hind wings white.

Antennæ of the male simple, short, shining, dark brown with whitish dotting; palpi porrected, trigonate, the maxillary pair proportionately large, dusky white, blackened at the sides; head and thorax white dusted with brown; abdomen silky greyish-white. Fore wings almost narrowly ovate, but the base narrow; costa gently arched; apex almost rounded; hind margin short but curved; white, dusted with brown, the markings dark brown, not very pronounced; first line concave toward the base, very evenly curved, but having in the middle a minute tooth from which projects the claviform stigma; above this last is a small brown cloud which almost obscures the separate orbicular dot; reniform stigma a faint black X-mark clouded with brown and having above it a grey-brown shade on the costa; second line waved and much indented, making a rounded bend outward above the middle, and blackened on the costa; a faint brown cloud near the apex and another near the middle of the hind margin are followed by dusted black marginal dots; cilia greyish-white. Hind wings ample, rounded behind, very delicate and thin in texture, white; cilia also white. Female similar.

Underside of fore wings shining smoky white; the costa and a large cloud before the apex shining yellowish-white. Hind wings white. Body and legs smoky white.

This species is altogether of slighter build and more delicate appearance, with a thinner covering of scales, than the preceding. Its evenly curved first line is an excellent means of recognition.

On the wing in July and August.

LARVA and PUPA practically unknown. Mr. Buckler records that some eggs which he received from Mr. John Sang hatched in August. He describes the very young larva—"pale bluish-green with darker greyish dorsal

vessel; a blackish head, and narrow plate across the second segment." These young larvæ "were placed on some potted moss," and this seems to have been the last that was seen of them.

The moth sits on tree trunks, especially oaks, in woods, preferring to rest on the portions which are silvered with grey lichens, which it closely resembles. It is restless and will move round the tree to avoid the rays of the sun: also flies off on the approach of a collector. It seems to have been first noticed in this country in the year 1844, when Mr. J. C. Dale took several examples sitting on the trunk of a wych-elm in Hants, one of which he gave to Mr. Curtis. The name under which the remaining specimens were placed in Mr. Dale's collection was not *published* till 1867, when the species was duly described by Dr. Knaggs; but no further specimens had then been obtained.

About the year 1871, however, it began to be found in woods in Westmoreland, and ten years later it was announced and described by Mr. J. B. Hodgkinson, under the name of *conspicualis*. Mr. Hodgkinson at the same time remarked that "it may be known from any other *Scoparia* by the distinct pale basal area, standing out like a whitish dot on the tree trunk on which the insect rests. When on the wing it appears as pale as *S. pallida*." A few years later Dr. P. B. Mason was able to compare Mr. Dale's original specimens with a long series of the form called *conspicualis*, and found them to be identical.

It seems to be exceedingly rare in the south, and the only instance of such a capture that I know of since Mr. Dale's discovery is by Mrs. Bazett in Berkshire: but in woods in the northern half of England it is by no means uncommon in favourable years: occurring freely in Yorkshire, Lancashire, Durham, and Westmoreland, and more sparingly even in Herefordshire, Warwickshire, Staffordshire, Leicestershire, and Derbyshire. So far it does not seem to have

been met with in Wales, Scotland, or Ireland, and its range on the Continent is quite uncertain.

6. *S. dubitalis*, *Hüb.*; *pyralella*, *Hüb., Stn.*—Expanse  $\frac{1}{2}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings somewhat broad and squared, shining white, the markings bright brown with darker edging in irregular transverse stripes. Hind wings white.

Antennæ of the male simple, shining black-brown, obscurely dotted with white; labial palpi rather drooping, brown-black outside, white within; maxillary palpi almost half as long, white; head also white; thorax white dusted with brown; abdomen greyish-white. Fore wings broad at the base, oblong, rather squared behind; costa most faintly arched; apex angulated; hind margin hardly oblique or curved; anal angle well formed; colour white dusted with brown; a basal line is indicated by two fine black streaks and some brown clouding; first line a broad nearly erect stripe, golden brown with black loops and edging, which unite with, or include, the very faintly ringed orbicular stigma, and a short black or brown straight streak as the claviform stigma; reniform stigma very large, golden-brown, constricted, and often edged with a fine black line, throwing off a brown cloud to the costa, and often a brown shade to the dorsal margin; second line a clear white stripe, very direct, except a small divergence outward above the middle; beyond is a golden-brown band of irregular width, edged outwardly by an incomplete white subterminal line or stripe; extreme hind margin yellow-brown with a row of minute black dots; cilia pale brown dashed with white. Hind wings broad and ample, with sinuous hind margin; silky, smoky white shading to smoky brown at the apex and hind margin; cilia rather paler. Female similar or having the ground colour more clearly white.

Underside of the fore wings silky, pale smoky brown. Hind wings equally silky, smoky white. Body and legs dusky white.

Very variable, especially so upon the coast. In western districts, and especially on the Irish coast, a form is common in which a brown tinge or shading obscures the fore wings, obliterating the brightness of the usual ground colour and markings. In chalk, oolite, and limestone districts, on the south coasts of England and Wales, a different range of variation is abundant, sometimes almost eliminating the typical forms. In this the ground colour is *chalky* white, and unusually conspicuous from the reduction of the brown clouding and curtailment of markings, or in the change of the colour of the markings to faint pale brown. In this range of varieties—known as var. *ingratella*—every possible stage occurs in the partial obliteration of the markings until a creamy white or porcelain-white form is reached, upon which are no markings at all; or in another direction to where the space between the first and second lines forms a darker central band on a white ground. Some beautiful examples of this last form have been taken on the Dorset coast by Mr. E. R. Banks; and others of the whitest forms at Eastbourne by Mr. H. F. Fryer. A very curious looking specimen which I met with on a cliff near Margate has the costal two-thirds of the central space filled up by a rectangular smoky brown blotch in which is a white spot, the rest of the fore wings very faintly shaded. It bears little resemblance to either of the other known variations.

On the wing from the end of May till July.

LARVA and PUPA unknown. Hartmann says "in March and April in moss and lichen on oak and birch," yet all the labour which has been lavished in the search for it in moss has been utterly without result. The late Mr. W. Machin, however, reared two or three specimens from unnoticed larvæ or pupæ among roots of sorrel (*Rumex acetosa*), which had been dug up in the search for the larva of *Sesia chrysidiformis*; and the example of *S. cembra* encourages a suspicion that the present species may ultimately prove to be

a root-feeder. It is an abundant species, occurring in thousands on chalk hills, downs, and dry open fields, but is usually not common in woods; moreover it does not love to sit upon tree trunks, but hides among grass and rough herbage near the ground, or on loose stones and rocks. It flies up in a lively manner at every footstep in such places, and buzzes about a little while tolerably swiftly, to settle down again; but about sunset begins to fly of its own accord, and very soon is to be seen hovering over the grass in multitudes in every direction. Common everywhere in England, and in Scotland to Perthshire and Aberdeenshire, though much more local in these northern districts; also found in Wales to Pembrokeshire and doubtless everywhere. In Ireland it may be more local, yet is common about Dublin and recorded from such extreme districts as Cork, Kerry, Donegal, and Derry. Abroad it is a well known species throughout Central and Southern Europe, the South of Sweden and Norway, Finland, Livonia, Dalmatia, Syria, Asia Minor, and Armenia.

7. *S. murana*, Curt.—Expanse  $\frac{3}{4}$  inch (16-19 mm.). Fore wings long, narrow at the base, greyish-white or pale olive-grey; markings grey-black—sinuous, clouded, and rippled; discal spot an 8-mark with white centres. Hind wings grey-white.

Antennae of the male rather long, simple, black-brown dotted with white; labial palpi elongated, rather drooping, black-brown, with the upper margins white; maxillary palpi short, white shaded with black; head and thorax greyish-white, or olive-white, dusted with black; abdomen glossy greyish-white. Fore wings elongated, with the base narrow; costa well arched; apex bluntly angulated; hind margin oblique, gently curved; dorsal margin rather full; greyish-white or greenish-white, dusted with black; basal line suggested by two black spots followed by a dusted band; first line black, erect but a little indented, shaded outwardly

with black ; stigmata detached—the orbicular a rough black triangular spot, claviform a somewhat rounded black spot, reniform a round *white* spot with a black ring which throws off spurs at the base ; second line much broken, formed of black dusting ; beyond it are clouds of similar black atoms near the apex, the hind margin, and the anal angle ; these three clouds, and also the first and second lines, are prettily edged by fine white lines ; hind margin regularly dotted with black ; cilia shining silvery white. Hind wings not very broad, the hind margin sinuous and a little curved ; silky, smoky white, darker along the hind margin ; cilia whiter. Female with similar markings often greyer or darker.

Undersides of all the wings glossy pale smoky grey, except that a yellowish shade lies along the costa of the fore wings. Body and legs dusky white.

Not very variable, but in some districts all the specimens have the grey tint, while in others a more olive or even faint greenish shade is noticeable ; occasionally also a specimen is found in which the ground colour is obscured and shaded with smoky black. There is also some variation in size, occasional specimens being very small.

On the wing at the end of May and in June, and as a second generation at the end of July and in August.

LARVA half an inch long ; the head very nearly of the width of the second segment, the lobes rounded ; highly polished, intensely black ; dorsal and anal plates similar ; body cylindrical and of nearly uniform width, tapering only a very little at the extremities ; segmental divisions well defined ; ground colour dingy ochreous-brown or sometimes purplish-brown ; a fine brown line, widening at the segmental divisions, extends through the middle of the dorsal area, also a wavy brown stripe along the subdorsal, and another one along the spiracular region ; all these lines together giving a reticulated appearance to the paler ground colour ; raised dots very dark brown, and shining ; spiracles

black; undersurface of the same colour as the upper. (G. T. Porritt.)

February to May—but probably from the proceeding autumn—and a second generation in July, on *Hypnum cressiforme*, *Dicranum scoparium*, *Bryum capillare*, *Grimmia pulvinata*, and other mosses growing upon old walls, dykes, and rocks.

PUPA of ordinary shape and proportions, highly polished; eye, leg, and wing-cases clearly defined though not prominent; bright brown, with an olive tinge over the front of the thorax; eye-cases darker than the ground colour; abdominal divisions well defined. chocolate brown, this colour showing clearly through the lower part of the wing-cases. In a cavity, lined with silk, at the roots of the moss. (G. T. Porritt.)

This moth loves to sit upon mossy walls, and upon rocks and stones in mountain glens: and rarely, if ever, is seen upon a tree. It also sits very quietly and may be touched where it rests without being alarmed if the weather is not too warm. It principally frequents northern mountain districts, but in rare instances has been seen in the south. A specimen taken at light at Studland, Dorset, must surely have been migrating; but it is said to occur on hills and rocks in Devon; also on the Black Mountain, Herefordshire, and casually in Leicestershire; rarely in Cheshire, and much more frequently in Yorkshire, North Lancashire, Westmoreland, Cumberland, Durham, and Northumberland; also on the mountains of North Wales. In Scotland it seems to be generally distributed in suitable hill districts to Sutherland and Ross, and also to the Hebrides and Orkneys; but I find no record for Shetland. In Ireland it appears to be very uncommon; Mr. Kane only quotes Mr. Hogan's old record at Belfast, but this I have been able to confirm by the capture, after long search, of two specimens on an old damp wall in the suburbs of that city.

Abroad it seems to frequent all the mountain ranges of Central Europe, and Northern Europe to the Polar region, including Lapland.

8. **S. truncicolella**, *Stn.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–22 mm.). Fore wings very narrow at the base, broad behind; glossy grey-white; the lines clouded and dusted; the discal spot an X-mark. Hind wings white.

Antennæ of the male simple, dark brown, regularly barred with glossy white; labial palpi rather drooping, narrow, black outside, white within; maxillary palpi small but similar; head greyish-white; thorax of the same colour, but much dusted and clouded with grey; abdomen silky brownish-white. Fore wings narrow at the base, rapidly broadened, and rounded behind; costa strongly arched; apex almost rounded and the curve carried round the hind margin, yet the anal angle well formed: white dusted with black-brown; in the middle of the base is a horizontal black streak, but sometimes this extends itself as a much angulated basal line; first line black, indented, upright, followed by some black dusting; orbicular and claviform stigmata detached, both elongated black dots; reniform stigma S-shaped, the two rings flattened a little, but often with the margins incomplete; second line regularly and plentifully rippled and indented, black, expanded on the costa to a triangular spot and edged by a slender parallel white stripe; in the white area beyond this are three patches of grey dusting, the darkest being in the middle; hind margin closely dotted with black and edged with white; cilia white with smoky clouding. Hind wings not very broad, the hind margin flatly rounded, and apex somewhat pointed; silky smoky white; cilia of the same colour, but with a pale line along the extreme hind margin. Female rather larger, and having both fore and hind wings a very little broader, sometimes also suffused with darker clouding.

Underside very silky; the fore wings smoky-white, with

parallel white and darker hind-marginal lines; the hind wings white. Body and legs brownish-white, the front tarsi dull black, barred with white.

Usually not variable, except a little in the depth of colour of the markings, and of the grey shade of the ground; but a specimen taken in the New Forest by Mr. L. B. Prout, has the portion of the fore wings between the first and second lines dusted with black scales, and forming a dark central band, against the unusually white outer areas.

On the wing from July till the beginning of September.

LARVA nearly three-quarters of an inch long; head a very little narrower than the second segment, with lobes rounded, and the mandibles rather prominent, highly polished, dark brown; dorsal plate shining black-brown; body of nearly uniform width throughout, tapering only at the anal extremity, rounded above but rather flatter on the undersurface: segments clearly defined, deeply cut; dingy dark olive-brown; a dingy black pulsating vessel shows distinctly at the dorsal stripe; the ventral surface of the same colour as the upper; skin with rather a tough appearance; the raised dots polished, large and prominent; black; the hairs also black and short. Altogether a very dingy looking creature. (G. T. Porritt.)

September till June, on *Dicranum scoparium*, *Hypnum cupressiforme* and other mosses growing on stones or on the earth, forming galleries under and through the moss; active, and very lively if removed from the feeding-tunnel.

PUPA apparently undescribed; spun up in the moss.

This species is especially attached to plantations of Scotch-fir; appearing later in the season than the other woodland species, it suddenly causes these still and solemn ranges of tall bare trunks to be enlivened by the numbers of small moths which flit from every tree at the approach of an intruder, flying to the earth or to a lower part of the same or

another trunk. As it sits in the usual perpendicular posture its head is raised and pointed in a peculiarly alert manner, and it is so restless as quickly to spoil itself if confined in a pill or chip box. Although so greatly attached to fir woods, it will sit on other trees when these are intermixed. It flies at late dusk and is then attracted by flowers, especially those of *Knautia arvensis* when blossoming in the neighbourhood of the firs. Locally abundant in the South and East of England and to be found in suitable places throughout the country to Cumberland, though, except that it is scarce in Durham, I find no records for the north-eastern counties, nor for Cornwall; neither any for Wales except my own in Pembrokeshire. In Scotland it seems to be rare, yet is recorded in Inverness; in Ireland found in Waterford, Kerry, Mayo, Tyrone, Armagh, and Donegal. Abroad common in Central Europe, Italy, and Russia.

9. **S. resinæ**, *Haw.*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings rather trigonate, white; first line joined to a black costal spot; discal spot to a larger one; and another lies nearer the apex; two black clouds lie near the hind margin. Hind wings grey-white.

Antennæ of the male simple, black-brown, with only very fine white dotting; labial palpi long, heavily tufted, black outwardly, white above and within; maxillary palpi very small; head white; thorax white, spotted with black; abdomen silky yellowish-white. Fore wings not elongated, rather narrow; costa very flatly arched; apex bluntly rounded; hind margin oblique, hardly curved; anal angle rather distinct; glossy white with the markings conspicuously black; basal line imperfect, running out to a point in the middle, and followed by a faint band of black dusting; first line erect but with one or two small projecting points, deep black and united to a black cloud which includes two blacker dots representing the orbicular and claviform stigmata; reniform stigma almost hidden in a large squared black spot which ex-

tends to the costa, and at its lower edge throws off one or two black points; second line obscure, a mere series of grey dots edged by a band of the white ground colour; this last forms a cross with another white stripe, which bends so as to proceed from the apex to the hind margin, and to isolate a black costal spot, and two more such spots, one at the hind margin the other at the anal angle; cilia white, dotted with black. Hind wings small, flatly rounded behind, greyish-white, cilia white. Female similar.

Underside of the fore wings shining pale smoke colour, more yellowish along the costa and hind margin. Hind wings dusky white, with two or three cloudy transverse faint stripes of smoke colour. Body and legs brownish-white, the front tarsi black, with white bars.

Tolerably constant, its deep black markings on white or sometimes greyish-white ground forming its most reliable characteristic, but occasionally the central black spot is extended so as almost to form a complete band.

On the wing from the middle of June till August.

LARVA. Body cylindrical, of moderate bulk, and attenuated slightly at the extremities; head and dorsal and anal plates highly polished, very dark bronzy-brown; ground colour greenish-yellow, very similar to that of the lichens on which it feeds; raised dots partially joined, bronzy-brown; segmental divisions deeply cut; on each segment is a slight transverse ridge: when it is crawling the dark green alimentary vessel shows through the divisions as a dorsal stripe, but there are no perceptible subdorsal or spiracular lines. Ventral surface and prolegs of the colour of the dorsal area. Legs ringed with darker. (G. T. Porritt.)

April till the beginning of June, on lichens and mosses growing on the trunks of ash, apple, and sometimes elm-trees.

PUPA apparently undescribed.

The moth sits during the day on the trunks of ash-trees, or occasionally on apple or elm trunks, and is there very conspicuous, its deep black spots distinguishing it at once from all other species; indeed, it is of a particularly pretty bright appearance. It flies in the evening, and comes willingly to "sugar" if placed on the tree-trunks. Rather a local species, but found in the New Forest, Hants, and in Surrey, Sussex, Dorset, Devon, Cornwall, Somerset, Wilts, Gloucestershire, Herts, Norfolk, Herefordshire, Cheshire, Lancashire, Yorkshire, and Westmoreland; but I find no record in Wales or Scotland. In Ireland it used to be rather common near Powerscourt Waterfall in the County Wicklow, and is found in the County of Cork, and near Kenmare, Kerry. Abroad it inhabits most parts of Central Europe, Denmark, Spain, and Sardinia.

10. *S. cratægella*, *Hüb.* — Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (16–20 mm.). Fore wings softly shining white, grey-white or greenish-white; lines and discal spot thinly marked, but more or less softly clouded; two black stigmatic dots clear of the first line; hind wings greyish white.

Antennæ of the male simple, brown, broadly barred at the back with white; labial palpi long and rather broad, brown outside, white within; maxillary palpi short, similar; head and thorax white dusted with black-brown; abdomen silky greyish-white. Fore wings elongated, of moderate breadth; costa very flatly arched; apex bluntly rounded; hind margin also rounded, not very oblique; anal angle well formed; white; the basal area more or less dusted with black-brown, blackest close to the base; first line very erect and but little angulated, composed of black atoms set in brown shading; orbicular stigma indicated by a separate black dot, claviform stigma similarly isolated—a dot-like black streak—reniform stigma or discal spot white edged with black which throws off black claws beneath; second line direct but once elbowed, black-brown, slender, very little indented; edged by a narrow

stripe of white ground colour, and this followed by three black-brown clouds which, though clearly separated, almost occupy the hind-marginal space, while the middle one extends to a series of coarse black hind-marginal dots; cilia white with smoky clouds. Hind wings tolerably ample, rounded behind, smoky white or pale smoky grey, rather darkened along the hind margin. Female similar.

Undersides of all the wings glossy, smoky white without markings. Body and legs yellowish-white, the front tarsi barred with black.

Usually very constant in its markings, but in some of its more sandy localities in Suffolk and Cambridgeshire the ground colour receives an olive or greenish tinge, and the markings become thickened and clouded with black or olive-black so greatly that an intimate knowledge of the species and the proportions of its markings becomes necessary to enable the collector to recognise it: yet some of these darkened forms are very handsome. In its ordinary and typical form the separated stigmata, and the whiter and clearer appearance of the middle area of the wing quickly catch the eye, and a peculiar arrangement of the markings difficult to put into words, but most distinct to the practised eye, will always, with the greater breadth of the fore wings, serve to distinguish it from the next species—its nearest ally.

On the wing from June till the beginning of August.

LARVA moderately plump and nearly cylindrical, but tapering rather suddenly at each extremity; head shining black-brown; dorsal plate rather similar, faintly divided; general colour pale brownish-yellow, or greenish-yellow without markings except the raised dots, which are large, conspicuous, and very glossy, black, and the spiracles, which are also black; anal plate and legs of the colour of the body.

May—but probably feeding from the previous autumn—on common mosses growing on tree-trunks, and sometimes

on old walls and dykes, inhabiting a slight tubular web in the moss.

PUPA apparently undescribed.

The moth sits upon tree-trunks by day, but usually in open places rather than woods, and is then easily recognised. At night it comes occasionally to light. Somewhat local yet found in the South London suburbs, and almost throughout England and Scotland, usually in very small numbers, but in favoured spots, as near Brandon, Suffolk, abundantly. Probably scarce in the north of Scotland, though it is recorded even from Shetland. Certainly its range is the less known from its being often confounded with the next species. In Wales I only know it from Pembrokeshire. In Ireland it has been taken near Dublin and in Waterford, Cork, Kerry, and Galway.

Abroad its range seems to extend all over the Continent of Europe and Asia Minor.

11. **S. mercurella**, *Linn*; **frequentella**, *Stn. Manual*.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–19 mm.). Fore wings rather narrow, rounded behind, white or grey-white; first line thickly shaded outwardly; base, discal spot, and hinder region clouded with black. Hind wings grey-brown or whitish-grey.

Antennæ of the male simple, black-brown, faintly barred at the back with white: labial palpi not long, rather trigonate, black outside, greyish-white above and within; maxillary palpi clearly separate, light grey; head and thorax greyish-white, the latter sprinkled with black; abdomen shining pale silvery grey. Fore wings rather narrow; the costa nearly straight; apex and hind margin rounded, and the latter very little oblique; greyish-white or smoky white; basal area much clouded with grey or black dusting; first line erect but slightly curved, with a projection on the costa toward the base, and a small tooth beneath it in the middle;

before it is a narrow white or whitish parallel stripe ; outside it some clouding of black atoms, which includes the dot and streak representing the orbicular and claviform stigmata respectively ; reniform stigma formed of two superimposed incomplete black rings which enclose white or grey spots ; second line dusky black, sinuous and rather erect, but sometimes only represented on the two margins ; this is followed by a white stripe which nearly meets another so placed that a sort of large white cross is formed enclosing two out of three hind-marginal black clouds ; extreme hind margin dotted with black in white spaces ; cilia white with smoky dotting. Hind wings ample and rather elongated, rounded behind ; pale grey-brown or whitish-grey ; cilia rather whiter. Female similar.

Underside of the fore wings silky smoky grey, with a darker spot at the end of the discal cell. Hind wings greyish-white. Body and legs white, the front tarsi blackish, with white bars.

A very striking and beautiful variety, known as var. *Portlandica*, Dale (*phœbeana*, Stainton) is found rather commonly, mixed with the more ordinary forms, in the Isle of Portland, and rarely in other places ; it has the basal area clear chalky white and a broad oblique band of the same between the stigmata and the hind-marginal clouds, almost obliterating the second line. It was long looked upon as a distinct species ; but has recently been proved by the Dorset entomologists to be merely an extreme form of variation, of which every possible intermediate gradation could be found along with the type. Another variety almost equally distinct in appearance often occurs in company with the type in southern woods ; in it the portion of the fore wings between the two lines is blackened, and the stigmata almost obliterated, so as to produce a blackish band : in other specimens the blackening extends widely over the fore wings ; and perhaps the most reliable character in this species is the even narrowness of its fore wings, *with a rounded apex*.

On the wing from June till September.

LARVA moderately stout, cylindrical and of almost uniform width, tapering only a little at the posterior extremity; segmental divisions deeply cut; skin smooth and slightly glossy; head polished, the lobes rounded, rather narrower than the two following segments, dark brown with frontal streak and mandibles darker sienna-brown; dorsal plate very dark sienna-brown, almost black; anal plate with a slightly greener tinge; body dingy straw-colour, but in younger examples strongly suffused with a dirty dark green tinge; raised dots polished, olive-brown; legs black, ringed with olive; prolegs and ventral surface of the same colour as the dorsal area; a very faint narrow brown pulsating vessel indicates the dorsal line; other lines not indicated. (G. T. Porritt.)

March and April, but probably from the preceding autumn, on mosses growing upon tree-trunks, rocks, and stone walls—*Hypnum cupressiforme*, *Isoetecium myurum* and other species—probably many other species, since this larva seems to be found in thick tufts of earthy moss in all sorts of situations, even on the spreading roots of trees, on the ground, and on the roofs of houses.

PUPA light brown; not further described; in a silken cocoon under moss.

The moth sits by day on all manner of trees, often where there is not much trace of the mosses on which it feeds; also on rocks and damp walls; but is very lively and ready to dart away if disturbed. Not rare in the suburbs of London and very common in most parts of the country; found throughout England, and probably Wales, since it is common in Pembrokeshire and found in Carnarvonshire; its range in Scotland does not seem to be well ascertained, but it certainly occurs in Perthshire and Dumbartonshire. In Ireland it is generally distributed and common. Abroad

it is found throughout Central Europe, and in Spain, Portugal, Dalmatia, Corsica, Greece, the Taurus mountain district, and in Northern Africa.

12. *S. lineola*, Curt.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.) Fore wings very narrowly oblong, white with much grey clouding; transverse markings rippled and mossy, black; orbicular and reniform stigmata white with black rings. Hind wings greyish-white.

Antennae of the male simple, pale brown, barred at the back with white; labial palpi not large, white shaded outside with brown; maxillary palpi obscure; head and thorax white, dotted with brown; abdomen shining pale grey, with a white edge to every segment. Fore wings long and narrow; costa faintly arched at the base and apex, straight between; apex bluntly angulated; hind margin rather expanded and rounded; ground colour, where visible, white; all the markings mottled with fine black mossy dusting; extreme base clouded with black dusting and minute streaks; first line rather curved and hollowed, not indented, almost wholly composed of black dots which spread outwards into a cloudy band; in this the orbicular stigma is visible as a clear white dot in a partial black ring, and also the broadened black elavicular streak; the black dusting continues along the costal region, and beneath it is the reniform stigma—white, partly encircled with black, and having a broad black base—second line deeply curved, indented into crescents throughout, and having in its upper portion short black lateral streaks; bordering it is a white stripe which unites in the middle with a hinder white stripe, producing a distinct cross which separates the rather small hinder clouds; of these the one close to the anal angle is black, the others grey; hind margin edged with black dots which throw points inward; cilia white, faintly dotted along the base with black. Hind wings broad and shining, rounded behind, greyish-white; cilia white. Female similar.

Underside of the fore wings smoky grey, clouded with darker. Hind wings smoky white, with a broad cloudy band beyond the middle, and a faint smoky central spot. Body and legs white.

Hardly variable, except that the clouding and dusting of the fore wings is sometimes of a browner tinge. Best recognisable by the *long* narrow fore wings, their pretty mossed and mottled aspect, and the round white dots of the stigmata.

On the wing from July till September.

LARVA half an inch long, of moderate bulk, segments plump, with deeply cut divisions; head highly polished, intensely black, with the lobes rounded, rather smaller than the second segment, into which it can be partially withdrawn; ground colour dark olive-green, throwing into rather striking relief two whitish-grey or cream-coloured transverse streaks on each segment, the front streak being broader and larger than that behind; on these streaks are placed the intensely black raised dots, which are large and glossy, and as broad as the streaks, thus appearing to divide them into sections; an irregular greyish stripe extends along the spiracular region, and on each segment below this is a small black spot; dorsal plate intense glossy black; spiracles black; ventral area and prolegs dingy dark olive-green, on the outside of each of the latter is a black spot; anterior legs encircled with black. (G. T. Porritt.)

April till June or even July—probably from the previous autumn—on *Parmelia parietina*, *P. olivacea* and other lichens growing on palings or the branches and twigs of hawthorn, blackthorn, elm, and other trees, or on stone walls and roofs.

PUPA apparently undescribed and unnoticed.

The moth usually sits on old lichen-covered branches of elm or apple, and in similar thick bushes of hawthorn or blackthorn, but not commonly on tree-trunks or walls; yet may sometimes be found hiding in old thatch; and when

beaten out will fly sharply into some dense cover. At night it comes occasionally to light; but is not commonly met with. It is found locally in Kent, Sussex, the Isle of Wight, Dorset, Devon, Cornwall, Somerset, and the Eastern Counties; but seems to be absent from many of the Western and the Midlands, and except that it is very local in Yorkshire, Durham, and Westmoreland, not known in the Northern Counties. In Scotland, however, it has many localities—Berwickshire, East Lothian, Midlothian, Ayrshire, Perthshire, Aberdeen, and even Orkney, where near Stromness it was taken by Mr. Cheesman. In Ireland it has long been known to occur on the Dublin coast, where the late Richard Shield found it on old blackthorns; more recently it has been taken in Galway and Derry. Abroad its range seems to be much restricted, but it is recorded in Central and Western France and Northern Spain.

13. *S. angustea*, *Steph.*; *coarctalis*, *Gn.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (15–23 mm.). Fore wings long and narrow, pointed, brownish-white, the markings dark brown; orbicular stigma elongated; hind margin retuse. Hind wings silky, white or smoky white.

Antennæ of the male simple, shining brown; labial palpi porrected, long and broadly tufted; maxillary palpi more erect and shorter, tufted; both dark brown with the inner portions whiter; head and thorax drab; abdomen glossy whitish brown with the segments edged with white. Fore wings long, narrow and pointed: costa very flatly arched throughout; apex decidedly angulated, and hind margin very oblique, retuse below the apex; colour brownish-white or very pale drab; the markings blackish-brown or dull brown; at the base is a cloud of brown dusting enclosing a black streak; first line very oblique, cloudy and faintly notched; touching it is the claviform stigma, a thick black streak; orbicular stigma ovate, edged with black; reniform stigma brighter brown, also edged with black, which edging

throws off claws from its base; second line very oblique, strongly undulated but not very distinct, dull brown, edged by a white parallel stripe, and this by a slender stripe of brown clouding which spreads out toward the apex; hind margin dotted with black; cilia whitish-drab. Hind wings not very broad; apex rounded; hind margin undulated and hardly rounded; silky smoky white, the cilia white. Female with rather narrower fore wings, and stout abdomen, often rather small, and more sharply marked.

Underside of the fore wings shining yellowish-drab, clouded beyond the middle with smoke colour. Hind wings smoky white. Body and legs brownish-white.

Very variable in size. Rather so in the depth of the markings; occasional specimens having the middle area darkened, or an unusual darkening of the first line and its attendant clouding. This species may always be recognised by its narrow and pointed fore wings and their brownish tint.

On the wing in its more favoured localities on the sea-coast in every month from April to October, probably in two generations; but in other localities in one only, lasting from July till October.

LARVA rather slender, cylindrical and of nearly uniform width, tapering very slightly at the anal extremity; head of about the same width as the second segment, highly polished, pale brown; dorsal plate similarly polished, dark sienna-brown, often nearly black; skin smooth and glossy, the segments deeply divided; ground colour very dark smoky grey, with an indistinct greenish tinge; raised dots smooth and glossy, of a darker shade of the ground colour, or in some specimens nearly black; ventral surface of a pale shade of the ground colour; the legs ringed and tipped with black. (G. T. Porritt.)

October, and feeding through the winter till May on the South Coast, and again (apparently) in July and August, but

where the species is single brooded, feeding till June or later : on *Tortula muralis*, *T. revoluta* and other wall mosses, especially those which form thick rounded cushions ; living in a silken gallery and eating the solid substance of the moss, yet avoiding the surface.

PUPA pale brown, in a slight cocoon among the moss.

The moth sits during the day upon mossy walls, and is sluggish, allowing itself to be boxed as it stands, or if disturbed flying only a short distance ; flying naturally at late dusk. and then fond of the flowers of Golden-rod (*Solidago canadensis*) and of ivy-bloom ; also very much attracted by light. so that it is by no means uncommon to see specimens on every street lamp at night, in suitable localities. Abundant on the walls of sunken fortifications on the South coast—where it begins to emerge in April or May—and sometimes common on sea sandhills where the sand is sufficiently consolidated to allow of the growth of moss-tufts. Most plentiful and most generally distributed on the coast, more local inland, but to be found in suitable places throughout England and Scotland, from the Scilly Isles and Kent to the Orkneys and Shetland Isles. Probably common throughout Wales, but only recorded from Pembroke, where it was very abundant. In Ireland common around Dublin and Belfast, also found in the counties of Cork, Fermanagh, Armagh, and Derry. Abroad it is common in Southern Europe, with Corsica ; in Asia Minor ; the Canaries and Madeira, and in Northern Africa.

14. **S. alpina**, *Stn.*—Expanse  $\frac{3}{4}$  to 1 inch (18–25 mm.). Thorax rather robust ; base of fore wings very narrow, broadening out with rather straight margins ; but in the male broadly rounded behind. Markings obscure, and the lines very faint ; hind wings shining grey-white.

Antennæ of the male simple, glossy, brown ; labial palpi slender, pointed, porrected, dark brown outside, whitish-

within; head and thorax brownish-drab, the latter rather robust; abdomen somewhat thick, yellowish-grey. Fore wings elongated, narrow at the base, steadily broadening to a well-developed outer area; costa nearly straight till far beyond the middle, then somewhat arched; apex bluntly angulated; hind margin a very little oblique, hardly curved, and the anal angle very definite; shining greyish-white; the markings obscure; first line very erect, but a mere brown shade almost broken at the claviform stigma, which is short, thick, and dull black; orbicular stigma decidedly ovate, edged with black, from which a streak is thrown off to connect it with the reniform; this last is faintly brown, with a black ring, from which minute claws stand off at the base; second line a series of small brown wedges edged on the outside by a whitish stripe, and this by a brown shade or pair of clouds containing blacker streaks; hind margin edged with black dots, from which tiny dashes point inwards; cilia shining whitish-grey. Hind wings long and very ample, rounded behind; shining smoky brownish-white or smoke colour; cilia concolorous. Female more stiff in appearance, the thorax thicker, the abdomen still more so, and looking really clumsy; the fore wings smaller, narrower, and rather more grey in colour.

Undersides of all the wings shining smoky yellowish-white, without markings. Body and legs very pale brown.

Usually only a little variable in the shade of ground colour, or the distinctness of the markings; but among specimens from the Shetland Isles are two beautiful forms—one having the middle area of the wing as usual, but the basal and hind marginal areas quite white; the other normal except a broad even white stripe before the hind margin. The sexes are so different that the larger specimens of the male have long been supposed to represent a distinct species under the name of *gracilalis*. This, however, is clearly a form of the present. There is reason to believe that increased size is caused in this species by rigour of climate. Very fine

and large specimens were found by Mrs. Fraser in a rocky hollow near the top of a mountain in which the snow had then melted for the first time for several years, and in which it seems possible that the pupæ had laid over for those seasons. The best characters in this species, independently of its stouter body, are the length of its fore wings, their narrowness at the base, and very gradual widening, and the glossy grey shade of colour.

On the wing in June and July.

LARVA unknown; except that Mr. Buckler received from Dr. Buchanan White eggs of this species from which were hatched larvæ, which he thus describes: "The young larva is of a drab colour with shining head, and plates slightly darker drab on the second and thirteenth segments; some faintly darker dots are seen along the back, which emit fine hairs." It does not appear whether these young larvæ partook of any food; doubtless they quickly died from lack of proper sustenance.

PUPA unknown.

The moth frequents grassy and mossy places on the higher hills of Scotland, especially frequenting the ridges; seldom found at a lower altitude than 2000 feet, and ascending to the snow-line or to the summits of the mountains. It may be disturbed by the footstep, flying up from the grey moss—*Trichostomum*—and settling again at a short distance. It does not seem to have been, as yet, observed in England, Wales, or Ireland. In Scotland it may be found on Schiehallion, Meol Ghaordie, Ben Lawers, Braemar, and probably on every high mountain in Perthshire and Aberdeenshire, and, as may reasonably be supposed, in the more northern districts, since it is found at lower elevations in the Orkney and Shetland Isles. Abroad it seems only to have been recorded from the mountains of Norway.

15. *S. pallida*, *Steph.*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings short, trigonate, blunt, white, with the markings faint—mere obscure dashes and dusting; discal spot a black dot; second line straight. Hind wings white.

Antennæ of the male simple, shining brown; labial palpi rather large, brown outside, whitish within; maxillary palpi conspicuous, but short, dusky white; head and thorax brownish white; abdomen slender, silky greyish-white. Fore wings short, blunt, narrowly trigonate; costa very slightly arched; apex squarely angulated; hind margin nearly straight and hardly oblique; white, faintly dusted or shaded with pale brown; a streak of black atoms from the base runs along the costa, and another from the middle of the base to the first line; this last is but faintly perceptible except that from it proceed three streaks, one on the costa, another—consisting merely of black atoms—in the discal cell, and the third below, forming a very small claviform stigma; beyond are minute black dashes on the nervures, and the second line indicated only by a channel of white ground colour between brown shading and hardly perceptible black dashes; the latter form a narrow transverse cloud pointing to the apex; hind margin minutely dotted with black; cilia white with tiny brown clouds. Hind wings broad, the hind margin but little rounded; anal angle prominent; shining white with smoky clouding along the hind margin; cilia shining white. Female similar.

Underside of the fore wings dark smoky-brown, very glossy; a paler streak from the middle runs along the costa to the apex. Hind wings glistening white. Body and legs brownish white.

Slightly variable in the ground colour—brownier or whiter. In the brownier specimens there is usually a faint subterminal white shade, and the markings are more noticeable.

This species is easily recognised from its small size, the triangular shape of its fore wings, and the absence of definite markings.

On the wing from the end of June till August.

LARVA and PUPA unknown.

The moth frequents fens and marshes, hiding during the day among the coarse herbage, close to the ground, and is rarely seen at that time, since it will not fly, but drops down if disturbed, and can only be discovered by careful parting of the grass and herbage and the blowing-down of smoke. But after sunset it flies of its own accord, and may be seen and taken in multitudes, keeping near to the ground and threading its way on the wing among the coarse plants. Apparently it furnishes no indication of any preference for moss, grass, or any other plant. Sometimes a shower of rain earlier in the afternoon will bring it out in full force. Most abundant in the fens of Norfolk, Suffolk, and Cambridgeshire, but apparently to be found in every wet marsh in the southern portion of England, with the Eastern Counties: also in Herefordshire, Derbyshire, Cheshire, Lancashire, and Yorkshire. Probably overlooked in a great portion of the Midlands and Northern Counties; for it exists in a marsh in Fife, near Edinburgh, and in the Orkneys and Unst, Shetland. My only record in Wales is in Pembrokeshire, where it is common in the smallest marshes. In Ireland it is found near Dublin, and in Waterford, Monaghan, Armagh, Antrim, and Donegal. Abroad distributed through Central Europe, North and East Spain, and Livonia.

## Section 2. PTEROPHORIDÆ.

Proboscis present; maxillary palpi imperceptible; labial palpi short. Fore wings usually shortly cleft; vein 5 absent or curtailed; hind wings closely folded or triply cleft; vein 5 absent; vein 8 closely pressed to vein 7; abdomen very slender, long, constricted at the base, thickened behind.

Genus 1. **AGDISTES.**

Antennæ very short, simple; palpi small; tongue well developed; abdomen long, slender, rather thickened behind; fore wings narrowly lanceolate, not cleft, the cell narrow; hind wings also long and narrow, with a ridge of scales under the median nervure, not cleft; in repose the fore and hind wings are rolled together; legs very long and thin, not tufted.

We have but one species.

1. **A. bennettii**, *Curt.* Expanse  $1\frac{1}{8}$  inch (28 mm.). Fore and hind wings long and extremely narrow, evenly tapering from the very slender base, pale grey-brown; the fore pair having a few black dots, the hind a dark line along the dorsal margin; abdomen and legs very long, thin and hair-like.

Antennæ of the male very short, simple, brown; palpi small, blunt, drooping, light brown; head and thorax brownish-drab; abdomen thickest behind, but very slender, anal tuft long, pale brown. Fore wings long and very narrow, especially so at the base; costa nearly straight, slightly arched toward the tip, which is sharply angulated; hind margin nearly straight, short, very oblique; colour dull brown, rather paler from the base along the costa and dorsal margin; a black-brown dot lies at the junction of the subcostal and median nervures, two more beyond it on the median, and a faint similar cloudy spot near the costa toward the apex; cilia dull brown. Hind wings long and narrow; apex pointed; hind margin almost straight, and rather sinuous; very pale smoky grey-brown, the nervures a little darker; a smoky-brown stripe along the dorsal margin runs to the anal angle; cilia light brown. Female similar, but the abdomen thickened from near the base. The body and legs in both sexes somewhat resemble those of a *Tipula*.

Underside wholly dull pale brown.

Rather variable in the darker or paler shade of ground

colour in both fore and hind wings. In the darkest examples smoky black dots become visible in the apical and hind marginal cilia.

On the wing at the end of May and in June, and in a second generation in July and August.

LARVA tapering a little behind; head smaller than the second segment, into which it is withdrawn when at rest, yellowish-green, the crown and a broad patch therefrom nearly to the mandibles on each side, rosy; a few short bristles are scattered over the upper portion of the head; ground colour of the body green, so thickly sprinkled with small white dots as to appear whitish-green; skin considerably roughened and wrinkled on the sides; the anterior segments wrinkled on the back; the second segment has horn-like points protruding from near its middle in a horizontal direction; the tips and bases of these are rosy; anal segment violet-brown above, yellowish-green on the sides; and it has four bristles projecting along its posterior edge at right angles with the prolegs; on the twelfth segment is a rosy horn; a yellowish stripe lies along the spiracular region. (R. South.)

Autumn till May, and in a second generation at the end of June and beginning of July; on sea-lavender (*Statice limonium* and *S. binerosa*), eating large pieces out of the leaves.

PUPA long and slender, tapering regularly to the tail, wing and limb-covers long but reaching only to the tenth segment; truncate in front and with a raised knob at the back of the thorax; green dusted with white and shaded with violet-brown; wing and limb-cases deeper green. Attached to a small platform of silk, upon the food plant, suspended by the tail.

The moth sits among its food plant during the day, having its fore wings rolled round the hind into a cylinder, slightly

raised, and thrown forward in such a manner that it resembles a letter Y. It flies if disturbed, but only to another part of the bed of sea-lavender, again to swing by its long legs and assume the curious rolled up form which renders it so difficult a creature to set out after death. At dusk it flies, much like a *Tipula*, over the *Statice*, hardly ever leaving it. Restricted to the coast, and almost so to salt marshes and those more rocky spots which yet are moist enough to allow the food plant to grow. In such situations abundant in the Isle of Wight and other parts of the Hants coast, Kent, Dorset, Essex, Suffolk, and Norfolk, also in a salt marsh at the side of the river Tees in Durham, and it has once been taken near Redcar, Yorkshire. So far as I know it has not been met with in any other portion of the United Kingdom; and abroad the only records within my knowledge are in Holland and France.

#### Genus 2. CNEMIDOPHORUS.

Antennæ simple; palpi short, pointed, thickened in the middle; fore wings cleft less than one-third their length, the segments broad and the hinder hatchet-shaped, the anal angle sharp; hind wings cleft into three wide divisions, the third showing a distinct anal angle; the fore wings laid flatly over the hind in repose; legs not excessively long.

We have only one species.

1. *C. rhododactylus*, *Fab.*—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings rich tawny with white stripes and cilia; hind wings paler red-brown, the third division white, with a chestnut triangle.

Antennæ of the male short, simple, pale brown, regularly barred at the back with white; palpi minute, light brown; head and thorax yellow-brown, the shoulder-lappets red-brown; abdomen red-brown, shaded with white at the base; legs white, shaded with large red-brown bands and tufts.

Fore wings spreading behind, acuminate, cleft; costa arched beyond the middle, apex sharply pointed; hind margin decidedly hollowed; dorsal margin also concave; rich tawny or golden red-brown, shaded with white from the base along the costa, and having a white line from the base along the dorsal margin; beyond the middle is an elbowed white transverse stripe preceded by a dark red-brown patch; extreme hind margin edged with the same colour, which throws out points into the otherwise silvery-white cilia. Hind wings—first two divisions broad, pale golden-brown or pale tawny with similar cilia; hind lobe short, white with a broad red-brown triangular spot occupying most of the apical area. Female similar, with the abdomen thicker.

Underside an almost accurate copy of the colour and markings of the upper, but a white line crosses the first lobe of the hind wings. Body red-brown.

On the wing in July and August.

LARVA half an inch long, cylindrical and strongly attenuated at the extremities, considerably retractile, and when at rest has a dumpy appearance; head small, globular, smooth and shining grey with the cheeks and mandibles shining black; segmental divisions strongly marked; skin soft, slightly rough in appearance, sparingly though conspicuously clothed with short hairs, light greenish-yellow or yellowish-green; dorsal line conspicuously purple, from the second to the sixth segment it appears as composed of round purplish marks joined at the segmental divisions, and rather broad; on the remaining segments it is much narrower and more uniform, but equally distinct; subdorsal and spiracular lines yellow, only faintly indicated; segmental divisions also yellow; ventral surface and prolegs uniformly dingy green or yellowish, according to the colour of the dorsal surface; legs black and shining. (G. T. Porritt.)

May and June—but from what time is uncertain—upon dog-rose (*Rosa canina*), feeding on the buds and flowers, also

sometimes on the young shoots, eating into an unexpanded bud from the side, and hidden by drawing down a leaf; when the blossom is open drawing together the petals. It has also been found among cultivated roses in gardens.

PUPA pale green; wing cases whitish; eye, antenna and leg-cases, also the edging of the wing-cases, smoky black. (G. T. Porritt.) Attached to the shoot or bunch of buds on which the larva has fed, hanging loosely from a small tuft of silk. This pupa is curiously sprinkled with fine hairs or long bristles, especially on the dorsal surface.

The moth is very sluggish and can seldom be induced to fly in the daylight. If disturbed it falls down into the thicker parts of its favourite rose-bush, when a very quick eye is requisite for its discovery. It flies at night, and has been taken at a strong light. Formerly known as a rare British species, to be found occasionally in Kent and Middlesex, but about the year 1872 it was discovered to be tolerably common in some parts of the large woods at Chattenden, North Kent; the larva was also found freely, and considerable numbers were reared, so that our cabinets became in some degree supplied. After a few years shocking accounts were received of the greed of certain collectors, accounts of the stripping of vast numbers of rose-bushes of *every bud*, and of the material collected being carried away by sacksful. By these means the insect seems to have become exterminated in that locality, and is again a comparative rarity, though still known to exist in a few other localities. So far as I am aware it is confined, with us, to the counties of Kent, Middlesex, Herts, and Essex. Abroad it is found throughout Southern and Central Europe, except Holland, also in Sweden, Finland, Livonia, Bithynia, and Armenia.

Genus 3. **PLATYPTILUS.**

Antennæ simple, very short; palpi short but projecting; forehead furnished with a prominent tuft of scales; fore wings cleft to less than one-third of their length, the sections broad and angulated; hind wings cleft to the base, the divisions moderately broad; anal angle obscure, but the hinder division having a small spot; cell aborted; legs very long, the tibiæ sometimes thickened behind.

We have five species, not difficult of discrimination.

A. Expanse of wings over three-fourths inch.

B. Fore wings ochreous or brownish ochreous.

*P. ochrodactylus.*

B<sup>2</sup>. Fore wings dull pale umbreous.

*P. isodactylus.*

B<sup>3</sup>. Fore wings bright yellowish-white with sharp brown markings.

*P. zetterstedtii.*

B<sup>4</sup>. Fore wings dull brownish-white with dull brown markings.

*P. gonodactylus.*

A<sup>2</sup>. Expanse of wings under three-fourths inch.

*P. tesseradactylus.*

1. **P. ochrodactylus**, *Hüb.*; **dichrodactylus**, *Muhl.*; **bertrami**, *Roessl.*—Expanse  $1\frac{1}{8}$  inch. Fore wings pale ochreous with elongated deep ochreous clouds; hind wings pale smoky-brown with a reddish gloss. Legs pale ochreous, clouded with brown.

Antennæ of the male short, very slender, simple, dark-brown; palpi porrected, slender, yellow-brown; head creamy yellow; thorax pale buff; abdomen rather browner, very slender; anal tuft pointed. Fore wings long and narrow; costa nearly straight except beyond the middle, where it is arched; apex sharply angulated, almost hooked; hind margin hollowed, cleft to one-fourth the length of the wing; rather roughly scaled, pale ochreous, a brown line along the costa from the base expands beyond the middle to a narrow brown cloud, and is cut off suddenly by an oblique whitish

ochreous bar; also from the base a brownish-ochreous horizontal line extends one-fourth the length of the middle of the wing, but after a pale interval is continued as a broader similar cloud to below the pale bar and usually united to the costal cloud; the costa before the apex is narrowly brown, and often the apex itself and a line or cloud down the hind margin, the latter also shaded inward; the whole surface thus being broken up into paler and darker ochreous shades; cilia white or yellowish-white. Hind wings cleft to the base into three broad fully ciliated fingers or sections; pale golden-brown, including the cilia. Legs very long, whitish-ochreous, regularly clouded from each joint with ochreous or yellow-brown. Female similar, the body a little thicker behind.

Underside of the fore wings smoky-red-brown to the middle, ochreous beyond, the margins faintly spotted with white. Hind wings pale golden-brown. Body pale-brown.

Variable in the shade of ground-colour from ochreous-white to rather rich full ochreous, and in the deeper shades of clouding. In that along the costa is often a deeper brown costal streak above the fissure; and concealed in the brown-ochreous cloud, a darker spot lies at the fissure's base—though this last is more obvious in worn specimens. The legs also vary greatly in the degree of dark clouding at the joints. This last character has been relied upon as a means of dividing this species into two, called respectively *P. dichrodaetylus* (the darker), and *P. bertrami* (the paler form), but although the former seems to be more restricted to tansy, as a food plant, and the latter to yarrow and sneezewort, I am unable to find any reliable distinguishing character between them. On the other hand I find every possible intermediate shade of variation, the darker being apparently the more northern forms.

On the wing from the end of June till August.

LARVA from one-half to five-eighths of an inch long; head very pale straw colour, faintly tinged with green, the ocelli large and intensely black; mandibles reddish-brown; dorsal and anal plates bright green; ground colour bright pea-green; dorsal stripe dark green, slightly brownish in front; between it and the spiracular region are two greyish-white stripes on which small black tubercular spots may be seen; spiracles black; below them is a clearer and more conspicuous white stripe; ventral surface uniformly of the same bright green as the dorsal area; at the front, and at the base of each anterior leg, is an intensely black spot; prolegs finely margined with black. (G. T. Porritt = *P. bertrami*.)

Mr. Buckler, under the head of *P. dichroductylus*, thus describes it. Moderately slender, cylindrical, tapering a little from the third segment to the head, which is rather rounded; tapering also from the eleventh to thirteenth segments; the segmental divisions well defined on the back, deeper on the undersurface; head very pale brownish-yellow or greyish-yellow, semi-pellucid and shining, the ocelli large and black, the mouth blackish-brown; dorsal plate of the colour of the head, bearing minute blackish dots; anal plate of similar tint; the rest of the back is either a lively green or else a subdued transparent light green, with a dark olive-brown pubescent dorsal line; a naked stripe of opaque whitish grey, on which minute black tubercular spots are visible, follows at a short interval, and below it another thin greyish stripe; succeeded by a broad lateral stripe of the ground colour, but so thickly covered by a minute kind of bristly brown pubescence as to assume an olive hue, in the lower edge of which are the circular brownish-red spiracles ringed with black; beneath them runs an inflated and puckered stripe of opaque greyish-white, relieved below by a line of the brown pubescence; under surface and legs of the green ground colour; between each pair of the legs, at their base, are two black spots; the prolegs tipped with dark

brown. These seem to me to be practically descriptions of the same species of larva.

May and June on *Achillea millefolium*, *A. ptarmica* (Yarrow and Sneezewort), and *Tanacetum vulgare* (Tansy), feeding in the heart of a young shoot and eating down into its solid stem, moving, when necessary, to another. The condition in which it passes the winter is not yet ascertained.

PUPA slender with a rather long beak in front bent downwards at a small angle; tail pointed; wing covers of moderate length, well developed; the ends of the leg-cases free of the abdomen; pale green, light pinkish-grey or dark reddish-grey; the beak is white above, blackish at the sides, on the thorax a blackish-brown dorsal stripe widens, and then narrows, thence passes down of uniform width to the tail; on the thorax it is margined with a white line; there is an interrupted blackish-brown subdorsal line, and between this and the dorsal stripe on each segment are double dark brown streaks, a little divergent; these are strongly marked on the anterior segments, more faintly on the hinder ones; below the subdorsal is another brown line, rather interrupted; lateral line white, bordered beneath by a black stripe; the ventral surface of each segment has a broad squared mark of light brownish grey, and a fine subventral line of similar tint, much interrupted; wing cases brownish-grey, with whitish rays. (W. Buckler.) Attached by the anal hooks to a stem or leaf of the food plant.

The moth hides by day in the tufts of its food plants, keeping very closely concealed, and if shaken out is hardly to be induced to do more than scramble away to another concealment. At early dusk it flies gently about, and is readily seen. Common among its food plants in the rough ground in which they grow, very often in open spaces at the sides of lanes and roads; also fields, railway embankments,

hill sides, rocky places, and quarries in all the Southern and Eastern Counties, particularly those along the coast; also found in Somerset, Gloucestershire, Cheshire, Derbyshire, Yorkshire, Durham, Lancashire and Westmoreland, yet apparently absent from almost all the Midlands. In Wales common in Glamorganshire and Pembrokeshire, and found in the Isle of Anglesea; in Scotland, near Edinburgh, in Roxburghshire, Lanark, Dumbartonshire, and Perthshire; and in Ireland, on the Dublin coast, in Waterford, Cork, Connemara, and elsewhere in Galway, Sligo, Cavan, Armagh, Antrim, and Donegal. Abroad it is found throughout Central Europe, the temperate portions of Northern Europe, in Russia and Armenia, and in Canada and many parts of the United States of America.

2. *P. isodactylus*, Zell.—Expanse  $\frac{3}{4}$  to 1 inch. Fore wings retuse, dull umbreous-brown with darker cilia; and ill-defined darker clouding from the costa to the discal dot. Hind wings brown.

Antennæ of the male short, simple, glossy brown; palpi short and rather concealed, pale brown; head and thorax dull drab; abdomen browner but pale at the base. Fore wings very narrow, rather truncate behind; costa arched beyond the middle; apex shortly pointed; hind margin retuse, not very oblique, and the anal angle well marked; fissure much concealed by its closely applied edges; colour dull umbreous or brownish-drab; a darker brown line, dotted faintly with white, lies along the costa, and two or three faintly darker streaks lie between the nervures before the middle; at the base of the fissure are one or two small black dots, and from this to the costa is a dark brown cloud which has some appearance of a costal cloudy triangle; extreme hind margin dark brown; cilia similar but whitish at the tips. Hind wings broadly divided into three heavily fringed sections, pale grey-brown with a glistening golden

gloss, cilia darker. Female similar but larger, and the abdomen much stouter.

Underside of the fore wings smoky-umbruous to near the hind margin, which is broadly ochreous to the apex. Hind wings glossy grey-brown. Body brown; legs long and thin, yellowish-white, with a dark brown cloud from each joint.

Very variable in size, the specimens emerging in the autumn little more than one-half the size of those on the wing in June, and far paler in colour—often dull drab or whitish-drab.

On the wing in June and the beginning of July, and as a second generation in August and September.

LARVA three-eighths of an inch in length; rather thick and plump, tapering at each end; head small, black; skin smooth, shining and pellucid, of a watery greenish tint, showing a dark green dorsal vessel; subdorsal stripe darker green; this is bordered above by an opaque whitish stripe which lies beneath the skin, and shows partially through its glossy surface; another such faint white stripe shows through along the side, and below is another, somewhat inflated, on which are the spiracles; dorsal plate black, divided, anal plate, legs, and raised dots black. (W. Buckler.)

April and May, and a second generation in July and the beginning of August, on *Senecio aquaticus*. When young it eats out the substance of the small shoots near to the buds, soon after it enters the stem at the axil of a leaf, eating out the side shoot, then passing into the main stem, in all cases eats the pith, and extrudes its excrement through a hole in the side.

Abroad it is said to feed also on *Senecio nemorensis*.

PUPA smooth, the wing and leg-cases meeting in a point low down the abdomen and in close contact with it; whitish-ochreous, the abdomen a little deeper tinted; striped and marked with brown on the head and back of the thorax, and

on the back with a series of acute brown triangles. (W. Buckler.) In a chamber of considerable size in the larval burrow in the main stem of the *Senecio*; a round hole in the side serving for the exit of the moth.

The moth hides during the day among coarse herbage, and especially among ragwort, in marshy places, and is very sluggish, when disturbed shuffling into the nearest hiding place; but before dusk it begins to be very lively, flying about such places quite freely; later at night ascending to fly abroad over the country, and sometimes to hang upon a road-side gas-lamp.

Very local, yet plentiful in its very restricted haunts: found in marshy places rather than fens in Norfolk; also in Devon and Dorset; in Wales common near Pembroke and elsewhere on the Pembrokeshire coast, also in Carmarthenshire; but apparently not noticed elsewhere in England or Wales. In Scotland Mr. Stainton recorded it in the Orkneys, and Mr. A. F. Griffiths found it in a marsh in the Hebrides. In Ireland it is not scarce in Kerry, Galway, Sligo, among the hills near Belfast and Carrickfergus, and also in Londonderry. This wide distribution seems to suggest that it may also exist—though overlooked—in many other marshy spots in the three Kingdoms. Abroad it seems to be but little known, yet is recorded from Belgium and Germany.

3. *P. gonodactylus*, *Schiff.*; *trigonodactylus*, *Stn.*  
—Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch (20–28 mm.). Fore wings pointed, retuse, with very prominent anal angle; whitish-brown, with a dull brown costal triangle joining the discal dot. Hind wings glossy pale brown.

Antennæ of the male short, simple, pale brown, barred with white; palpi rather short, slender, pointed, brown: head and thorax grey-drab; abdomen pale brown dotted with white, and the base ashy. Fore wings very narrow, the costa gently arched, apex sharply pointed; hind margin excavated; dorsal margin also much hollowed out, and the

anal angle very prominent; pale greyish-drab or whitish-brown; before the middle is a brown streak near the dorsal margin, pointing toward a brown spot near the costa; just beyond the middle is a black dot on the dorsal margin, and beyond it a large brown triangle, the base of which is along the costa, and which extends half way across the wing just behind the fissure, where two black dots lie close together; along the hind margin is a dark brown line; cilia white. Hind wings fully divided into three finger-like sections, glistening pale purplish-brown, with long cilia of the same colour, except on the hind margin of the third, where the cilia are white with a brown dot before the middle. Legs long and thin, white, repeatedly clouded with brown. Female very similar, but larger, and the abdomen thicker.

Underside of the fore wings dark purplish-brown to the fissure, thence pale ochreous with white dashes, margin black-brown. Hind wings smoky-brown; body dull brown.

Variable in size, and in the shade of white, or brown, ground colour.

On the wing at the end of May and in June, and as a second generation in July and August, or in the north in the beginning of September.

LARVA plump, almost naked; head shining pale brown or black; dorsal plate black; general colour greyish-white, or greenish-white; dorsal line a broad stripe, rosy-red or purplish-red; subdorsal and spiracular lines narrower, of the same colour; raised dots shining black; spiracles and legs black.

April and May on coltsfoot (*Tussilago farfara*), eating out the substance of the bud or flower, or the base of the seed vessel, and causing the flower stalk to droop; a second generation feeds in June in the upper part of the root of the same plant; or on the undersurface of the large leathery leaves, gnawing the parenchyma under the white down, but not cutting through the leaf.

PUPA naked, beaked, rather angular, slender, surface dulled, pink or green, or pale grey, with or without pink or red longitudinal dorsal stripes, and reddish clouding. In the cavity at the base of a seed-head of coltsfoot, excavated by the larva, with the terminal pappus drawn together; or in the second generation attached to the stem of the plant. The covers of the antennæ and legs are detached, in part, on the emergence of the moth.

The moth hides during the day among the coltsfoot, well concealed, and sheltered by the large leaves, and if aroused is unwilling to move to any distance, scrambling hastily down among the herbage to the ground; yet in the late afternoon is more lively, and towards sunset flies freely about railway banks, rough fields, and waste places; later at night leaving the coltsfoot beds, to roam more widely, and very often to come to a lighted window or a gas lamp. Often a specimen may be found in the morning in some unexpected place, away from its natural haunts, as though it had lost its way. Still common in the suburbs of London, where the coltsfoot grows on railway banks, or the embankments of waterworks; and to be found commonly in suitable places throughout England; probably also Wales, though the only records seem to be in Pembrokeshire, and at Penmaenmawr, Carnarvonshire. In Scotland it occurs in Berwickshire, Fife, Lanark, Dumbartonshire, and elsewhere in the Clyde Valley; in Perthshire; and rarely in Aberdeenshire, but apparently not farther north, nor in the Isles. In Ireland it is common about Dublin, in Kerry, and in the north near Belfast and Armagh, and is probably generally distributed.

Abroad it has a more wide distribution than some of the allied species, being found through Central Europe, the temperate portions of Northern Europe, including Norway; South-east France, Central Italy, Southern and Eastern Russia, and Bithynia.

4. **P. Zetterstedtii**, *Zell.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (19–22 mm.). Fore wings sharply pointed; bright whitish-brown; the costal triangle distinct, dark red-brown, sometimes produced toward the anal angle. Hind wings glossy grey-brown.

Antennæ of the male very short and slender, black-brown barred with white; palpi small, slender, pointed, brown; head and thorax brownish-drab dusted with chocolate; abdomen reddish-brown, with the base white. Fore wings narrow, rather squared behind; the costa a little arched beyond the middle; apex sharply angulated; hind margin retuse, shortly divided, oblique, but with a distinct anal angle; dorsal margin hollowed; colour pale brownish-ochreous or tawny-white, dusted toward the base with white, and having below this a brown streak on the dorsal margin which extends to an obscure broken oblique transverse stripe; beyond this is a chocolate streak near the dorsal margin having white dusting on either side; still beyond a large red-brown or dark chocolate triangle having its base on the costa, edged outside with pale ochreous, extends to a black dot just before the fissure; a slender whitish ochreous stripe, parallel with the hind margin, precedes a dark marginal band edged with black; cilia dusky-white. Hind wings glistening pale purplish-brown, the cilia of the three long lobes being of the same colour, but upon the hindmost portion there is a black spot with some white edging. Legs long and very slender, white, clouded at the joints with dark brown. Female similar, but rather more clouded beyond the triangle with chocolate-brown, and with the fore wings more widely cleft.

Underside of the fore wings smoky red-brown, with the pale areas of the upper side sharply indicated. Hind wings as on the upper side. Body brown.

On the wing in June and July.

LARVA and PUPA unknown. The food-plant is probably

golden-rod (*Solidago*), among which the moth is usually found; the Continental record, upon *Senecio nemorensis*, probably referring to an allied species.

This species inhabits woods in the south, flying along their broad grassy paths or open spaces, but is extremely local, found among golden-rod, but not among any species of ragwort. It was first taken in this country at Lynmouth, North Devon, in July 1855 by Mr. Thomas Boyd, and is still to be found in that district; shortly afterwards specimens were taken on the coast of Cornwall, and subsequently one was obtained at Sydenham, in the southern suburbs of London, but this casual capture has not been repeated. More recently it has been found, not rarely, in the woods near Dover, Kent, and here also it still exists. This, so far as I know, is the extent of its distribution in these islands. Abroad it has a considerable range. Professor Zeller told me that he found it in the Reissengebirge, the Eastern Alps, and Rhaetia, quite accompanying *L. ostodactylus*, a well-known *Solidago* feeder, "as if the two species belonged together." It is recorded as occurring throughout Central Europe, the temperate portions of Northern Europe, including Norway, the northern half of Italy, the Taurus Mountain district, and Southern Siberia.

5. **P. tesseradactylus**, *L.*—Expanse  $\frac{5}{8}$  inch (15–17 mm.). Fore wings narrow but short, the anal angle sharp; brownish-white, the costal triangle obscurely brown, followed by two white transverse stripes. Hind wings pale grey-brown.

Antennæ of the male short, simple, pale grey, barred on the back with white; palpi very small, grey; head and thorax ashy-grey; abdomen ashy-white. Fore wings narrow, not much widened behind; costa nearly straight; apex pointed; hind margin rather uneven, but not hollowed; anal angle sharp; dorsal margin concave; colour ashy-brown, or pale brown, abundantly dusted with white; on the dorsal margin near the base is a longitudinal brown line, and

another lies beyond it on the disk, followed by a second on the dorsal margin; the usual costal triangle is obscure and ill-defined, darker brown, followed by an oblique white transverse stripe, and this by another, narrower, crossing both lobes; hind margin edged with black; cilia dusky white; the dorsal cilia also white, but shaded with brown clouds. Hind wings shining pale greyish-brown, the cilia of all three lobes of the same colour, and all dusted with dark brown. Female similar.

Underside of the fore wings smoky brown, with a white spot beyond the middle of the costa, and a white transverse band before the hind margin. Hind wings with the legs and body ashy-brown.

On the wing in June.

LARVA cylindrical in the middle, a little smaller at each end; head small, black; thoracic shield black, divided by a light line; anal shield dark brown; body dark ferruginous-brown; on the back stand whitish flecks; raised dots black, those on the sides bearing long light hairs; legs dark brown. (Gartner.)

August till May on *Gnaphalium dioicum*, and *G. arenarium*.

PUPA apparently undescribed.

The moth flies in the late afternoon and evening among *Gnaphalium* (cudweed) at road sides and dry banks at the edges of bogs. It was first met with in these islands in June 1895 at Clonbrock, Galway, Ireland, by the Hon. R. E. Dillon and Mr. W. F. de Vismes Kaue. Mr. Kane now tells me that he has found it in several localities in Galway and Clare; but so far as I know it has not as yet been discovered in any other part of the British Isles, though nearly ten years earlier it had been indicated by the late Dr. R. C. R. Jordan as a probable inhabitant of these islands. Abroad it is widely distributed in Central and Northern Europe, South-

East France, Central Italy, Dalmatia, and Persia; and in North America in New England and California.

Genus 4. **AMBLYPTILUS.**

Antennæ simple; palpi thick, laterally compressed, ascending, pointed; head with a small pyramid of scales on the forehead; fore wings cleft about one-fourth of their length, the sections broad and angulated; on the dorsal margin having one or two projecting tufts of scales; hind wings deeply divided, the segments slender, the third having a tooth-like tuft of scales. Legs very long.

We have two species, very similar except in colour.

- A. Fore wings pale reddish-brown with chocolate-black markings. *A. acanthodactylus.*  
 A<sup>2</sup>. Fore wings pale greenish-brown with olive-black markings. *A. punctidactylus.*

1. **A. acanthodactylus**, *Hüb.*—Expanse  $\frac{7}{8}$  inch (20–23 mm.). Fore wings narrow, sharply pointed, their dorsal margins toothed; pale reddish-brown with red-black costal triangle and dots. Hind wings brown-grey.

Antennæ of the male simple, short, dark brown dotted with white; palpi short, pointed dark chocolate; head and thorax reddish-brown; abdomen brown, prettily marked with slender, crossing, white lines. Fore wings very narrow, and only moderately broadened behind; costa slightly arched beyond the middle; apex pointed; hind margin decidedly hollowed; dorsal margin concave, but furnished in the hollow with one or two small projecting teeth of scales; pale reddish-brown, dusted from the base with white, and faintly barred with the same along the darker brown costa; at about one-third of the length of the wing is an oblique, ill-defined, brown transverse stripe; beyond the middle a shallow red-black costal triangle preceded by a brown-black tooth on the dorsal margin; beyond the triangle is a yellow-red spot,

followed by a chocolate band which crosses both lobes ; at the anal angle is a dark chocolate spot or blotch ; apical area minutely mottled with yellow-brown and white ; cilia similar. Hind wings divided into slender lobes, pale golden-brown with cilia of the same colour, except that the hind lobe is spotted along the dorsal margin with black, and has a black and white tuft. Female similar, hardly stouter.

Underside of the fore wings dark reddish-brown ; costa dotted with white, and having a white triangle and slender transverse lines before the apex. Hind wings shining smoky-brown. Body brown, the legs white, with long brown cloudings.

On the wing in June and July, possibly after hibernation, and apparently as another generation in August and throughout the autumn, even emerging in October and November, but whether as a third generation, or only a second, or even a deferred emergence, is not clearly ascertained.

LARVA bristly, cylindrical ; head pale yellow, with the lobes and ocelli black ; body dusky pale green with a bright green dorsal line, and paler green subdorsal lines.

September and October on *Stachys sylvatica* and *S. palustris*, feeding mainly upon the blossoms. This I give separately as a description which I have taken myself ; but there is great apparent confusion as to times of appearance, food-plants, and varieties of the larva. Mr. Porritt has reared larvæ from the same kind of food-plant, but having the ground colour deep purple, the dorsal stripe smoke-coloured, and subdorsal and spiracular lines white ; others green, tinged in front with pink, and having the dorsal and lateral lines as just stated. As food plants different observers mention *Ononis spinosa* and *O. arvensis*, *Mentha*, *Clinopodium vulgare*, *Geranium rotundifolium*, *Euphrasia lutea* and *E. officinalis*, and the buds and blossoms of the scarlet garden geraniums ; and July and the beginning of August as times of feeding. Mr. Buckler's larvæ fed in July.

PUPA pale green or pale brown, with the wing, leg, and antenna-covers darker, and a purple-brown tint on all the angles. Attached by the tail hooks to the flower spike between two of the whorls of flowers, and looking wonderfully like a withered blossom itself.

The moth hides among herbage during the day, very often in the summer among restharrow or heather; later in the year in hedges and bushes, and is of somewhat perplexing habits. On the coast and in sandy districts it is thus often common, hiding in the beds of restharrow and keeping quite close to that plant; but in autumn it seems to have forsaken those spots for the lanes and hedges, and in them it may be found till winter. It is supposed by some that the late autumn specimens hibernate and reappear early in June, but this even seems to be mainly a surmise; the June specimens are not worn, yet no larvæ have been, apparently, observed in the spring. In autumn it will come at night to ivy-bloom and heather-blossom, and to sugar and light. Apparently to be found throughout England though rather locally, and most attached to the coast; quite scarce in the Northern and Midland Counties. Probably well distributed in Wales, though I only *know* of its presence in Pembrokeshire. In Scotland found in Berwickshire, Fife, Aberdeenshire, Perthshire and Lanark; in Ireland in Wicklow, Cork, Kerry, Sligo, and Fermanagh.

Abroad it seems to be found all over the Continent of Europe, and in Armenia, Syria, Madeira, the Canaries, Morocco and other parts of Northern Africa. Professor Fernald records it in New York State in North America.

2. **A. punctidactylus**, *Haw.*; **cosmodactylus**, *Staud. Cat.*—Expanse  $\frac{7}{8}$  inch (21–23 mm.). Very similar to the last, but colour pale olive-grey, and the markings olive-brown or greenish-black. Hind wings smoky brown.

Antennæ of the male short, simple, black-brown, faintly barred with white; palpi small, pointed, dark brown, edged

beneath with white; a line of whitish scales also extends round the eyes; head and thorax dark brown; abdomen dark olive-brown, every segment curiously streaked, longitudinally and obliquely, with white; legs long and thin, black-brown with a white space following each joint. Fore wings very narrow and the hinder area only moderately expanded; costa nearly straight except toward the apex, which is sharply pointed; hind margin hollowed close beneath the tip, then irregular, and the anal angle well defined; colour olive-brown; from the base to beyond the middle is a series of obscure oblique white transverse lines of dusting broken into spots and streaks; costa also dotted with white; beyond the middle is an olive-black costal triangle, and beneath it a curved whitish line in the hollow of the dorsal margin, where also are two olive-black tooth-like tufts of scales; beyond the costal triangle is a white spot and some white atoms, and beyond these a distinct white transverse line crossing both lobes; extreme hind margin edged with black-brown; cilia white, very short. Hind wings deeply divided, the lobes angulated behind; glistening pale golden brown, dusted with dark brown; cilia of the lobes shining olive-brown, except that of the dorsal margin of the hind lobe, which is white, enclosing a projecting black tooth. Female similar, a little stouter.

Underside of the fore wings smoky red-brown; dotted on the costa, and streaked on the hind margin, with white; a white spot beyond the middle is followed by a transverse white line. Hind wings dusky grey. Body olive-brown.

On the wing in June and the beginning of July, and again in September, but whether as two generations, or hibernating and reappearing in the following summer is not clearly ascertained.

LARVA clear purplish-pink; the head dark sienna-brown, almost black; dorsal stripe smoke colour; sub-dorsal stripes clear white; below them is a narrow interrupted white line,

and another tinged with pink along the spiracles; hairs white; under surface semi-translucent yellowish-grey; prolegs purplish-pink on the outside; legs dark sienna-brown with paler rings.

Or—the ground colour is bright pale green; the markings the same, except that the white lines are hardly so conspicuous; in some specimens the smoky dorsal line is tinged with pink, and the ventral surface and prolegs are of the same bright green as the dorsal area. (G. T. Porritt.)

August and September—and Frey says July—on *Stachys sylvatica* and *Salvia glutinosa*, feeding on the flowers; also, upon the Continent, feeding on the seeds of *Aquilegia vulgaris*.

PUPA slender, with two somewhat curved and pointed protuberances on the back; either green or purple. Attached by the anal hooks to the food-plant, hanging like a little slender butterfly-pupa.

The moth is rather secret in its habits, hiding in dense hedges, or among thick herbage in the daytime, but not easily disturbed, and not very often seen. It flies at night, and will come to the flowers of ragwort. Found sparingly in Kent, Surrey, Sussex, Dorset, Devon, Somerset, Gloucestershire, Herefordshire, Worcestershire, Salop, Cheshire, Lancashire, and Westmoreland. In Wales only recorded from Cardiganshire, where it was found by Mr. N. M. Richardson; in Scotland singly from Berwickshire, Perthshire, and Argyleshire; in Ireland only at Killarney, a record which is not confirmed. Abroad it has a very wide range through Sweden and Norway, the greater portion of Central Europe, Sicily, Dalmatia, and Russia, and in North America, in California and Oregon.

#### Genus 5. OXYPTILUS.

Antennæ short, simple; palpi ascending, thickened in the middle, compressed at the sides, pointed; forehead not

conically tufted; fore wings cleft quite one-third of their length, the lobes separate, rather drooping at the tips; no sharp anal angle, but one or two small teeth of scales on the dorsal margin; hind wings divided into three from the base; a dark tuft or tooth of scales on the hindmost lobe.

We have four species—probably five—very closely allied.

A. Expanse half an inch. *O. parvidactylus.*

A<sup>2</sup>. Expanse three-fourths of an inch.

B. Fore wings black-brown; dark tuft on hind wings large, on both sides of hind lobe. *O. teucrui.*

B<sup>2</sup>. Fore wings fawn-colour; dark tuft on hind wings very small, only on hinder margin. *O. distans.*

B<sup>3</sup>. Fore wings tawny-brown; dark tuft on hind wings medium-sized.

C. Apex of fore wings drooping, broad but narrowly pointed. *O. hieracii.*

C<sup>2</sup>. Apex of fore wings broadly and horizontally pointed. *O. pilosella.*

1. *O. parvidactylus*, *Haw.* Expanse half an inch (12–16 mm.). Fore wings slender, pale chocolate-brown; apical margin of the costa, two slender transverse streaks on the lobes, and a dot at the fissure, all white. Hind wings golden-brown with smoky cilia and a large black tuft on the hinder lobe.

Antennæ of the male simple, dark brown, barred with white; palpi slender, pointed, projecting, brown edged with white; head and thorax chocolate; abdomen golden-brown, striped at the base longitudinally with white, and having numerous silvery-white streaks and dots down the sides. Fore wings narrow with the fissure wide and obvious; costa arched beyond the middle; the apex sharply pointed, and a very little curved downwards; each lobe a little hollowed behind and the anal angle obscure; chocolate-brown with a golden gloss; before the fissure is a white dot, and sometimes another still further back; crossing both lobes near the base

of the fissure is a white stripe, very oblique on the front lobe, broader on the hind; beyond this is another white transverse line, narrower, produced along the costa to the apex in the front lobe, but only visible on the cilia of the hind; cilia red-brown interrupted with white; on the dorsal margin, in the hollowed portion, are short white cilia in which are two small black oblique dashes. Hind wings slenderly divided, pale golden-brown, with the cilia of each lobe smoky-brown, except the hindmost, where on the dorsal margin is a large black triangular tuft edged with white and extending nearly to the tip. Female similar.

Undersides of all the wings darker brown than the upper, with the white markings repeated, two white patches are very distinct on the anterior lobe of the hind wings. Legs very long and slender, red-brown, prettily barred with white; body very similar,

On the wing in June and the beginning of July.

LARVA and PUPA doubtfully described. The late Mr. E. Shuttleworth distinctly stated that its food-plant is wild thyme, but furnished no details; this statement, in view of the habits of the species, seems most probable. Frey, however, describes it "dirty pale green; head and dorsal plate black, the latter divided by a pale line; raised dots large, black bearing tufts of bristles," and says that it feeds in the heart-shoots of *Stachys alpina* and in the late summer in the whorls of flowers of *Marrubium*. Zeller thought that he had reared it with *O. pilosella* from *Hieracium*. Further observation is desirable.

This moth frequents the slopes of chalk hills and open downs, also any rough ground in chalk and limestone districts, and more especially haunts wild thyme and marjoram. It may be disturbed by the foot from its hiding place among the short herbage, but at sunset flies freely of its own accord. Found locally, yet often plentifully, in Kent, Sussex, Surrey, Dorset, Somerset, Gloucestershire, Norfolk, Suffolk, Cam-

bridgeshire, near Scarborough, Yorkshire, at Grange, North Lancashire, and in Westmoreland and Durham; but it is not known to occur in Scotland or Wales. In Ireland Mr. J. J. F. X. King has taken it commonly near Athlone, and Mr. C. W. Watts at Carrickfergus, Antrim; and it is also found at Sligo, and in some parts of Galway. Abroad it is common all over Europe except in the colder districts; also in Asia Minor, Northern Persia, and the mountain districts of South-West Central Asia.

2. *O. distans*, Zell.; *lætus*, Zell. Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–19 mm.). Fore wings broadened and rather rounded toward the hind margin; pale greyish fulvous, with two cloudy white crescents crossing the lobes, preceded by a white streak and dot. Hind wings shining reddish-brown; the spot on the hind lobe small.

Antennæ of the male slender, short, simple, brown, ringed with white; palpi slender, horizontal, brown; head and front of thorax fawn-colour, hinder part of the latter brownish-white; abdomen pale brown with oblique white streaks and a white edging to each segment. Fore wings narrow and costa but little arched beyond the middle; apex rather bluntly pointed; the lobes narrow behind, but showing a definite hind margin and looking a little rounded; dull fawn-colour or pale fulvous dusted with grey or brown; a yellow-white line from the base runs along the dorsal margin and bends up into a very faint oblique central whitish cloudy stripe; before the fissure is a white cloud; beyond this two white stripes, placed somewhat in a curve or crescent, cross both lobes, the first being broad and cloudy, the second forked on the hinder lobe and running in two directions into the cilia, which otherwise are brown; on the dorsal margin are very short white cilia interrupted at the anal angle by a black-brown spot; apices tipped with dark brown. Hind wings glistening pale golden-brown; cilia similar, but on the dorsal edge of the third lobe interrupted by a dark brown spot. Legs

long, light brown streaked with white. Female a very little larger and rather stouter.

Undersides in all respects similar to the upper.

A little variable in tone of colour and the degree of darker dusting in the fore wings. Specimens of the second generation, taken in August are commonly paler and more smoothly light fawn colour; those of the June emergence darker and dusted; these last seem to agree accurately with Professor Zeller's *O. distans*, the paler forms with his *O. letus*. Those found on the south coast of Kent are especially soft in colour. I think that Professor Zeller ultimately felt doubtful of the distinctness of his *O. distans* and *O. letus*. They seem to be no more than faint variations of this one species.

On the wing in June, and a second generation in July and August.

LARVA and PUPA uncertain. Milliere says of the pale form—*letus*—“Larva spindle-shaped, bone colour, strongly bristly, with small blackish head and a divided black dorsal plate. In July on the flowers of *Andryala sinuata*.” This is not, however, a British plant; and long and close searching, by myself and others, among the low growing plants in the exact places where the moth is almost common in its proper season has been hitherto devoid of result.

The moth frequents open places among low herbage and abundant wild flowers on the lower slopes of chalk or limestone hills; but its favourite haunt in this country is on the “Breck” sands of the Eastern Counties, where it hides in the daytime among lucerne, yarrow, *Hypochaeris maculata*, and all manner of low-growing plants. At sunset it flies very quietly about the same places; but is quite easily disturbed and induced to flit to a short distance in the afternoon, especially in hot weather. It was discovered in this country in July 1868 by Lord Walsingham on his estate in Norfolk, and the following year was found in both generations in some numbers on

similar ground close to Brandon, Suffolk. From that time to the present, it has been found all over that sandy region, and to extend from it to some of the more chalky portions of Norfolk and Suffolk. Elsewhere it is found at Deal and Dover, Kent, and in North Devon, but this is, I think, the extent of its range in these Islands. Abroad it is widely distributed through Central and Southern Europe including Corsica, also in Asia Minor, the Canaries, and Northern Africa.

3. *O. hieracii*, Zell.—Expanse  $\frac{3}{4}$  inch (17–19 mm.). Fore wings rather broad behind, with drooping tips; deep red-brown with shining white transverse stripes across the lobes. Hind wings glossy golden-brown.

Antennæ of the male simple, slender, red-brown thickly dotted with white; palpi slender, dark brown; head and thorax pale red-brown, the latter barred across the back and the shoulder lappets with yellow-brown; abdomen light chestnut with oblique dorsal silvery-white markings. Fore wings very slightly broader and more robust than in the previous species, costa straight to beyond the middle, then arched with a big curve so that the apex is obliquely pointed down; hind margin of each segment deeply hollowed; dorsal margin also concave, having before the middle a tooth of brown scales, red-brown; at some distance from the base is a slightly paler red-brown oblique transverse stripe, very obscure; before the fissure is a white spot arising on the costa; beyond this a yellow-white transverse narrow stripe, crossing both fissures, is oblique in each, but in different directions, forming almost a right angle; much nearer the apex a narrower and more direct stripe is glistening yellow-white; from it a similar streak in the costa runs into the apex; cilia yellow-white streaked with red-brown. Hind wings chocolate-brown with a bright golden gloss; cilia similar; on the hinder lobe the usual black tooth of scales is broad and bounded on either side by a few white scales. Legs very long

with the spurs also long, rich chestnut with long white intervals. Female similar.

Underside of the fore wings dull red-brown, the white stripes on the lobes very distinct but somewhat curtailed. Hind wings as above, except that in the middle there is a dull white dot, and at the apex of the anterior lobe a white horizontal streak. Body golden-brown with parallel rows of white streaks.

LARVA green or dirty yellow, with short knobbed raised dots, and long white hairs; on the hinder segments is a double row of redder or browner longitudinal streaks; head honey-yellow. Lives in the heart-shoots of *Hieracium umbellatum*, sociably. (Frey.)

PUPA light green with brown triangular markings on the back. (Frey.)

A good deal of mystery hangs over this species in this country, and I venture to include it as British with some misgivings. There are specimens in the collection of the late Mr. T. H. Allis in the Museum at Newcastle-on-Tyne which I believe to be correct, but unfortunately the locality in which they were taken is not now known. Mr. Stainton included it without doubt in his "Manual," and there gave Birkenhead, Bristol, Darlington, and Newcastle-on-Tyne as localities; and for anything that I know it may still exist in some of these more northern localities, or on the other hand they may refer to *O. teucris*, which at the date of that work had not been separated as a distinct species. Unfortunately all the more modern supposed examples which have come under my notice have proved to belong to other species; and frequent and prolonged search among the food-plant has furnished no satisfactory result. At present, therefore, I can furnish no certain locality in these Islands. Abroad it seems to be well known, and found through Central and Southern Europe, Finland, Livonia, and Armenia.

4. *O. pilosellæ*, Zell.—Expanse over  $\frac{3}{8}$  to  $\frac{3}{4}$  inch (16–19 mm.). Fore wings long, the tips sharply pointed, very little curved down; chestnut with a white band before the middle and two others across the lobes. Hind wings dark red-brown with darker cilia and a blunt tooth on the hind lobe.

Antennæ of the male short, simple, brown, closely barred with white; palpi slender, sharply pointed, slightly drooping, dark brown edged with white; face dark chocolate; head and thorax dull chocolate dusted with paler; abdomen yellow-brown with broad white stripes from the base and short oblique silvery white streaks down the sides. Fore wings narrow, the costa rather flatly arched beyond the middle, apex of each lobe pointed, slightly drooping, and very graceful; hind margin of hinder lobes excavated; dorsal margin very flatly concave, and hardly toothed; colour chestnut or pale chocolate; before the middle is an oblique white transverse band, sometimes very obscure; base of the fissure edged by a tawny-white cloud; beyond this is a sharply defined yellowish-white stripe crossing both lobes and not strongly angulated; beyond this two slender white streaks form a partial similar stripe, but each throws off a white streak to the tip of its lobe; cilia of the front lobe brown, of the other white. Hind wings long, tri-cleft to the base, dark golden brown, with much darker smoky-brown cilia, except that the hinder lobe is furnished with white dorsal cilia to the tip, but interrupted by a broad flat triangular brown tuft. Legs exceedingly pretty, long and very thin, with long spurs, red-brown with short shining white spaces. Female similar but with a thicker abdomen.

Underside like the upper, except that on the first lobe of the hind wings is a bright white patch.

On the wing in July and August.

LARVA yellowish-white, with tall bristly raised dots, and

longer hairs on the back and sides of the segments; head pale honey-yellow with the jaws darker.

In May in the heart-shoots of *Hieracium pilosella*. (Frey.)

PUPA slender, bone-yellow; at the extremities reddish-brown, suspended to a leaf on the outer portion of the food-plant. (Frey.)

This moth is excessively local with us, occurring in a few places on chalk hills and adjacent greensand, but is very little known. Its habits seem to be as in the allied species. Neither larva nor pupa has been noticed here, although the pretty *Hieracium pilosella* is abundant, and has often been carefully examined. Indeed there is much that is unsatisfactory in our knowledge—or want thereof—in this whole group. The present species is found near Dover and Maidstone, Kent; Mickleham and Box Hill, Surrey; Isle of Portland, Dorset; and was formerly found at the Devil's Ditch, Newmarket, Cambs. This appears to be the extent of its range in these Islands. Abroad it is tolerably widely distributed through Central and Northern Europe, South East France, the Northern half of Italy, the Trans-Caspian region, and Armenia.

5. *O. teucarii*, *Greening, South*; **heterodactylus**, *Haw?*—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–19 mm.). Fore wings rather broad behind, the points of the lobes long and drooping; glossy blackish-brown with black dots round the lobes, the stripes broad, yellow-white. Hind wings dark brown with a large black-brown hind tuft.

Antennæ simple, slender, black-brown, faintly ringed with white; palpi very small and slender, horizontal, dark brown, head and thorax umbreous, dusted with yellow-brown; abdomen dark brown, clouded at the base and in some degree at the sides, with broad white streaks. Fore wings narrow, but decidedly broadened behind; costa hollowed to

the middle, beyond this strongly arched; apex of both lobes pointed but drooping; hind margin of the hinder lobe deeply excavated; dorsal margin concave; colour black-brown abundantly dusted with golden-brown; just before the middle is a faint white cloud; before the fissure a bright white dot sometimes edged with black; beyond this is an oblique silvery-white transverse stripe crossing both lobes and edged on the anterior margin of each by a black minute dot; beyond this is a more oblique and more slender white stripe or line, hardly complete, yet produced along the costa to the apex; hinder cilia mixed brown and white but also containing black dots, the hollow in the hinder lobe white; dorsal cilia short, dusky white, with two small black tufts, and a broad black patch beneath the anal angle. Hind wings dark brown, with golden-brown dusting; cilia mainly darker smoky-brown, except a white dash upon that of the dorsal edge of the second lobe, and that of the same margin of the third lobe, which is white, enclosing a large black-brown patch extending to *both* sides of the lobe. Legs very long and elegant, alternately white and black-brown. Female similar but with a stouter body.

Underside quite like the upper except that there are two white clouds on the first lobe of the hind wings. Body brown, mottled with pale yellow.

On the wing from the end of June to the beginning of August.

LARVA. Length 6 lines, attenuated behind; head smaller than the second segment, yellowish-green, the crown and sides mottled with dark violet-brown, and the mandibles pale reddish-brown; ground colour green or yellowish with a green tinge; dorsal line slender, faintly pink; subdorsal lines broader, pale rosy; raised dots brown, emitting each a star-like ray of short white bristles and one moderately long white hair chequered with brown at the base; spiracles enclosed each in a violet-brown ring; prolegs yellowish-

green, mottled with dark violet-brown. (R. South—condensed.)

May to the end of June on *Teucrium scorodonia* (wood-sage), gnawing a hole in one side of the young shoot of the plant, so as to cause the shoot to droop to the length of two or three inches; then eating out the heart completely, while concealed and protected by the drooping leaves. When this is exhausted proceeding to another shoot and treating it in same manner.

PUPA dull green, head and wing-cases paler; there are two dorsal rows of warts with chequered hairs as in the larva stage. On the underside of a withered leaf, clod, or stone, attached by the anal segment. (R. South.)

The moth hides itself during the day in patches of wood-sage, and can hardly be induced to fly, except in the afternoon, and then very sparingly; but at dusk it dances about in a lively manner, sometimes in plenty, over the same patches. It prefers these when growing on an open heath, or extensive gravel pit, or even in a very open wood, and appears scarcely ever to be found on a hedge-bank, or under bushes, even though the plant may be there in abundance. It was discovered in this country about the year 1868, but was then supposed to be the little-known and rare *O. hircacii*, and under that name the larva was sent to Mr. Buckler to be figured. The error was discovered and the present name given in 1869 by Dr. Jordan—though even then no sufficient description was attached. A specimen in the collection of Dr. P. B. Mason, having Haworth's label "*Heterodactylus*" upon its pin has led to an opinion that this may be the true name of the present species—but surely that author's description, "Black, with white spots," is by no means sufficiently definite.

It is known to occur with us in Kent, Sussex, Surrey, Hants, Dorset, Devon, Somerset, Gloucestershire, Suffolk, Norfolk, Staffordshire, Cheshire, and Westmoreland; but

abroad is very little known, and only recorded from Germany.

Genus 6. **MIMÆSIOPTILUS.**

Antennæ simple, short; palpi also short, blunt; head and face smooth; fore wings cleft to one-third their length, the segments moderately broad, the anterior pointed, and at the hinder edge rather angulated, the other more distinctly so; tips not drooping; dorsal margin not toothed; hind wings fully divided, the middle lobe spoon-shaped, hinder lobe very narrow and without a dark tuft; when at rest the fore wings are a little wrapped round the hind; legs long and slender but rather plain.

We have four species, not difficult of recognition.

A. Fore wings chestnut-red or red-brown.

B. A yellow cloud before the fissure. *M. phæodactylus.*

B<sup>2</sup>. Two small black dots before the fissure.

*M. pterodactylus.*

A<sup>2</sup>. Fore wings grey-brown.

C. Edge of the costa before the apex narrowly white.

*M. zophodactylus.*

C<sup>2</sup>. Edge of costa dark brown.

*M. bipunctidactylus.*

1. **M. phæodactylus**, *Hüb.*—Expanse  $\frac{7}{8}$  inch (21–23 mm.).—Fore wings rather broad, the lobes blunt and coarsely ciliated; red-brown with a large, crescent-shaped, yellowish cloud before the fissure. Hind wings darker red-brown.

Antennæ slender, simple, red-brown faintly barred with white; palpi very small, thread-like, brown; head, thorax, and abdomen reddish-brown, the latter whitish-brown at the base. Fore wings not very narrow, and but little broader behind, the lobes almost rounded and heavily ciliated: costa arched over the anterior lobe; apex bluntly pointed or almost rounded; hind margin not excavated; dorsal margin only a little concave; rather silky, red-brown; before the

middle is a very faint paler cloud along the dorsal margin; before the fissure a large crescent-shaped but ill-defined ochreous cloud; cilia dark brown. Hind wings broadly subdivided, all three lobes alike, golden-brown with cilia hardly darker; legs dull brownish-white streaked with white and dark brown. Female similar but stouter, and usually a little paler.

On the wing at the end of June and in July.

LARVA moderately stout, tapering towards the anal extremity; head smaller than the second segment, whitish tinged with green, crown, sides, and a spot on each lobe shining black; mandibles blackish-brown; body green, segmental divisions paler; dorsal line bluish-green; raised dots black, each with a moderately long grey hair and a tuft of whitish bristles; legs and prolegs semi-transparent, dotted with grey. (R. South—condensed.)

May and June on *Ononis arvensis* and *O. spinosa* (rest-harrow), feeding on the young leaves at the top of a shoot. Resting on the leaf, to which from its colour and downy appearance it bears an accurate resemblance.

PUPA at first light whitish-green, later pale brown; covered with thorn-like bristles. (Frey.) Attached by the tail to the surface of a leaf of the food-plant.

The moth hides during the day in the thick masses of rest-harrow, flying lazily to a distance of a few feet if disturbed in hot sunshine, hardly moving when it is chilly. It flies over this plant at dusk, either on the slopes of chalk hills, chalky banks and commons, or in sandy spots on the coast. It is local, but sometimes very abundant where it occurs, in Kent, Sussex, Surrey, Dorset, Devon, Wilts, Berks, Oxfordshire, Herts, Essex and Cambridgeshire; found sparingly in one portion of the Norfolk coast near Hunstanton; also in Herefordshire and Worcestershire, and Mr. Arkle records it at the Leet, Denbighshire; but I have no knowledge of its existence elsewhere in the United Kingdom. Abroad it is common

throughout Central Europe, South East France, Italy, Livonia, Greece, and Southern and Eastern Russia.

2. *M. bipunctidactylus*, *Haw.*; *serotinus*, *Zell.*—  
Expanse  $\frac{3}{4}$  to 1 inch. Fore wings narrow, grey-brown or pale brown, costa dusted with black; two small black dots before the fissure and another half way to the base. Hind wings dull brown with a purplish flush.

Antennæ of the male slender, simple, short, brown; palpi shortly triangular, pale brown, whiter above; head and thorax drab-brown; abdomen very slender, light brown, paler still at the base and at the anal tip. Fore wings narrow the lobes near together; costa almost straight till very near the apex, there arched a little; apex of each lobe narrowly yet bluntly, angulated; anal angle also blunt; grey-brown or drab-brown, the costa darker but the nervures often dusted with red-brown; just before the middle is a black dot in the discal cell, and immediately before the fissure two more, placed one over the other; two or three much smaller lie upon the hind margin; cilia pale brown mixed with white. Hind wings, and the cilia of the three lobes, glossy golden-brown or purplish-brown. Legs very long and thin, almost hair-like, pale drab, whiter on the inner side. Female similar.

Underside wholly glistening pale brown, or pale reddish-brown.

Variable, to pale drab almost without indications of the markings—which form has been erroneously supposed to be the species named *M. aridus* abroad—and on the other hand to increased size and a browner colouring, with very small black dashes in the lobes of the fore wings, or a bordering of white between them, or both. In chalky districts, and more particularly in the north-west of England, this tendency becomes exaggerated, the costa above the fissure is blackened, so as sometimes to form a flattened dark triangle with the usual two dots at its apex, these dots are also joined together

and the hind marginal dots elongated into streaks. These forms, which seem especially to be found among *Scabiosa columbaria*, form the variety (or supposed species) called *plagiodyctylus*, Stn. which was believed to be distinct, till it was found that among *Scabiosa succisa* in the Fens another form existed, of the full size of *M. plagiodyctylus*, with considerable variation in colour, and the precise markings of the typical form. This was found completely to bridge over the differences, and to unite these forms as one species.

On the wing from June till October; but apparently in two generations.

LARVA about five lines in length, of moderate proportions, neither stout nor slender, tolerably cylindrical, tapering a little behind; head rounded, rather smaller than the second segment, of a very pale brownish-yellow colour and shining; body very pale olive-yellow, with a conspicuous brown dorsal line attenuated at each end, and with two faint lines along the side a little deeper in tint than the ground colour; on the lowest line are the black spiracles, each on a slight swelling; raised dots of the ground colour and furnished with rather long curved whitish hairs; the head and other parts of the body emit short hairs. (W. Buckler.)

Of the second generation Rössler writes "spindle-shaped, verdigris-green, with a broad dull red dorsal line margined on both sides with whitish-green as far as the usual position of the subdorsal line. Head, legs, and spiracles brown-black."

May and June, and a second generation in August and even September, on *Scabiosa succisa*, *S. arvensis*, and *S. columbaria*, the first brood in the young shoots, gnawing a hole in the side and eating out the interior substance, thereby causing the shoot to droop, when it is quickly hidden by the growing plant; but in the second generation feeding upon the flowers. The singular variation in colouring has been noticed above.

PUPA slender, attached by the tail; the wing-cases long, the tips well produced and projecting a little, though lying close along the abdomen; the head and thorax rise a little on the back to a ridge; tail pointed; green, slightly inclining to olive, the wing-covers darker green; there are a purplish-brown dorsal stripe, and two parallel lines of the same colour, along the subdorsal region. (W. Buckler.)

The moth can hardly be said to hide during the day; it hangs on to the plants of scabious, and when disturbed dances away with a curious tipula-like flight, its long legs conspicuous and apparently buoyant, but it only flies a few yards to a similar resting place on the scabious or on grass; constantly to be found in boggy meadows, marshes and open damp woods among *Scabiosa succisa*, and on chalky slopes among *S. columbaria*, the smallest specimens being found among the former plant in the most open pastures. To be found, usually in the typical and smaller forms, in suitable places throughout England, Wales and Ireland, and in Scotland in Roxburghshire, Midlothian, Fife, Renfrew, Dumbartonshire, Perthshire, Aberdeenshire, and Moray; in the *plagiodyctylus* variety in chalk districts, and in the large umbreous form in the Fens. Abroad, in the typical form all over Europe except the polar region, occurring in Lapland; also in Asia Minor, Palestine, Syria, Armenia, the Canaries, and Northern Africa; the variety *plagiodyctylus* being frequent in the Alpine regions of Europe.

3. **M. zophodactylus**, Dup.; **loewii**, Zell.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–18 mm.). Fore wings very narrow, not broad behind, whitish-brown; a small black dot is before the fissure and another half-way from this to the base; extreme edge of costa white. Hind wings pale brown with a reddish gloss.

Antennæ of the male simple, dark brown, paler in front; palpi very short, bluntly pointed, drab; head and thorax whitish-brown; abdomen dull pale brown with whitish

clouding on the base. Fore wings narrow throughout; the lobes placed closely together; costa only gently arched beyond the middle; apices of both lobes bluntly pointed; pale brown, whiter toward the base, the spaces between the nervures dusted with white; part of the costa faintly dotted with the same, and followed by an extremely narrow white line edging the curve nearly to the apex; before the middle of the wing is a faint brown dot, and another with some black dusting before the fissure; cilia mixed, white and grey-brown. All these markings most obscure. Hind wings and their cilia pale golden brown.

Underside entirely pale golden brown. Legs long, brown outside, white within.

Hardly variable, except that often the markings are hardly visible; but in the most strongly marked specimens two black dots are sometimes visible in the cilia of the anterior lobe of the fore wings.

On the wing at the end of June and in July; and as a second generation in August and September.

LARVA less than half an inch in length; head smaller than the second segment, the lobes rounded and polished, pale yellowish-green, the mandibles and ocelli brown: body cylindrical, uniform, tapering a little behind, delicate pale green, strongly tinged with yellow; segmental divisions fairly defined; a tuft of short hairs springs from each raised dot; these last are not very distinct; dorsal stripe dark green or purple, in different specimens; subdorsal stripes yellow; and there are two other fine but very faint yellow lines, one above and the other below the spiracles; segmental divisions also yellow; spiracles black, very narrowly encircled with white; ventral surface, legs, and prolegs, uniformly pale yellowish-green.

Or—Ground colour brownish-yellow; head also brownish-yellow, freckled with brown; dorsal stripe broad, bright purple; subdorsal stripes also broad, but of a much less

distinct dull pale purple, and having a fine white line running through them; a narrow purple line edged with white extends along the spiracular region: ventral surface, legs and prolegs uniformly pale yellowish-brown. (G. T. Porritt.)

May and June, and a second generation in the latter part of July and beginning of August, on *Erythraea centaurium*, *E. pulchella*, and *Chlora perfoliata*, the second generation feeding on the flowers and seeds, but the earlier gnawing the leaves. Mr. W. H. B. Fletcher finds the young larvæ till the second moult, *mining* the leaves. Herr Kaltenbuch says that it hides within the green seed-capsule, eating the contents and keeping well concealed, but protruding yellowish brown frass. It was found by Herr Anton Schmid feeding on *Gentiana germanica*.

PUPA slender, very uniform in width, and almost, if not quite, as long as the full grown larva; glossy, cylindrical, but with a depression on the thorax and front abdominal segments; mouth and top of the thorax prominently and sharply defined; the leg-cases extend a long distance down the front of the abdomen, but before the end become detached from it; ground colour yellow, almost hidden by a suffusion of deep pink over the surface, which almost forms a stripe from the head through the abdominal segments; wing- and leg-cases dingy olive tinged with pink. (G. T. Porritt.)

The moth is an obscure-looking creature, appearing at first sight like a faded example of the last species. It is easily disturbed by day from its hiding place among the food-plants, and lies voluntarily at dusk, but is not then very visible. A form hardly differing from it in any degree was described in 1868 as a distinct species under the name of *Holykinsoni*, but it appears to be nothing more than the first brood of this species as found in North Lancashire and Westmoreland.

Rather local, but found in Kent, Surrey, Sussex, Dorset,

Cornwall, Somerset, Wilts, Herts, Suffolk, Norfolk, Herefordshire, Cheshire, Yorkshire, Durham, rarely, and as already mentioned in Lancashire and Westmoreland. In Wales I found it, though not commonly, in Pembrokeshire. So far as I know this is the extent of its range in these Islands. Abroad it is distributed through Central and Southern Europe, Asia Minor and Armenia.

4. **M. pterodactylus**, *L.* : **fuscus**, *Retz. Stn.*—Expanse  $\frac{7}{8}$  to 1 inch (22–25 mm.). Fore wings long and narrow, red-brown or pale chestnut, dusted with black; before the fissure are one or two small black dots. Hind wings grey-brown with a reddish flush.

Antennæ of the male simple, brown at the back, almost white in front; palpi rather trigonate, but the tip produced, light brown; head reddish-brown with a white line down each side; eyes brown; thorax red-brown, paler behind; abdomen long, dull brown. Fore wings narrow, a little broader behind, the lobes laid closely together; costa gently arched beyond the middle; apex of each lobe bluntly pointed; pale tawny or red-brown, dusted between the nervures with white; before the fissure is a black spot or two black dots; cilia reddish-brown with a white line along the base. Hind wings glossy purple-brown. Legs very long and slender, dull brown, white inwardly. Female similar.

Underside of fore wings red-brown without markings; hind wings purple-brown.

On the wing from the end of June till the beginning of August.

LARVA not stout; head small, narrower than the second segment, polished, rather flat in form, rounded at the sides, pale yellowish-brown prettily reticulated with intense black; body of fairly uniform width but tapering a little at the extremities, segmental divisions well defined; the skin, with a soft and half-transparent appearance, is sparingly clothed with short hairs; colour either bright grass-green, or

equally bright yellow-green ; dorsal stripe dark green or dark brown ; subdorsal lines rather indistinct greyish-white ; below them is a still more indistinct line of the same colour, and a similarly coloured faint line along the spiracular region ; segmental divisions of the same pale colour ; ventral surface of the colour of the upper surface ; the legs reticulated, and the prolegs tipped, with black.

May and June on the shoots, buds and flowers of *Veronica chamædrys* (Speedwell).

PUPA rather long but slender, the head, which is the thickest part, abruptly rounded, and having the snout very prominent ; thorax and abdomen rounded above, rather flattened beneath, and tapering strongly to the anal point ; eye, leg, and wing-cases fairly prominent, the last prolonged to a considerable distance on the abdominal segments ; bright green with the abdominal divisions pale grey, two indistinct pale lines on the dorsal area, and several faint purplish spots behind the thorax, and on the anal segment ; or dingy green with a distinct purple dorsal stripe, edged on each side with grey ; the abdominal divisions and the tip of the prolonged wing-cases also purple. It is capable of considerable movement, and on being disturbed turns up sharply the thorax and higher abdominal segments to a right angle with the remaining segments. (G. T. Porritt.) Attached by the anal hooks to its food plant, or any convenient neighbouring object.

The moth is quite common among its food-plant, and also generally in hedges, dry fields, and the borders of woods ; readily disturbed by day and flying freely at dusk. Common throughout the South of England and also in the Eastern and Western Counties, but except in Leicestershire it seems to be scarce or absent in the Midlands, though reappearing freely in Yorkshire, Durham, Cheshire and Lancashire. In Wales I only know it in Pembrokeshire, yet it is probably well distributed. In Ireland it seems to be generally

common, and in Scotland to Moray, at least, but it is not recorded from any of the Isles. Abroad it is found freely all over the Continent of Europe except the coldest portions, also in Asia Minor, Armenia, and even North America.

#### Genus 7. **CEDEMATOPHORUS.**

Antennæ simple, the basal joint thickened ; palpi slender ; head smooth, fore wings cleft one third of their length, the lobes curved and broad, the apex pointed, anal angle present, dorsal margin toothless ; hind wings deeply tri-cleft, the middle lobe rather spoon shaped ; when at rest the fore wings wrapped round the hind ; legs very long, tibiæ thickened behind.

We have only one species.

1. **Æ. lithodactylus**, *Tr.*—Expanse 1 inch. Fore wings broad behind, drooping at the tips of the lobes ; shining whitish-drab with faint black dusting ; before the fissure is a black spot joined to an oblique clouded black-brown line running to the costa ; at each tip is a black dot. Hind wings glossy golden brown.

Antennæ of the male simple, slender, dark brown barred with yellow-brown ; palpi small and very slender, red-brown ; head red-brown ; thorax whitish-drab ; abdomen pale brown with the base and apex pale drab. Fore wings rather broad behind and slightly hooked ; costa gently arched throughout ; apex sharply pointed and curved down, and the apex of the lower lobe more bluntly pointed ; dorsal margin even and scarcely concave ; pale drab or smoky-drab, longitudinally faintly dusted with red-brown and white ; before the fissure is a black dot lying in a black-brown cloud, which communicates with an oblique black-brown cloudy shade from the costa, and bends more faintly toward the anal angle ; on the anterior lobe are two nearly opposite red-brown dots, and at the tips of the lobes are often one or two black dots ; cilia

shining pale brown. Hind wings, and the cilia of their lobes very glossy golden brown. Legs long, pale brown or drab, clouded with white. Female stouter, often a little darker in colour, otherwise similar.

Underside wholly glossy golden-brown, except that there is a faint black streak and some white edging on the costa of the fore wings, and the tips of the lobes are darkened. Body pale drab.

Rather variable in colour, usually from a little smoky suffusion, but the dark cloud from the fissure to the costa is sometimes obsolete.

On the wing in July and August.

LARVA. Head globular and polished, smaller than the second segment, into which it can be partially withdrawn, pale green, the mandibles brown; body of nearly uniform width throughout, but tapering slightly behind, bright yellowish-green; throughout the entire length is a broad dorsal pink stripe edged on each side by a narrow purplish stripe, which is again edged by a fine white line; rather thickly clothed with short hairs, those on the dorsal area dark brown, those on the sides nearly white; ventral surface uniformly pale green. (G. T. Porritt.)

May and June on *Inula dysenterica* (fleabane), *I. conyza* (ploughman's spikenard), and abroad on *I. germanica*, *I. salicifolia* and *I. montana*, hiding during the day in a hollow of a leaf or of its petiole, feeding at night, riddling the leaves with holes or reducing them to skeletons. When quite young, however, it eats out the young shoots.

PUPA thickly clothed on the dorsal surface with short whitish hairs; green, having on the back a series of pale green lozenge-shaped marks connected at the abdominal divisions; subdorsal region dull purple; wing-cases pale green with several purplish streaks; underside of the abdomen pale green. Very similar to the larva. On the

upper surface of a leaf, lying in a hollow, and hardly to be distinguished at a glance from a larva. (G. T. Porritt.)

This is rather a sluggish species. It hides during the day in the thick masses of the Fleabane, or hangs upon the lower part of the Ploughman's spikenard, a plant of more solitary growth; if disturbed scrambles down and creeps among the herbage, and unless the afternoon is well advanced decidedly objects to fly. At late dusk it is quite active, flying among its food-plants.

Rather local, yet common in its favourite haunts in all the Southern coast counties, also in the Eastern Counties to Norfolk, and in the Western to Westmoreland, but scarce or absent in the Midlands, except that it has been found in Leicestershire and Staffordshire; also in Yorkshire, but although formerly existent in Durham it appears to have been almost extirpated. Further north than this it seems to be unknown, and in Wales I have no record except for Llandudno and Llanferris in North Wales, and my own in Pembrokeshire—where *Laula conyza* was its favoured food. In Ireland it has been taken in Cork County, Galway, Monaghan and Fermanagh. Abroad it ranges through Central Europe, the temperate portions of Northern Europe, France, the North of Spain and of Italy, Dalmatia, Southern and Eastern Russia, and Bithynia.

#### Genus 8. PTEROPHORUS.

Antennæ simple, rather long, the basal joint thickened; palpi short, slender, rounded, pointed; head smooth; hind wings cleft to one-third their length, no anal angle to the first lobe, and that of the hind lobe indistinct. Hind wings deeply divided, the three lobes long and having long cilia. Legs long; tibiæ not thickened, but feet tufted with small brushes of scales. When at rest the fore wings rolled round the hind.

We have only one species.

1. **P. monodactylus**, *L.*; **pterodactylus**, *Stn. Manual.*—Expanse 1 inch. Fore wings long; tips hardly drooping; drab, whitish-drab or pale red-brown; without markings except a faint black dot before the fissure, and sometimes some black dusting. Hind wings long, shining dark brown.

Antennæ simple, slender, reddish-brown, obscurely barred with paler; palpi small, slender, rather drooping, pale brown; head and thorax pale brown, reddish-brown, or whitish-ash colour; abdomen brown, with a succession of dorsal pale dashes. Fore wings narrow, long, and rather loosely plumed; costa very faintly and regularly arched; apex of each lobe bluntly pointed, hardly drooping; colour ashy-brown, grey-brown or reddish-brown, often with plentiful white dusting; there is also some dusting of black atoms and dots, particularly along the margins; a small black spot lies before the fissure; and a short series of similar but smaller dots at the hinder edge of the second lobe; cilia pale brown. Hind wings divided into very long lobes, all, with their cilia, shining golden-brown. Legs very long, pale brown. Female similar.

Underside of the fore wings shining golden-brown with the costa white. Hind wings shining grey-brown. Body brown.

Constantly varying in colour, as already suggested, from whitish-drab to pale red-brown; also in some degree in size. I have a specimen, taken in Wicken Fen, Cambs., which is hardly more than one half the usual expanse.

On the wing in August and through the autumn, hibernating, and re-appearing from March till June, in a single generation.

LARVA about five-eighths of an inch long, and stout in proportion; head rather small, narrower than the second segment, polished, pale yellow, the mandibles light brown; body uniform, tapering a little behind, bright yellowish-

green, more decidedly green on the back; dorsal stripe a fine but clear yellowish-white line; there is a much broader stripe of the same colour along the spiracular region, and the space between it and the spiracles is freckled with streaks and spots of the same colour; spiracles black; hairs grey: ventral surface, legs, and prolegs pale green; each raised dot emits a tuft of short but rather strong hairs.

July and August on *Convolvulus sepium*, and *C. arvensis*, eating the young shoots. Mr. South found several feeding upon *Convolvulus tricolor*, and fed them afterwards upon *Ipomœa purpurea*. Mr. Porritt finds it constantly in hill districts from which the species of *Convolvulus* are absent. feeding upon *Vaccinium myrtillus* (bilberry) and *Calluna vulgaris* (ling); and in North America it is found to feed upon *Chenopodium* and *Atriplex*.

PUPA at first green, afterwards pale dingy brown; more or less suffused with reddish-brown along the back; dorsal and lateral lines interrupted, blackish-brown; raised dots and hairs as in the larva, except that some of the dorsal series are blackish; head flattened, marked with brown and thickly covered with short hairs; wing cases yellowish-green faintly streaked with brown. Attached by the anal hooks to the stem of the food-plant or other neighbouring object. (R. South.)

The moth sits during the day among herbage on a hedge-bank, or in a hedge, or any bushes, sometimes also on a post or paling, where, with fore wings rolled round the hind and the long legs laid closely to the long body, it forms as neat and cleanly-cut a little sign-post, or cross of two single fingers from an upright, as can well be conceived. In such a form and place of security, it may often be seen—even here in the London suburbs—when the fierce winds of October or even November have driven it out of its more ordinary concealment in the bushes or among the weeds.

At dusk it flies vigorously and generally; often coming to the light of a gas-lamp, more rarely to that of a window; and also is very commonly to be seen feeding on the honey of an ivy blossom, or at sugar spread for *Noctua*, or over-ripe blackberries. After hybernation it is equally tempted by the sweetness of the sallow-bloom, but frequents it more especially on cool moon-lit evenings, and not so much on those warmer and darker nights on which it is so greatly frequented by *Noctua*. Apparently common throughout the United Kingdom to the Orkneys, though less so in the north of Scotland; but in Southern districts very plentiful. Also throughout the Continent of Europe, Asia Minor, Armenia, Persia, the trans-Caucasian region, the Canaries, Madeira, Northern Africa, and North America from Maine to California.

#### Genus 9. **LEIOPTILUS.**

Antennæ simple, the basal joint slightly thickened; palpi short, slender, pointed; head smooth; fore wings rather short, cleft to one-third of their length, the segments rather broad, but not angulated behind; hind wings deeply divided, but the segments or lobes slender; no dark tuft on the hindmost. Legs long, slender, the tibiæ not thickened nor the feet tufted. Wings usually laid tolerably flatly in repose.

We have five species, readily discriminated.

A. Fore wings glossy pale drab or yellow-drab.

B. Two black streaks on the costa before the apex.

*L. licivigianus.*

B<sup>2</sup>. A black spot on the costa near the discal dot.

*L. microdactylus.*

B<sup>3</sup>. No black mark on the costa.

*L. tephrodactylus.*

A<sup>2</sup>. Fore wings shining pale yellow without markings.

*L. ostcodactylus.*

A<sup>3</sup>. Fore wings black-brown with pale fasciæ.

*L. brachydactylus.*

1. *L. lienigianus*, Zell.—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18-22 mm.) Fore wings short, the lobes rather broad; shining pale drab, dusted with brown; a curved black streak lies before the fissure, and beyond it two black dashes on the costa; hind wings shining whitish-brown.

Antennæ of the male slender, simple, pale drab, annulated with white; palpi minute, threadlike, pale brown; head, thorax, and abdomen whitish-drab. Fore wings rather short, the two lobes broad, bluntly pointed, without anal angle; costa only arched beyond the middle, and the apex a little bent over; dorsal margin not concave; colour pale drab or brownish-white, more ashy toward the base, otherwise dusted with brown; before the fissure is a black cloudy crescent, and half-way between this and the base sometimes a black dot; on the costa on the anterior lobe are two black streaks or dashes, and the apex of both lobes is faintly blackened; cilia dark brown. Hind wings moderately short, divided to the base, the third lobe short; glossy grey-brown; cilia of the same or darker colour. Legs shining white. Female similar, but a little stouter.

Underside of the fore wings smoky drab, the costa paler, and the markings as on the upper side; hind wings glossy pale grey. Body pale drab.

On the wing from the middle of June till August.

LARVA three-eighths of an inch long; head a little smaller than the second segment, and rather rounded, shining greyish-brown, blotched with black-brown on the lobes and between them; body cylindrical though tapering a little behind, pale glaucous green; dorsal stripe broad, darker bluish-green, divided by a fine thread of the ground colour; sub-dorsal line thin, yellowish-white, and just above it is a whitish-grey parallel streak; all these regularly interrupted at the segmental divisions, which are somewhat yellow; spiracles white, ringed with brown; there is a white wart on the hinder part of the side of the third and fourth segments;

raised dots white, each bearing a little fascicle of about four silky white hairs, curved and finely pointed; ventral surface and legs a little paler than the rest of the ground colour. (W. Buckler.)

October till May or June; on *Artemisia vulgaris* (mugwort), eating only the parenchyma of the leaves. When young it gnaws oblong blotches near the tips of the upper leaves, leaving the cuticle of the upper side entire and carefully rolling back the downy skin of the underside to the edge of the blotch. When about one-fourth grown it moves to a lower leaf which it draws together, uniting the tips underneath and carefully sewing together the edges of the segments so as to make a secure little tent, inside which it feeds as before, only making larger blotches side by side between the ribs of the leaf, until the greater portion of the substance is devoured, when it deserts this habitation and makes another lower down; and so on, constructing four or five tents before becoming full grown. When several larvæ feed upon an isolated plant its growth is checked, and every leaf takes something the appearance of a bladder, giving it a very singular aspect.

PUPA exceedingly bristly, all the tufts of hairs of the larva fully reproduced, colour pale green, with a faint yellow dorsal line, and some oblique brownish shading on the back; wing covers green; antennæ and leg covers tinged with brown; spiracles black. Attached by the anal hooks to a silken pad or carpet on a stem, dead leaf, or other object, but not hanging—rather in the position of a living larva—level upon the surface. Most curiously active, having strongly developed the power possessed by many pupæ in this group of violently throwing back the thorax if disturbed. In the case of this species, a touch upon the back of the abdomen of the pupa is instantly responded to by a blow delivered backwards by the thoracic portion. So bristly is this pupa that it cannot well be distinguished by the naked eye from a larva.

The moth is a sluggish and lazy creature. It hides during the day in the thick masses of its food plant, or in the weeds beneath, and is very difficult to disturb, even when aroused, creeping out with great unwillingness. It flies in the late dusk, and will occasionally come at night to the light of a gas-lamp; but it is by no means a conspicuous species at any stage. Extremely local, perhaps more frequent in Norfolk than anywhere else with us; but found also in Suffolk, Kent, Surrey, Devon, and the Isle of Wight. This, I think, is the extent of its range in these Islands. Abroad its distribution is not very wide—Central Europe, Central Italy, and Livonia.

2. **L. tephradactylus**, *Hüb.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18-22 mm.). Fore wings short, broad behind, glossy pale drab, dusted with black; two minute dots lie before the fissure, but there are no other noticeable markings. Hind wings shining whitish-drab.

Antennæ of the male rather long, simple, pale drab; palpi very small, pale brown; head and thorax whitish-drab; abdomen whitish-brown. Fore wings short, the two lobes broad and both bluntly pointed; costa faintly arched, but more so towards the apex; dorsal margin not hollowed; whitish-drab, with very faint longitudinal shades of dusky dusting mixed with a little dusting of black; just before the middle is the faint indication of a blackish dot; and just before the fissure a pair, a little more distinct; there are also indications of faint dark dots on the lobes; cilia grey brown, or smoky-brown. Hind wings well divided, the lobes rather broad, pale silvery-grey, the cilia more tinged with brown. Legs whitish-brown. Female similar.

Underside of the fore wings shining pale drab, with browner lines along the nervures, and a smoky tinge along the hind margin. Hind wings pale silvery-grey. Body pale drab or pale yellowish-brown.

On the wing from the end of May till July.

LARVA about half an inch in length, head polished, about the same width as the second, but narrower than the third segment, pale yellow; body rather flattened beneath, and also a little on the back, grass green; there is an interrupted grey line along each side of the dorsal ridge, and a faint indication of a similarly coloured sub-dorsal line; raised dots greyish-white, as also are the hairs; segmental divisions pale yellow; ventral surface uniformly grass green. (G. T. Porritt.)

September till May on *Solidago virgaurea* (golden-rod), feeding upon the leaves, in which it eats holes.

PUPA half an inch long, compact and of moderate bulk; a distinct depression extends down the dorsal surface from the head to the anal extremity; abdominal divisions and eye and leg-cases well defined; colour dingy dull green, the sides thickly sprinkled with smoke colour; and a smoky stripe through the wing-cases; the abundant hairs grey. Not suspended, but lying flat along a leaf or stalk attached only by the anal extremity. (G. T. Porritt.)

The moth frequents especially the open parts of woods where golden-rod is common, and is easily disturbed from among it and neighbouring herbage in the afternoon. Its natural flight is rather late in the dusk and well into the night. It is known to occur, and sometimes commonly, in such places in Kent, Sussex, Surrey, Berks, Dorset, Devon, Cornwall, Somerset, Essex, and Herefordshire; and very locally in Derbyshire, Lancashire, Yorkshire and Westmoreland. In Wales I only know of it in woods in Pembrokeshire and at Bangor; in Scotland in Dumbartonshire, and, curiously enough, in the Isle of Skye; in Ireland Mr. Kane records it in Clare, Galway, and Sligo. Abroad it is common in Central Europe, also in the more temperate portions of Northern Europe, including Norway, and in Northern Italy, and Southern and Eastern Russia.

3. **L. osteodactylus**, Zell.—Expanse  $\frac{5}{8}$  to  $\frac{3}{4}$  inch (15–20 mm.). Fore wings narrow throughout; pale sulphur-yellow with a minute dark dot before the fissure. Hind wings shining whitish drab, with darker cilia.

Antennæ of the male short, simple, yellowish-white; palpi very slender, almost threadlike, similar in colour; head and thorax pale sulphur-yellow; abdomen yellowish-white. Fore wings slender with a slightly drooping tip; costa arched beyond the middle; apex of each lobe pointed, the anterior longer and curved over; dorsal margin not hollowed; colour smooth shining pale sulphur-yellow without markings except a very minute dark dot at the base of the fissure; cilia glossy pale grey-brown. Hind wings rather short, divided, the lobes narrow but glossy, pale golden-grey, the cilia more smoky in shade but equally glossy. Legs extremely slender, sulphur colour. Female similar.

Underside of the fore wings smoky yellow, sulphur colour along the costa; hind wings shining pale smoky grey.

On the wing in July and the beginning of August.

LARVA white-brown with a greenish tinge and thickly sprinkled with minute black dots; dorsal stripe and sub-dorsal line pale rosy pink; raised dots inconspicuous, from those on the dorsal area a single pale brown hair of moderate length arises, those on the third to fifth segments curve forward, those on the posterior segments curve backward; along the lateral area there is one dot with a moderately long hair, on each segment; spiracles black; prolegs pale brown.

September and October, then hibernating full grown in a case in the seed-head and spinning up in April; on *Solidago virgaurea* (golden-rod), feeding on the flowers and seed-heads.

PUPA apparently undescribed.

The moth hides, like its congeners, in the daytime among its food-plant, and may be disturbed therefrom late in the afternoon; it flies naturally rather late at dusk and in the

night, and will come occasionally to light. I have found it on the slopes of an undercliff, but its usual haunts seem to be hill-sides and open woods, and it is found in both North and South Devon, Somerset, Sussex, Suffolk, Herefordshire, Yorkshire, North Lancashire, Westmoreland and Cumberland; in Scotland in Dumbartonshire; in Wales on the coast of Pembrokeshire, and at Llanferris and the Leet in Denbighshire; but, so far as is known, not in Ireland. Abroad it inhabits Northern Europe to Norway, Central Europe, France, Italy and Portugal.

4. **L. microdactylus**, *Hüb.*—Expanse  $\frac{1}{2}$  to  $\frac{5}{8}$  inch. (12–16 mm.). Forewings pale brownish-yellow, with the tips darker; a black dot on the fissure is followed by another above. Hind wings shining drab.

Antennæ of the male simple, whitish-brown; palpi short, threadlike, purple-brown; head and thorax shining yellowish-white; abdomen very slender, pale yellow. Fore wings short, the lobes rather separated and pointed, pale primrose yellow, slightly dusted with brown; a black dot is situated just before the fissure, a larger one just beyond it on the costa, and the two lobes are dotted and shaded on the upper margins with black-brown; cilia pale golden-brown. Hind wings short, the lobes narrow, glistening pale grey-brown or whitish-brown; the cilia browner; legs yellow. Female similar, but usually a little larger.

Underside of the fore wings smoky yellow-brown, with a white edge to the middle of the costa and beyond a blackish spot. Hind wings shining grey-brown. Body pale yellow.

Variable in size and in the ground colour, from yellowish white to pale yellow-brown.

On the wing from June till early in August, in two generations.

LARVA slightly bristly; head pale brown, jaws darker, dorsal plate not visible; body white, with a broad faint band

of black dots across the back of each segment; spiracles black; anal segment white.

September and October, and another generation in July.

On *Eupatorium cannabinum* (hemp-agrimony) in the highest portion of the stem, especially at the axils of the bunch of flower-stalks, eating out the pith, and extruding frass through a round hole in the side; sometimes also at the second and third joint lower down; occasionally two feeding one above the other.

PUCHA a quarter of an inch long, rather slender, thorax rounded and well defined; having a few bristly hairs; head and eye covers rather prominent; wing covers long; leg cases reaching to the last abdominal segment but one, but free from it; on the abdomen are sub-dorsal, lateral, and sub-spiracular rows of hooks in pairs; whole surface glistening bronzy-green. In the stem of the food plant, in a small cleared space, the head uppermost, the tail steadied by a few silken threads from the frass beneath. (W. Buckler.)

The moth buzzes quietly about the plants of hemp-agrimony in the early dusk and may be shaken out earlier, but it is a very fragile species, and at no time makes any very vigorous movement. Common where it occurs, generally in marshy places. in Kent, Sussex, Dorset, Devon, Somerset, Wilts, Gloucestershire, Herefordshire, Herts, Cambridgeshire (in the fens), Suffolk, Norfolk (in fens), North Lancashire, Yorkshire, and Durham. In Wales, in both Glamorganshire and Pembrokeshire; in Scotland only noticed in the extreme south—in Berwickshire by Mr. W. G. Guthrie, and in Roxburghshire by Mr. A. E. Elliot; recorded in Ireland, in Galway, and Sligo, by Mr. Kane. Abroad it is well distributed through Central Europe, Sweden, Mid-Italy, Sardinia, North Spain, Livonia, Dalmatia, Pontus, and Bithynia.

5. **L. brachydactylus**.—Expanse  $\frac{5}{8}$  to  $\frac{7}{8}$  inch (16–22 mm.). Wings all rather short, with broad lobes; black-

brown, with broken, cloudy, reddish white transverse stripes, and a white spot at the anal angle of the fore wings.

Antennæ of the male slender, black-brown; palpi minute, brown; head and thorax bronzy black-brown; abdomen dull brown, longitudinally streaked, on each side, with white. Fore wings rather short, the lobes broad and hooked; costa strongly arched; apex drooping but sharply angulated, second lobe more bluntly so; bronzy black-brown; with whitish-yellow-brown opposite spots on the costal and dorsal margins beyond the middle, and again at the base of the fissure, where they almost unite as an angulated transverse stripe; a white streak runs into the apex of the first lobe, and there is a white dash on the long cilia of the second. Hind wings fully divided, the lobes rather broad; bronzy-brown with a yellowish cloud on the cilia of the second lobe, and a long, similar cloud on those of the third; cilia otherwise darker bronzy-brown. Legs long and very thin, white with black-brown bands and clouding. Female similar, usually rather larger.

Underside a repetition of the upper in colour and markings.

On the wing in June and July.

LARVA narrowly fusiform; head yellowish-brown, body green, with the dorsal line darker green; sub-dorsal line also dark green, but so wavy as almost to look like separate spots in each segment; spiracles black; there are two rows of lateral tubercles, each having a few dusky hairs. (Dr. Jordan.)

May and June on *Prenanthis purpurea*, on the undersides of the leaves, eating holes in them. (Frey.) This plant is not known as British, but is very closely allied to the species of *Lactuca*, and Dr. Jordan's larvæ ate *Lactuca muralis* freely.

PUPA whitish-grey, dusted with black over the front portion, the thorax, and the wing cases. (Frey.)

This species is one of our rarest, and scarcely anything is known of it in this country. It was included as British in his Manual, by the late Mr. H. T. Stainton, on the evidence of a specimen taken in Norfolk by Mr. Farr more than half a century ago. This specimen has been long in the collection of the late Mr. Jenner Weir. Mr. George Bird has obliged me with a note on this matter found by him in the diary of the late Mr. Farr, of Yarmouth, as follows: "June 17, 1842, took two specimens of *Pterophorus trichodactylus* in a wood by Sir John Leathes's boathouse, at Herringfleet; beaten out of alder bushes by me and Charles Paget." There is little doubt in my own mind that this entry referred to the present species, since *Pt. trichodactylus* is not known to have occurred with us. If so, the destination of the second specimen is unknown; Mr. Bird, who possesses Mr. Farr's collection, has not ever had it. Another British specimen is recorded as captured at Glen Tilt, Aberdeenshire, in 1874, by Sir Thomas Moncrieff; this was confirmed more recently by Mr. Stainton, and Dr. F. B. White states that another was captured in the same locality. Mr. J. B. Hodgkinson had a specimen said to have been taken by a working collector in Cumberland; and Mr. N. V. Sidgwick informs me of the capture of several specimens in Gloucestershire. This appears to be all the evidence available of its existence in these islands. Abroad it is found throughout Central Europe, and in Denmark, Sweden, Livonia, the northern half of Italy, Dalmatia, and Armenia.

#### Genus 10. **TRICHOPTYLUS.**

Antennæ rather long, simple; palpi extremely slender, of moderate length, depressed; head rounded; fore wings cleft one half their length, and minutely toothed with scales on the dorsal margin, hind wings tri-cleft to the base; hinder lobe without white scales or dark tuft. Wings excessively fragile, legs long, thickened a little at the joints.

We have only one species. It singularly resembles those of the genus *Oxyptilus*. It has usually been included in the last—*Lcioptilus*—but has been separated by Lord Walsingham, under the present name, with a number of closely allied North American, and other exotic species.

1. **T. paludum**, *Zell.*—Expanse  $\frac{1}{2}$  to  $\frac{5}{8}$  inch (12–15 mm.). Fore wings slender and weak, chestnut-brown with two white stripes crossing the lobes and a white dot at the fissure. Hind wings red-brown, the third lobe without a tuft.

Antennæ of the male rather long, simple, brown; palpi very slender, drooping, dull white; head reddish-brown; thorax similar but shot with silvery-white. Abdomen slender, brown, much clouded and streaked with silvery-white. Fore wings short, rather broad behind and hooked; costa arched; tips of the lobes rather drooping and pointed; light red-brown, shaded along the costa to the middle with silvery-white; opposite this on the dorsal margin is a black dot edged with silvery-white; a black dot at the base of the fissure has before and beyond it a white cloud; crossing the two lobes are two broad white stripes extending to the cilia, and having between them small black dots and streaks; cilia otherwise red-brown. Hind wings with their cilia golden-brown. Legs very pretty, reddish-brown, broadly and repeatedly banded with white, rather thickened at the joints. Female similar.

Undersides of all the wings golden-brown; the white markings in the cilia of the fore wings bright and distinct; some white shading is also under the hind wings. Body pale brown with white lines.

Variable in size, Yorkshire specimens being much larger than those taken elsewhere.

On the wing in June and as a second generation in August.

LARVA and PUPA quite unknown.

The moth hides during the day among the low growing herbage—stunted heather, bog-asphodel, cranberry, and short grasses and sedges—on the boggy portions of heaths or the edges of fens, but flies up if disturbed by a passing foot-step, to hide again at a few feet distance. It flies naturally at sunset and after. It is said to be unusually regardless of weather and to fly willingly on windy nights. Formerly it was common in the fens of Cambridgeshire and Huntingdonshire—Burwell Fen, Whittlesea Mere, Holme Fen—but apparently not in Wicken Fen, for since the draining of the former fens it seems to have died out of that district; and so far as I can ascertain it has never been seen in those of Norfolk. It is now a scarce species, but a few have been captured from time to time near Arundel, Sussex; in Wolmer Forest and at Lyndhurst, Hants; and at Bloxworth Corfe and Studland, Dorset; more recently Mr. G. T. Porritt has discovered it at Thorne Moor, Yorkshire. With the exception of an old report of several specimens from a small moss a few miles from Crewe, Cheshire, these are apparently all its known localities in these Islands. Abroad it is found among the mountains of France, in Holland, Northern Germany, Switzerland, Catalonia, Livonia, and Finland.

#### Genus 11. **ACIPTILUS.**

Antennæ simple but the basal joint thickened; palpi short, slender, the final joint depressed; fore wings cleft to near the middle, the segments almost linear, slender, set well apart and without lateral angles, or tufts; hind wings also cleft in long linear sections broadly ciliated but without tufts. Wings rather lax and drooping at the tips. Legs very long. Abdomen rather short.

We have five species—readily discriminated.

A. Fore wings white.

B. Fore wings slightly dotted with black.

*A. galactodactylus.*

- B<sup>2</sup>. Fore wings crossed by broken cloudy stripes. *A. spilodactylus.*  
 B<sup>3</sup>. Fore wings spotless. *A. pentadactylus.*  
 A<sup>2</sup>. Fore wings pale drab or whity-brown.  
 C. Costa of fore wings faintly streaked with smoky brown. *A. baliodactylus.*  
 C<sup>2</sup>. Costa wholly smoky brown. *A. tetradactylus.*

1. **A. galactodactylus**, *Hub.*—Expanse 1 inch. Fore wings broad, the tips drooping; shining white with a few small black dots and streaks; cilia white, with faint smoky dashes. Hind wings spreading, white.

Antennæ of the male rather long, simple, brownish white; palpi minute, threadlike, white; head and thorax snowy white; abdomen rather short, brownish-white. Fore wings not very narrow, the lobes spread rather widely behind, but bent at the tips; the costa somewhat straight; dorsal margin rather concave; apices pointed; colour snowy-white; a black or brown dot lies on the disk before the middle and another blacker *in* the middle; two divergent minute black brown streaks at the base of the fissure; one each on the costal and dorsal margins beyond, and another on each lobe still further toward the tips; cilia white, clouded and streaked with smoky brown. Hind wings rather broad, the lobes set well apart; silky white, with the cilia quite the same colour. Legs white. Female similar, but with a stouter body.

Underside of the fore wings white but tinged from the base to the fissure with yellow-brown, the minute brown dots and streaks of the upper side repeated; hind wings white; body the same.

On the wing in June and the early part of July.

LARVA slightly flattened on the back, more so beneath; attenuated behind, and also from the third segment forward; the head has the lobes rounded and polished, pale green, the mandibles brown; body pale green, the raised dots large and

prominent, each of them furnished with a tuft of moderately long hairs; along the dorsal region are two rather distinct grey lines, and between them the still more faint grey dorsal line; one indistinct row of grey spots is substituted for the sub-dorsal line; and the spiracular line is greenish-grey; hairs grey, those from the sides standing out horizontally and slightly curved; ventral surface uniformly pale green. (G. T. Porritt.)

March till May; on burdock (*Arctium lappa*). feeding on the undersides of the leaves, eating out holes and carefully rolling back the white down of the leaf, while it devours the parenchyma. Seldom eats from the edge of the leaf; as it gets older removes to a younger leaf.

PUPA rounded on the dorsal area; flattened beneath; head bluntly rounded off; the leg and wing cases extend half-way down the abdomen, but are detached therefrom; ground colour bright green; two distinct white stripes extend from the thorax to the tip of the abdomen; outside these stripes, on each side of the first two abdominal segments, are two conspicuous black spots, and similar spots are faintly indicated on the other segments; the hairs are as in the larva.

On the underside of a leaf or on a stem, or other convenient object; attached only by the anal hooks, but lying close to the leaf or other object.

This is a sluggish species, very unwilling to fly when disturbed from among its food-plant, but hiding among the long grass and herbage. Even at dusk it is not often seen on the wing, and our cabinets are almost entirely supplied by specimens reared from larvæ found on the burdock leaves. Rather a local insect, and mainly confined to open woods, but found in Kent, Sussex, Surrey, Wilts, Dorset, Devon, Somerset, Berks, Oxfordshire, Middlesex, Essex, Suffolk, Norfolk, Hants, Cambs, Gloucestershire, Herefordshire, and

Worcestershire. In Wales it has been found in Glamorgan-shire; and in Ireland Mr. Kane records it from Kenmare, Kerry. So far as can be ascertained, this is the extent of its distribution in these Islands. Abroad it inhabits Germany, Lower Austria, Hungary, Southern Russia, and Armenia.

2. **A. spilodactylus**, *Curt.*—Expanse  $\frac{7}{8}$  to nearly 1 inch (21–24 mm.). Fore wings broad, the anterior tip a little upraised; white, dusted and clouded with smoky brown before the fissure and on the lobes. Hind wings smoky white.

Antennæ of the male not long, simple, brownish-white; palpi slender, whitish-brown; head and thorax creamy white, or faintly tinged with brown; abdomen white streaked with brown. Fore wings broad behind, the tips of the lobes strongly divergent; costa nearly straight; the tips bluntly pointed and the lower lobe deflected; chalky white; the extreme edge of the costa smoky black, and the basal area rather shaded with smoky brown; a smoke-coloured streak from each margin, with a similar intermediate spot, form an incomplete angulated band before the fissure; other smoky dashes run along the nervures, cloud the cilia of each lobe, and indicate a second angulated transverse band; cilia otherwise white. Hind wings broad, the lobes set well apart, golden brown, the cilia white, much clouded with smoky grey; legs white. Female similar, stouter.

Undersides of the wings golden-brown, with white streaks to the middle, thence white with smoky clouding. Body smoky white.

On the wing in July and August, but Mr. Buckler reared it in September and October, as probably a partial second generation.

LARVA tapering a little from the third segment to the head, and a very little at the three hinder segments; head rounded, small, whitish-brown, freckled a little on the face

with dark brown ; segments plump and deeply cut ; second segment rather long, light yellow-green, very minutely freckled with raised dark brown dots ; body pale glaucous-green, rather darker on the back than on the sides ; a thin faint whitish dorsal line is just visible ; besides the ordinary raised dots, there are along the sides three rows of minute blunt cones, pale green tipped with dark brown, and each having five or six radiating curved whitish bristles ; spiracles minute, round, green, ringed with dark red ; the raised dots on either side of them have nine or ten bristly hairs each. (W. Buckler.) This larva is exceedingly like the surface on which it rests, its hairs closely resembling the white pubescence of the plant.

May to June or July, but apparently feeding from the previous autumn, on *Marrubium vulgare* (White horehound), feeding on the young leaves. Mr. South says that it rests on the upper surface of the leaf in damp or dull weather, but hides beneath it when the sun shines.

PUPA green with whitish warts and hairs, the wing-cases paler green, thickly studded with short whitish bristles along the edges. Attached by the anal hooks to the upper surface of a leaf of the food-plant. (R. South.) Also closely resembling the hairy whiteness of the plant.

The moth is sluggish in the daytime, hiding closely among its food-plant, but flies at night. It is exceedingly local—as is its food-plant—and confined mainly to chalk districts. It is not, however, limited to those localities in which the plant grows *wild*, but equally affects it in gardens on the same soil. It is found in Kent, Sussex, Hants, with the Isle of Wight, Dorset, Somerset, Suffolk, Herts, and Bewdley Forest, Worcestershire. This seems to be the extent of its distribution in these Islands. Abroad it is spread abroad over Central and Southern Europe and Northern Africa.

3. **A. baliodactylus**, Zell.—Expanse  $\frac{7}{8}$  to 1 inch (21–25 mm.). Fore wings narrow, the lobes also narrow and divergent, the apex straight or upraised; pale brownish-sulphur; on the costa are short brown clouds; cilia brown. Hind wings pale bronzy brown.

Antennæ of the male simple, pale yellow, tinged in front with brown; palpi small, slender, drooping, yellow-brown; head, thorax, and abdomen whitish-yellow or whitey-brown. Fore wings narrow, but the lobes widely diverging behind; costa nearly straight, the apices pointed, the front one sometimes pointing a little forward, the other drooping; pale sulphur-yellow, the front lobe tinged with yellow-brown and the costa edged, in interrupted streaks, with darker brown; of these streaks one runs along the anterior lobe into the apex; cilia yellowish-white, with smoky clouding toward the apices of the lobes. Hind wings shining pale golden-brown, with similar cilia. Legs pale sulphur. Female similar.

Undersides of all the wings pale golden-brown; the lobes more yellow beyond the middle, but the cilia darker. Body pale sulphur.

On the wing from the end of June till August.

LARVA seven lines in length; tapering towards the anal extremity; head smaller than the second segment, yellowish-green with a small black spot on each cheek, and brown mandibles; ground colour dingy green; segmental divisions and dorsal line yellowish-green; dorsal raised dots whitish, with whitish hairs; those of the sides are provided, so far as the foremost on every segment is concerned, with an additional longer hair; prolegs transparent yellowish-green. (R. South.)

May and June on marjoram (*Origanum vulgare*), eating the young leaves at night. Mr. South says that it bites into the stems and causes them to droop.

PUPA dingy green, with a broad obscure red-brown dorsal

stripe; or the whole dorsal area suffused with red-brown; wing-cases pale green; antenna-cases either brownish-green or red-brown; raised dots with their tufts of hairs as in the larva. Upon the food-plant, attached by its anal hooks. (R. South.)

The moth hides among its food-plant, the marjoram, by day, flying over it at dusk. It is local, confined to chalk downs, hills, and waste places in chalk districts, but in them not everywhere to be found. It occurs, however, pretty generally on ground such as I have mentioned in Kent, Sussex, Surrey, Hants, Dorset, Somerset, and Gloucestershire. Mr. Atmore has just discovered it in Norfolk; and it is difficult to imagine it absent from some of the intermediate counties. Yet, with the exception of a very doubtful record at Sligo, in the West of Ireland, this is the extent of its known range in these Islands. Abroad it is extensively distributed through Central and Southern Europe, Belgium, Livonia, Bithynia, and the Taurus mountain district in Asiatic Turkey.

4. **A. tetradactylus**, *L.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings narrow, the fissure deep, the tips of the lobes widely divergent, and the apex pointed forwards; brownish-sulphur, costa and cilia dark brown. Hind wings drab, but with dark cilia.

Antennæ of the male simple, shining dark brown; palpi minute, threadlike, black-brown; head reddish-drab; thorax pale yellow-drab; abdomen yellowish-white. Fore wings rather short but very narrow, the tips widely apart, the first lobe curved forward, the other back; whitish-drab with a brown tinge in the costal half; extreme edge of the costa uniformly black-brown; no definite markings; cilia smoky brown, very dark toward the tips. Hind wings well divided into very narrow lobes, which are golden-brown, but the cilia, which are long and conspicuous, smoky brown with a faint golden gloss. Legs pale yellow. Female rather

smaller but stouter, the fore wings paler, often pale sulphur-yellow; the hind wings also paler.

Underside of the fore wings smoky brown except the shafts of the lobes, which are pale yellow; the first and third lobes of the hind wings also pale yellow, the second smoky brown; the cilia of all dark smoky brown. Body pale yellow.

On the wing from June till August.

LARVA half an inch in length, thickest in the middle, attenuated at the extremities, rounded above, flatter beneath; head small and glossy, considerably narrower than the second segment, yellowish-green, the mandibles and a spot on each side of them brown; ground colour bright pea-green; dorsal stripe broad, of a considerably darker shade of green and powdered on each side with greyish-white; sub-dorsal stripes of the same dark green colour, but not so conspicuous; spiracular stripes rather broad, yellowish-grey; a tuft of short white hairs springs from each raised dot; segmental divisions white; ventral surface, legs and prolegs bright pea-green. (G. T. Porritt.)

May and June on wild thyme (*Thymus serpyllum*).

PUPA green with numerous bristles; the wing-covers pale brown along the edges. (Hofmann.)

The moth hides itself among thyme and other low-growing herbage during the day, and is readily disturbed by the footstep in the afternoon, flying naturally and freely at sunset. It frequents open fields and waste places as well as hill-sides, in chalky places and limestone districts, also following its food-plant into soils which contain enough of the calcareous nature to allow it to thrive; consequently it is more widely distributed than some of the chalk-loving species. We have it in suitable spots throughout the Southern Counties from Kent to Somerset; also in Gloucestershire, Oxfordshire, Cambridgeshire, Suffolk, Norfolk, Herefordshire, Worcester-

shire, Yorkshire, North Lancashire, Durham, and Westmoreland, and there is a single record in Leicestershire. Also locally in North Wales, but I never saw it in the limestone districts of South Wales. In Scotland it becomes in some degree a mountain insect, and is found in Berwickshire, Roxburghshire, and Midlothian; also at Braemar, Aberdeenshire; in Glen Lochay, Perthshire; and in Renfrew. In Ireland it is common in suitable places, and is recorded from Kerry, Clare, Galway, Louth, and Down. Abroad it is spread all over Europe except the Arctic portion, including the greater part of Scandinavia; also Armenia, Bithynia, the Taurus Mountain district, the Trans-Caspian region, and the Canary Isles.

5. **A. pentadactylus**, *L.*—Expanse  $1\frac{1}{2}$  inch. Fore wings long, deeply fissured, the tips drooping; whole insect shining snow white.

Antennæ of the male simple, brownish-white, palpi thread-like, white; head, thorax and abdomen snow-white, but the scales of the abdomen are large and loose and often get displaced, showing the skin beneath to be bright green. Fore wings long, broadly spreading behind, the two tips of lobes drooping and pointed; the costa much arched; cilia very long and full; wholly shining snow-white. Hind wings long, divided to the base, all three lobes slender but broadly and strongly ciliated, also shining snow-white. Legs long and slender, equally white. Female quite similar.

Underside also wholly shining snow-white.

On the wing in June and July.

LARVA very bristly, the hairs at each extremity four times as long as those of the rest of the body; head shining yellow or green; body somewhat cylindrical, though a little thicker in the middle, light green, with a darker green dorsal stripe; subdorsal lines white, but interrupted on every segment by a yellow bar across the back; raised dots black; the hairs grey.

July or August through the autumn, hibernating while

very small, and feeding up from April to June; on bindweed (*Convolvulus sepium* and *C. arvensis*), eating the tender leaves upon the young shoots.

PUPA very similar to the larva, equally bristly except that the long hairs are wanting; green with a triple row of shortly elongated chocolate-brown spots down the back. Attached by the anal hooks to a pad of silk under a leaf, not by any means always that of the food-plant; or under or on any other convenient substance; lying close to the surface, but able to strike vigorously backward with its thorax if interfered with.

This is the most brilliant and attractive in appearance of all the group to which it belongs, indeed its extreme purity and lightness as it flutters from any patch of weeds, when kicked or trodden out, and moves exactly like a bit of pure white swansdown drifting over the grass or the garden path, is always a source of delight and amusement to the keen observer who sees it for the first time. Especially attached to neglected gardens and weedy hedges, where it abounds among the common and mischievous bindweed; and common throughout the Southern, Eastern, Western, and Midland counties of England to Yorkshire and Durham, becoming very local in Lancashire and apparently absent farther north. In Wales it is found in Glamorganshire and Denbighshire; and in Ireland in the neighbourhood of Dublin, in Wicklow, Wexford, Waterford, Cork, Kerry, Clare, Galway, and Sligo, but by no means commonly—often, indeed, only singly. Abroad it has a range over almost all Europe, except the polar region, and including the island of Corsica; also Armenia, Bithynia and Eastern Siberia.

### Section 3. *ORNEODIDÆ*.

Tongue present; palpi slender and short; fore and hind wings each divided into six feather-like lobes; vein 5 absent

in both; vein 8 separate from vein 7 in the hind wings. Abdomen very slender, rather short.

#### Genus 1. ORNEODES.

Palpi distinctly showing the third joint; second joint tufted; fore wings having the plumes laid rather closely together; those of the hind wings more loose. Legs long and rather slender.

We have but one species.

1. *O. polydactyla*, *Hüb.*; *hexadactyla*, *Staud. Cat., L.?*—Expanse  $\frac{5}{8}$  inch (14–17 mm.). Fore wings six-cleft to near the base; pale yellowish-brown with broad dark grey-brown stripes crossing the divisions. Hind wings more widely six-cleft, dotted with pale brown.

Antennæ of the male very slender, simple, brown; palpi slender, projecting, thickly tufted, brown outside, white within; third joint obliquely placed and pointed, dark brown; head and thorax grey-brown dusted with black; abdomen rather flattened, pale brown. Fore wings divided almost to the base into six narrow plumes laid rather closely side by side; the costa very straight and the hind margin gently curved; very pale yellowish-drab, the costal lobe regularly spotted with brown; from the fourth of these spots a broad brown band crosses the wing, and from the sixth another; remainder of the wings clouded and dashed with brown, in its outer half having numerous little brown crescents and darker dots in the pale areas; at the hind margin a round black dot tips every lobe; cilia pale brownish-drab. Hind wings divided from the base into six lobes—the whole forming an open fan-shape—glistening whitish-drab, every lobe regularly dotted with dark brown in pale crescents. Cilia of all the wings rather short, but extending up both sides of the lobes, and very evenly placed, pale drab. Legs long, shining yellowish-white with brown clouding. Female similar.

Underside quite like the upper, yet a little paler. Body pale brown.

Usually not variable ; but in the south of Scotland a form is found, by Mr. Adam Elliot, little more than one half the usual size.

On the wing from August through the autumn, then hibernating, and reappearing in the spring, till May or even June.

LARVA. Length 4 lines ; somewhat leech-like, both extremities pointed ; anterior segments retractile ; head smaller than the second segment, pale pinkish-brown, spotted with darker brown ; mandibles dark brown ; ground colour reddish-pink or salmon-colour, becoming paler when nearly full fed, and finally, just before pupation, yellowish-white ; no raised dots, but a few short bristles are scattered over the body.

June and July in the buds and flowers of honeysuckle (*Lonicera periclymenum*). Dr. Chapman says that its food consists mainly of the pollen of the flower, but that it also eats the filaments of the stamens and styles of the pistils, and will gnaw the inner surface of the corolla ; from time to time it emerges from one flower, sometimes having devoured only its pollen, and enters another by a small round hole.

PUPA. In general proportions and outline very like that of a *Noctua* ; pale brown and somewhat delicate ; its terminal armature consists of a double bunch of hooks, ten or twelve in number, with slender shafts ; the spiracles are large and well developed ; dorsal head-plates very large. In a slight but tough cocoon on or under the surface of the earth. (Dr. Chapman.)

The moth hides during the day in hedges or bushes, or under any shelter over which the honeysuckle may be growing, and is easily disturbed. It seems rather fond of buildings, creeps into them to hibernate under beams, on ceilings,

or in any dark corner, and often may be found commonly in outhouses. Its hybernation is, however, not very complete, for, except in sharp frost, it is always lively and restless. Pairing takes place in the spring. Common in the London suburbs about cultivated honeysuckles on the walls; abundant throughout the South of England and also in the Eastern, Western, and Midland Counties, but becoming local in Cheshire, Yorkshire, Durham, and Cumberland. Common in Wales and throughout Ireland; in Scotland it is found in Roxburghshire as already remarked, in the Clyde Valley, and in Perthshire; occasionally in Midlothian, more frequently in Aberdeenshire and Moray. Abroad it has a wide range, through the whole of Europe except the Arctic region; Asia Minor and Armenia; while in North America it is found in Canada, including Manitoba, also in California, Oregon, Colorado, and Missouri.

#### Section 4. *PHYCITIDÆ*.

Proboscis present; antennæ of the male often either thickened, flattened, or swollen and tufted near the base; maxillary palpi noticeable; fore wings undivided, elongated, narrow, usually blunt behind; vein 11 absent; hind wings ample, having upon the upper side of the median nervure, a row of stiff hairs or hair-scales, more or less erect; veins 7 and 8 closely approximating; abdomen cylindrical, not elongated.

#### Genus 1. **PHYCITA.**

Antennæ of the male simple, except that the second joint is thickened and broadened into an oval plate; palpi slender, upcurved; thorax and abdomen rather robust; fore wings moderately narrow and elongated, blunt behind; hind wings ample; legs robust, not very long.

We have one species.

1. *P. spissicella*, *F.*; *roborella*, *Zk.*—Expanse 1 to  $1\frac{1}{2}$  inch. Antennæ of the male conspicuously thickened or knotted near the base; fore wings elongate, reddish-grey with red-brown clouding; a distinct red-brown dorsal blotch lies before the first line. Hind wings smoky brown.

Antennæ of the male simple, thickened, brown, the basal joint short, the second expanded into an oval flattened knot, hollowed and blackened at the back; palpi slender, pointed, projecting, brown; head and thorax purplish-brown; abdomen rather thick, glistening, pale-brown faintly barred with white. Fore wings elongated, rather narrow but becoming a little wider behind; costa very gently arched; apex bluntly angulated; hind margin a little rounded but hardly oblique; pale brown clouded with red-brown; basal space tinged with red; first line far from the base, rather oblique, black, preceded by a large cloudy red-black triangular spot on the dorsal margin, edged with white; second line erect but a little sinuous, red-black, edged outwardly with white; at the end of the discal cell are several divergent black streaks on nervures, surrounding a white streak; extreme hind margin edged with short black lines; cilia glossy pale brown. Hind wings ample, rounded behind, uniformly smoky brown with a golden gloss; cilia shining but paler. Female having simple antennæ devoid of any excrescence; the fore wings a little broader, and often darker, otherwise similar.

Underside of the fore wings shining smoky brown, with a black cloud on the costa near the apex; hind wings pale smoky brown. Body and legs light brown.

On the wing from the end of June till August, in one generation.

LARVA one inch in length; back and sides dark purplish-brown; dorsal line thin, of the same colour, edged with paler freckles; three other, still finer, lines of pale freckles follow on either side; head and second segment glistening dark purplish-brown, the former with a paler streak across the

upper lip, the latter with a paler front margin; antennal papillæ pale brown with dark purple-brown tips; spiracular region and ventral surface light pinkish-brown with a paler freckling; spiracles outlined with dull black; raised dots minute, black; legs glistening dark purple-brown. (W. Buckler—condensed.)

May and the beginning of June on oak, living upon the leaves and twigs under the protection of a silken web or tent. Rather an active larva, and may easily be shaken or beaten out of its habitation, with a stick, into a net or umbrella.

PUPA without any peculiarity of form, the head, prothorax, and thorax most distinctly defined; wing-covers long, not shining; anal tip rounded and furnished with several minute curly-topped bristles; dark mahogany-brown, last four segments of the abdomen rather paler and shining. In a cocoon of silk covered with earth, in the ground, or under a felled log, or other suitable object.

The moth hides during the day in oak-trees, among the leaves, often of the lower branches, and may easily be disturbed; yet if the weather is not warm and still and the day somewhat advanced, it drops to the ground like a bit of bark. If, however, circumstances are propitious, it flies to a similar hiding-place elsewhere. At dusk and in the night it flies vigorously about the trees, but has been known to come to heather-bloom, or to the sugar spread to attract *Noctuæ*, or even to a well placed light. It frequents woods, large oak woods especially, but does not entirely avoid other well-timbered districts, and is very common in the Isle of Wight and the New Forest, Hants; moderately so in suitable places throughout the South of England and the Eastern and Western Counties, to Yorkshire and Cheshire—becoming in the latter much more local—but seems to be scarce in the Midlands; once reared by Mr. Sang from larvæ found in Durham, and not noticed in the other northernmost counties of England, nor in Scotland nor Wales. In Ireland

Mr. Kane records it from Kerry and Galway. Abroad its range is through Central Europe, Italy, Spain, Greece, Central and Western Russia, and Armenia.

## Genus 2. **DIORYCTRIA.**

Antennæ simple but rather notched, first joint thickened, second (in the male) furnished with a raised ridge or knob on the upper side; palpi short, blunt, upraised; fore wings elongate, rather narrow; a ridged tuft lies along the upper side of the subcostal nervure; hind wings ample, normal.

We have three species, two of which are very similar:

- A. Fore wings shining whitish-grey, clouded with darker grey.
- B. Markings grey-black. *D. decuriella.*
- B<sup>2</sup>. Markings deep black, and a pale reddish cloud before the first line. *D. splendidella.*
- A<sup>2</sup>. Fore wings purple-brown with the costa grey. *D. palumbella.*

1. **D. decuriella**, *Hb.*; **abietella**, *Zinck.* — Expanse  $\frac{7}{8}$  to  $1\frac{1}{8}$  inch. Fore wings elongate, blunt, pale grey clouded with darker; transverse lines and discal spot white, edged with grey-black. Hind wings smoky white.

Antennæ simple, the basal joint swollen and bent, the second rather spread and flattened, dark brown; palpi slender, pointed, curved up, grey-brown; head and thorax silvery grey, dotted with dark-grey; abdomen pale silvery grey. Fore wings elongated, narrow, broader behind; costa flatly arched; apex squarely angulated; hind margin straight and nearly perpendicular; shining pale grey dusted and clouded with darker grey; an erect white shade with a cloudy black edging suggests a basal line; first line angulated but erect, thick, black, edged internally with white; second line also erect, but much indented, white, closely edged on either side by equally erect indented grey-

black lines; discal spot white; hind margin narrowly edged with black; cilia shining whitish-grey. Hind wings ample, the apex a little angulated, and hind margin flatly rounded; shining smoky white; cilia whiter. Female similar, but with the antennæ threadlike.

Underside very glossy; fore wings pale smoky grey; hind wings white. Body and legs whitish-brown.

On the wing from the end of June till August.

LARVA five-eighths of an inch in length, active, cylindrical but tapering slightly behind; dull grey or dull greyish-white, with the narrow dorsal, and broad subdorsal lines dark smoky grey; spots similar, with abundant fine hairs; intestinal canal dark green, giving a greenish tinge to the body; head shining brownish-black; thoracic plate dark brown, usually grey towards its anterior edge; anal plate, ventral surface and legs horn-colour. (E. A. Atmore.)

August and September to April and May; in the previous years young shoots of *Pinus sylvestris* (Scotch fir), eating out the pith and partially filling the passage with excrement, but having a round hole for exit at the end of the tunnel; occasionally feeding in the young green shoots, or even hollowing out a very young cone.

This description does not agree with some of those previously given, but these others I am satisfied refer to the next species. Mr. Atmore has devoted much time, in several seasons, to working out this larva, with results which to me appear fully satisfactory. Moreover, I have myself reared this species from larvæ exactly such as he describes. It has also been reared by Mr. R. Adkin from the pine shoots on which were the nodules of *Retinia resinella*.

PUPA apparently undescribed. It is said to be found in rotten firwood, dead fir stumps, and under moss on the ground beneath.

The moth sits in fir-trees in the daytime, and may occasionally be beaten out, but probably does not always fly, and when it does, only obliquely down, to hide on the ground. At dusk it is sufficiently active flying round the trees, and will come to flowers such as those of scabious and ragwort if they happen to grow very near to the firs; later at night it is attracted by a strong light. Not a very common species, but widely distributed and found, where fir is plentiful, in Kent, Surrey, Hants, Dorset, Devon, Somerset, Bucks, Suffolk, Norfolk, and rarely in Yorkshire, Lancashire, Cheshire, Westmoreland, and Cumberland. I have no record for Wales, and those in Ireland seem to be quite uncertain; but in Scotland it has been reared from larvæ found in the Clyde Valley and Ross-shire, and taken rarely in Aberdeenshire, Moray, Perthshire, the Isle of Skye, and the Outer Hebrides. Abroad it is found throughout Central and Northern Europe, the North of Italy, and Southern Russia; also in Japan; but the reports from North America appear doubtful, since *Pinipæstis reniculella*, Grote, appears to belong to the next species.

2. **D. splendidella**, *H. S.*; **sylvestrella**, *Rtze.*—Expanse 1 to  $1\frac{1}{4}$  inch. Fore wings elongated, rather broadly rounded behind, silvery grey; markings deep black with white edging; second line not erect but angulated and indented; a broad reddish-grey cloud lies before the deep black first line. Hind wings smoky grey.

Antennæ of the male simple, but the basal joint thick, and the second ridged with a strong black thickening, otherwise shining black-brown; palpi closely appressed to the face, curved up, black; top of the head shining white; thorax dark grey; abdomen pale grey, dusted with black. Fore wings elongated, blunt behind; costa arched, especially so beyond the middle; apex almost rounded; hind margin curved and very little oblique; colour shining greyish-white, dusted with black; basal area occupied by two greyish-

white, and two broader red-black transverse clouds placed alternately; first line far from the base, thick, deep black, erect and indented, edged inwardly with white; second line less erect, much indented and having a projecting angle above the middle, deep black, edged outwardly with white; central space much dusted with black, containing a white discal spot, and obliquely beneath it a large black cloud; beyond the white edging of the second line is a parallel cloudy stripe of black dusting; extreme hind margin edged with short, squared, black streaks; cilia shining grey. Hind wings ample, apex angulated; hind margin gently curved; shining pale smoky grey; cilia smoky white. Female similar, but with filiform antennæ.

Underside of the fore wings shining dark smoke colour; on the costa two white dashes enclose a black spot. Hind wings smoky white, with a broad whiter stripe in the hinder area and the hind margin blackened. Legs and body blackish-grey, but the extreme anal tip ochreous-grey.

On the wing at the end of June and in July.

LARVA half an inch long, stoutest at the thoracic segments, tapering at the last two; head broad, rather flattened, shining pitchy-black; paler on the top of the lobes, and brown beneath; dorsal plate shining black; body dull, but of a rich red-brown or chocolate colour; undersurface a little paler; raised dots small, shining black, each with a rather long fine hair; spiracles minute, in faint black rings; on the back of the twelfth segment is a faint ochreous patch; anal segment paler, with a dark brown subdorsal stripe; legs of the ground colour. (W. Buckler, under the name of *abietella*.)

August till May, in cones of spruce fir (*Pinus abies*), feeding in them when quite small and green, hibernating in them, probably moving from one to another, and feeding up within when the last infested cone is of full size; extruding frass through a round hole in the side.

PUPA apparently undescribed. This state is not, I think, assumed in the fir cone in which the larva has fed.

But little is known among us as to the habits of this species, indeed it is itself not very generally recognised. In 1877 and 1878 the habits of its larva were carefully worked out in Herefordshire by Dr. J. H. Wood and Mr. Buckler, under the name of *abictella*, and ten years later the details were published by the late Mr. H. T. Stainton, with the remark that they seemed to be referable to the present species. That is undoubtedly the case—two of Dr. Wood's specimens are now before me. In 1887 a larva was obtained in Norfolk in a young green cone of *Pinus abies*, by Lord Walsingham, when collecting those of *Cateremna terebrella*, and the moth duly emerged in the following June. Before this—in 1885—attention had been drawn in the *Entomologists' Monthly Magazine* to this species by the late M. E. L. Ragonot, though without knowledge of its existence as British; and some suggestions are there made with reference to its larva and habits; yet, reluctant though I am to dispute the accuracy of so high an authority upon the present group, it seems impossible to escape from the conclusion that he transposed the larvæ of the two species.

In June 1888 the Rev. C. T. Cruttwell drove me over to Southwold, on the coast of Suffolk, and there, close to the sea, in a district devoid of fir-trees of any kind, we secured six specimens of this species—one by beating a hedge, and the rest hiding under the edges and chinks of some wooden buildings. Every inquiry was made as to possible means for their introduction to this particular spot, but without result, and the only feasible explanation seemed to be that a small partial migration had taken place. A similar explanation seems to account for the capture by Mr. J. Gardner of a specimen flying over flowers at Hartlepool, Durham. The insect is now becoming common in the New

Forest, Hants, and has been taken, besides the Eastern Counties already mentioned, in Sussex and Dorset, as well as in Herefordshire, where it has been found flying about the fir trees in the evening, and the larva repeatedly secured. In Ireland it has been reared at Timoleague, Co. Cork, by Mr. R. E. Donovan; but I have no knowledge of it elsewhere in these Islands. Abroad it is said to be extensively distributed through Central Europe, the South of France, and the North of Spain; also in India and Japan, and under the name of *Pinipestis reniculella* in North America.

3. **D. palumbella**, *Fab.*—Expanse 1 inch. Fore wings elongate, rather rounded behind; purple-brown with pale grey shading along the costa; transverse lines black edged with purple-red; discal dot black. Hind wings smoky brownish-white.

Antennæ of the male simple, but thickened and flattened near the base, brown; palpi short and thick, ascending, dark brown; head and thorax hoary purple-brown; abdomen silky pale grey-brown. Fore wings elongated, rather narrow; costa very flatly arched; apex bluntly angulated; hind margin rather rounded; colour purple-brown with a broad cloud of hoary grey along the middle of the costa; first line placed far from the base, erect but angulated and indented, edged internally by an orange-red stripe, which again is edged by a black line; second line black, waved and forming a sharp angle near the dorsal margin; this line is edged outside by a light red cloud; discal spot an erect deep black streak expanded at its base; a small black cloud lies on the costa before the apex and is followed by a hoary grey cloud; extreme hind margin edged with black; cilia shining greyish-white. Hind wings broad, rounded behind, shining pale smoky-brown, margin darker; cilia brownish-white. Female very similar, but the antennæ quite simple.

Underside of the fore wings shining smoky-brown, with a darker spot on the costa near the apex. Hind wings shining

smoky-white with a brown margin. Body and legs brownish-white.

On the wing from June till August.

LARVA, when young—after the second moult—dorsal surface deep heather-green, having a blackish dorsal line finely edged with paler; subdorsal line black, followed by a blackish-green stripe, and beneath this by a broad spiracular stripe of the colour of the back, and edged above and below each by a paler line; head green with black markings on each lobe; dorsal plate glossy green with dark lines. (W. Buckler.)

The larvæ from which this incomplete description was taken were hatched from the eggs, and fed upon heather in the autumn, but did not survive the winter; and the larva seems to be rarely observed here. It is said to feed from August till May, on *Calluna vulgaris* and *Erica cinerea*. But Herr von Hornig says that it is dark red-brown with olive-coloured pale-bordered lines, and red-brown longitudinal stripes, having upon the fourth segment two black spots; head round, glossy black; dorsal plate similar, large. Upon *Polygala chamæbuxus*, singly, close to the earth, in a slight web upon the stems; and Herr Anton Schmid says upon *Thymus* among the lower shoots; by which one is tempted to believe that its history is not perfectly known on the Continent either!

PUPA apparently undescribed—in a thick white cocoon in the earth.

This moth is found with us only upon heaths, and seems always to sit upon the heather. Since *Polygala vulgaris* often grows among heather it is possible that it may sometimes serve this species as a food-plant, but all experience seems to point to the heather (*Calluna*) or one of the other common heaths (*Erica*). Yet it is singular that the larva should be so difficult to obtain. The moth is not very local, occurring

upon most large heaths, and sometimes in plenty; easily to be aroused in the daytime on hot afternoons, and swift in its motions; but far more active in the late dusk and at night. It is found in Surrey, Sussex, Hants, Dorset, Somerset, Berks, Gloucestershire, Cambridgeshire, Suffolk, Norfolk, Lincolnshire, Yorkshire, Cheshire, Lancashire, Westmoreland, Durham, and Northumberland, and is common on the mosses in some of these more northern counties. In Scotland it seems to be very scarce, but Dr. F. B. White assured me of its existence in the south-west. In Wales it seems to be unknown or unnoticed, except that Dr. Freer took a specimen—which I have seen—in the Isle of Anglesea; and in Ireland I know of only a single capture—at Howth, near Dublin. Abroad it is widely distributed through Central and Southern Europe, Western Russia, Western Asia, Ceylon, and Northern Africa.

### Genus 3. **NEPHOPTERYX.**

Antennæ with the basal and second joints thickened in the male, the latter joint having a strong ridge of raised scales at the back; palpi rather short, curved up, thick and bluntly pointed; head rough; thorax moderately smooth; fore wings elongated, the discal cell narrow; hind wings ample.

We have now two species, readily recognised, the ground colour in *N. genistella* being very pale brown; in *N. similella* glossy slate-black.

1. **N. genistella**, *Dup.*—Expanse 1 inch. Fore wings elongate, pale brown; two slender transverse lines, a discal dot, and a larger spot before the first line, black. Hind wings shining smoky-white.

Antennæ of the male thickened at the base and second joint, the latter edged with a black tuft of scales; remainder simple, pale brown, barred with whitish-brown; palpi rather broad, but pointed, upraised, whitish-brown; head and thorax

whitish-drab; abdomen glossy brownish-white. Fore wings elongate, narrow; costa nearly straight, but arched a little toward the apex; this last is very bluntly angulated, almost rounded; hind margin short and faintly curved; colour very pale brown, or brownish-drab, with small scattered white clouds, first line slender, black, erect but bent back above the middle, edged inwardly with light red-brown, and this again bounded by a small black cloud; second line rather thicker, black, oblique and strongly undulating; edging the discal cell is a horizontal white streak which clasps a small black discal dot; around this are scattered black atoms; this second line is edged outwardly by a faint parallel tawny stripe; and the hind margin by rough black dots; cilia whitish-brown. Hind wings broad, rounded behind, shining smoky-white; cilia nearly white. Female similar, but with filiform antennæ.

Underside of the fore wings shining smoky-brown to the second line, which is dull black; and the area beyond pale brown. Hind wings smoky yellowish-white. Body and legs pale brown.

On the wing at the end of July and in August.

LARVA nearly three-fourths of an inch long; the head full and rounded at the sides, pale drab thickly covered with black-brown spots and curved blotches, but above the mouth is a transverse white band; second and third segments a little larger; thence even in size to the tenth, and from this tapering a little to the thirteenth; colour pale drab; dorsal line blackish-brown, narrowly edged by the ground colour; then a ragged-edged stripe of reddish-drab; along the subdorsal region is a broad blackish-brown stripe; undersurface reddish-drab, slightly inclining to grey; on the sides of the third and twelfth segments, situated in the broad dark stripe, is an ocellated spot, whitish-grey with a black centre, bearing a fine pale hair, longer than those from the ordinary raised dots; spiracles ringed with black; legs reddish-brown;

prolegs spotted and tipped with dark-brown. (W. Buckler—condensed.)

August or September till May or June; on furze (*Ulex europæus*) feeding in the young shoots, buds, and blossoms, and lying concealed in a silken tube, from which it sometimes emerges to sun itself; also hibernating in the tube. Later the tubes are somewhat concealed by numerous silken threads passing from twig to twig in a confused manner.

PUPA apparently undescribed. In the larval silken habitation.

This moth furnishes a remarkable instance of deceptive resemblance. As it sits on the end of a broken bit of furze it looks precisely like a short bit of the dead stick of that plant; the deception being heightened by the rough scales of the head, which stand out exactly like the broken fibres of a snapped-off twig.

The first certain notice of this species here was in 1871, when fifteen specimens were captured, during heavy rain, in the Isle of Wight, by Mr. W. E. Davis—doubtless beaten out of furze-bushes, though nothing is said as to the method of capture—these were recorded under the name of *Pempelia albariella*, and in another periodical under that of *Phycis davisellus*, N. sp. (without description); and it was not until 1875 that it was recognised as a species well known on the Continent under the present name and several others. In all probability it is also the insect recorded in the year 1859 by the Rev. O. Pickard-Cambridge, as captured in Dorsetshire, and stated by him to be *Phycis contubernella*, Hüb., but in the absence of any description of that insect this must remain doubtful. It is of little importance, since *contubernella* is now sunk as a synonym of *palumbella*, and *palumbella* is a species hardly likely to be put forward as a novelty in 1859!

From the date mentioned above (1871) this insect has, almost every year, been taken on the South Coast, and

sometimes in numbers, but it seems very closely restricted to the neighbourhood of the sea, and is there constantly kept in check by the practice of cutting and burning the furze. Its principal haunt is along the shores of the Solent, and the coast next the New Forest, both in Hants; and in the Isle of Wight; also found in the Isle of Purbeck, Dorset, but very probably it extends further along the coast. It seems certainly to be absent from other portions of the British Isles. Abroad it is also commonly a coast-frequenting species, but is found in Central and Southern France, Spain, and Corsica.

2. *N. similella*, Zinck.—Fore wings silky grey-black or slate-black; first line a curved yellow-white stripe; second obscure. Hind wings pale grey.

Antennæ of the male simple, but the basal segments thickened, and the second thickly tufted, black; palpi rather short, curved up, grey-black, as are the head and thorax; abdomen rather slender, glossy grey, faintly barred with white. Fore wings narrow at the base, rather expanding; costa gently and regularly arched; apex bluntly angulated; hind margin rather oblique and but little curved; very smooth and shining, grey-black or slate-black; the first line broad and conspicuous, yellow-white, either straight or faintly curved, broadest on the dorsal margin, but much obscured or obliterated as it reaches the costa; second line very faint, cloudy white, rippled and much waved; no other markings; cilia shining, slate-black. Hind wings moderately broad, rounded behind, glossy, smoky-grey, more glistening toward the front margin; faintly edged by a slender white line; cilia shining grey.

On the wing in May, June and July.

LARVA somewhat tapering in front and behind, smooth, shining with a greasy gloss, and studded with fine single hairs; body uniformly black; head similar, smaller; mouth and dorsal plate brownish.

July and August in a confused web, on oak.

PUPA somewhat slender, red-brown. (Heyden.)

A single specimen, somewhat damaged, captured by Mr. Bernard Piffard in the New Forest, Hants, toward the end of June 1901, was sent up at the end of that season for identification. Mr. Piffard informs me that he saw, but did not secure, another specimen at the same place in the present season (1902). Another, taken also in the New Forest, by Mr. C. Gulliver, is in the collection of Mr. C. W. Dale. These are the only British specimens of which I have any knowledge. Abroad its distribution seems to extend to France, Holland, Germany, Austria, Hungary, Livonia, and Central Italy.

#### Genus 4. **SALEBRIA.**

Antennæ, in the male, with the basal joint thick and ridged above, the second joint still more broadly expanded, having a ridge on the upper side, and being somewhat bent back; palpi broad, blunt, ascending; fore wings moderately narrow, elongated, blunt; hind wings ample, the cell broad. Legs not very long.

We have six species.

- A. Fore wings dark purplish-grey, base light red. *S. hostilis.*
- A<sup>2</sup>. Fore wings bright or dull purple-red.
- B. A black bar across the middle of the wing. *S. formosa.*
- B<sup>2</sup>. Obscure slender white threads irregularly crossing the wing. *S. obductella.*
- A<sup>3</sup>. Fore wings glossy black.
- C. First line oblique, obscurely white, no tufts. *S. fusca.*
- C<sup>2</sup>. First line perpendicular, preceded by a tufted bar of npraised black scales. *S. betulæ.*
- A<sup>4</sup>. Forewings light crimson, shading to yellow. *S. carnella.*

1. **S. hostilis**, *Steph.*—Expanse 1 inch. Fore wings rather broadly elongate, blunt, shining, reddish-grey dusted with black; base dull red bounded by two black transverse stripes. Hind wings pale smoky-brown.

Antennæ of the male simple but thickly ciliated, second joint thickened and the expansion edged by a divided black ridge; palpi short, pointed, turned up against the face, black-brown; head whitish-drab; thorax very pale purplish-red; abdomen pale brown. Fore wings elongated, obtuse, rather narrow at the base but quickly broader; costa flatly arched; apex bluntly angulated; hind margin very little oblique and nearly straight; colour grey-brown or reddish-grey, thickly dusted with black; basal area dull red to a thick black perpendicular bar which precedes the first line and is only separated from it by a narrow reddish parallel shade; that line is also parallel, slender, black and a very little sinuous; second line almost erect, much indented, grey-white, bordered on each side with cloudy black; two black dots placed perpendicularly represent the discal spot; hinder area much dusted with black and edged with the same; cilia glossy pale grey. Hind wings ample; apex bluntly angulated; hind margin gently curved and sinuous; pale smoky-brown; cilia rather whiter. Female similar, but antennæ quite simple.

Underside of the fore wings pale smoky-brown, with a yellow dash along the costa beyond the middle, interrupted by a smoky-black spot—the beginning of a transverse smoky line. Hind wings shining smoky-white. Body and legs brownish-white.

There is considerable variation in the depth of the rust colour of the basal patch of the fore wings, and in rare instances it is totally wanting.

On the wing at the end of May and in June.

LARVA three-quarters of an inch long; head broad, as wide as the second segment; body moderately slender, tapering a

little at the last three segments; head shining black-brown with a broad ochreous stripe on the crown of each lobe and a streak about the mouth; papillæ black, finely ringed with white; body dingy blackish olive-brown or chocolate-brown, darkest on the anal flap, rather glistening on the second segment, dull on the rest of the body; two fine black lines on the collar change thence to a plain dorsal stripe, rather darker than the ground colour, to the last segment, where it is black; continuous from either lobe of the head is a broad ochreous stripe on the second segment, opening out beyond into two subdorsal lines which after passing the thoracic segments become dingy faint greyish-ochreous; midway along the side is a faint extra line, and on the third segment begins a dirty white sub-spiracular stripe; raised dots small, blackish-brown, each with a fine hair; ocellated spots of the third and twelfth segments ringed with black and having a minute black centre bearing an extra long hair; legs black; prolegs of the ground colour. (W. Buckler—condensed.)

July to September or October, but not hibernating; on aspen (*Populus tremula*), feeding on the leaves, but occupying two or three together, in a habitation formed of a dead leaf which has been used by some earlier-feeding larva, and fixed by spinning strands of silk to adjacent green leaves. (Dr. Wood.)

PUPA of ordinary form, very compact, the limb and antenna-covers closely levelled; wing covers rather flat, very dull in texture, light brown, remaining surfaces very little sculptured or punctured, shining chestnut-brown; anal segment thickened, cremaster a mere flat knob with two or three projecting hooked bristles. In a tough silken cocoon in the corner of a fallen dead leaf or on any other suitable object, but away from the larval habitation. The winter is passed in this state.

The moth is very little known; but it hides during the

day in aspen trees, and has been captured by beating them. It was originally noticed and described in this country by Mr. J. E. Stephens, in his "Illustrations," but had apparently not been again observed for many years, and had become confused with a quite distinct species—*adelphella*, Fisch—when in the year 1879 it was rediscovered, almost simultaneously, by Dr. J. H. Wood at Tarrington, Herefordshire, and Mr. W. H. Harwood, near Colchester, Essex, and its identity and distinctness fully established. It may still be found in both those localities, and has been met with in Worcestershire and also in Kent and Surrey, but continues to be excessively local in this country, and quite unknown in the other portions of the United Kingdom. Abroad it is recorded from France, Denmark, Germany and Austria.

2. *S. betulæ*, Göze.—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings elongate with rounded costa; shining grey-black, with faint whitish transverse lines; before the first is a large blotch of erect, deep black scales. Hind wings pale smoky-brown.

Antennæ of the male elbowed at the first joint, thickened at the second, and there edged by a short black ridge, black-brown; palpi short and very blunt, curved up closely to the face, deep black; head and thorax grey-black or deep black; abdomen paler grey-black, shining, the apical tuft dusted with white, and each segment edged with the same. Fore wings elongated, not very narrow; costa arched from the base; apex squared; hind margin almost perpendicular, but faintly rounded; colour glossy slate-black; at a short distance a large perpendicularly placed blotch of upraised, deep black, scales precedes the first line, but has itself a faint white edging next the base; first line slender and faint, dull white edged with black, and placed obliquely outwards from the costa; second line obscurely white, somewhat erect but sinuous, and really composed only of white dusting; discal spots obscurely black in a cloud of whitish dusting; hind margin black dusted with white; cilia shining grey. Hind

wings ample, the apex angulated and the hind margin sinuous; glossy pale smoky-brown; cilia still more glossy whitish-grey. Female similar, but with thread-like antennae.

Underside of the fore wings shining smoke colour, with the costa paler; hind wings shining smoky-white. Body and legs pale grey-brown, but the tip of the abdomen beneath is ochreous.

Hardly variable, but in the far north, and especially in Iceland, the ground colour tends more to silvery grey, with the markings as usual.

On the wing in June and July.

LARVA about three-quarters of an inch long and rather slender; head a little narrower than the second segment, its lobes rounded; black and glossy, prettily marbled on the lobes with clear white, and having a white streak above the mandibles; skin soft and velvety, very sparingly clothed with short hairs; ground colour dull velvety black; two clear, bright, lemon-yellow stripes extend through the middle of the dorsal area running parallel from the second to the twelfth segment, where they unite, and form one stripe through that and the thirteenth, on this last and on the second their colour is almost white; an indistinct and interrupted series of small white dots, from about the second to the ninth segment indicates each subdorsal line; spiracular stripes clear bright lemon-yellow; and below each is a broad interrupted white stripe; spiracles black; ventral surface and prolegs uniformly dull black; legs also black but highly polished. (G. T. Porritt.)

May and June on birch; always resting on the upper side of a leaf and drawing it together with fine silken threads, into a curve, but so open that the pretty larva is quite visible from above. It eats the upper surface and parenchyma of the leaf and then moves to another which it draws together in the same manner. Sometimes several leaves are attached together with the threads.

PUPA nearly half an inch long, having a rather pointed appearance, caused by the abdomen tapering rapidly to the last segment, which ends in a rather sharp point; all the parts prominently defined; the surface highly polished; black. (G. T. Porritt.)

In a chamber formed of spun-together leaves. In this state a fortnight or three weeks.

The moth sits in the day in birch bushes, and may occasionally be beaten out and captured, but in all probability it usually drops to the ground without opening its wings; and its black colour renders it practically invisible at dusk, but it will come to a strong light at night. Still the vast majority of specimens in collections are obtained by rearing the pretty larvæ, which are so easily collected. It is a local species, preferring the birch bushes which grow scattered about sandy heaths; and in such places is sometimes common. Found in Kent, Sussex, Surrey, Hants, Wilts, Somerset, Herts, Essex, Suffolk, Norfolk, Warwickshire, Staffordshire, Gloucestershire, Herefordshire, Worcestershire, Cheshire, Lancashire, South Yorkshire, and once in Durham. This appears to be the extent of its range in these Islands. Abroad it is found throughout Central and Northern Europe.

3. **S. fusca**, *Haw.*; **carbonariella**, *F. v. R.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings elongate, costa very little arched; shining grey-black; discal spot blacker; transverse lines very faint. Hind wings shining smoky brownish-white.

Antennæ of the male simple, but the second joint spreads out into a cup-like thickening, black; palpi upraised, thick and blunt, black with pale dusting; head and thorax glossy leaden-black; abdomen similar but with a faint whitish edging to each segment. Fore wings elongated, rather narrow; costa very flatly arched; apex bluntly rounded; hind margin also a little rounded; colour grey-black, irregularly and minutely dusted with white; first line very oblique outward from the costa, faintly white; second line

rather oblique in the opposite direction, angulated and sinuous, faintly whitish-grey, but edged on either side with black; two black dots surrounded with whitish dusting represent the discal spot; hind margin black faintly dotted and dusted with white; cilia glossy leaden-black. Hind wings ample; apex bluntly rounded; hind margin gently so; pale smoke-colour with a yellowish gloss; cilia shading to white at the tips. Female similar, but with threadlike antennæ.

Undersides of all the wings smoke colour with a leaden gloss. Body and legs smoky-black.

The white or grey-white colour of the lines and dusting is often obscured and the wings wholly shiny-black.

On the wing from June till August or even September, and in a forward season it has been known to appear before the end of May; but apparently in only one generation.

LARVA very incompletely known. Mr. G. T. Porritt obtained eggs from captured females and fed the resulting larvæ upon sallow leaves—for which they forsook the heath and ling (*Erica* and *Calluna*) which had been supplied as the probable food-plants—and reared them to near full growth, when they settled down to hibernate, and in the spring had totally disappeared; neither could more be obtained on the heaths upon which the moths had been taken. Therefore it is uncertain whether Mr. Porritt's description is that of the full-grown larva—Length three-quarters of an inch; dull black tinged with very dark olive; dorsal line black; head, dorsal plate, and raised dots black and polished; ventral surface and prolegs dull dark olive-green; legs black.—When very young these larvæ mined between the skins of the sallow leaves, eating the parenchyma, but after the first moult they spun leaves together, and ate their soft portions, yet no sallow at all grew on the heaths where the moths were plentiful; and as this is usually the case, it seems clear that we have more to learn about this species. Heinemann suggests as food the leaves

of birch ; Wocke, whortleberry ; neither of which is satisfactory. Probably it is in the larva state from August till May.

PUPA apparently unknown.

The habits of this moth are curious, and, indeed, in some degree puzzling. It frequents heaths, usually large heaths, hiding during the day in the thick masses of *Calluna* and *Erica*, and is not very easily disturbed from such a hiding place, so that it *seems* rather uncommon ; but if any portion of the heath has been burned off and charred sticks of heather and furze remain standing in any plenty, all the moths of this species seem to congregate there to sit upon the black tops of the burnt sticks. I have often walked into such a spot and seen them rise from the sticks, often two or three at a time, and by scores, towering into the air and flying wildly some distance before descending again to a similar resting-place. The coal-black appearance of the moth harmonises exquisitely with the colour of the burnt sticks, so that, provided it remained still, hardly a specimen could be seen ; but this is by no means the case, its activity under these circumstances seems to contrast most curiously with its behaviour when hiding among the uninjured heather. Its natural flight is at night, and it has been known to visit a strong light. It seems to occur on all extensive heaths throughout England, and more commonly on those of midland and northern districts than in the south ; in Durham even recorded, by Mr. J. E. Robson, on sea sandhills ; also probably found throughout Wales, though it seems to be recorded only in Flintshire ; and Mr. Kane reports it generally distributed and common in Ireland. In Scotland it is known in Roxburghshire, Fife, Perthshire, Aberdeenshire, Inverness, and in the Outer Hebrides, and exhibits the same preference for burnt heaths. Abroad it has a wide distribution through Central and Northern Europe, including Iceland ; also Catalonia, Northern Italy,

Russia, Bithynia, Syria, and even some parts of North America.

4. *S. formosa*, *Haw.*—Expanse  $\frac{3}{4}$  to  $\frac{7}{8}$  inch (18–23 mm.). Fore wings silky pale red-brown; a broad, rather oblique, clouded black bar crosses near the middle of the wing, and encloses the displaced white first line; second line shortly following it, distinct. Hind wings shining pale smoky-brown.

Antennæ of the male simple, but the second joint flattened into a broad, hollow—almost cup-shaped—knob, black-brown; palpi short, blunt, curved up closely to the face, brown; head and thorax purple-red; abdomen glossy pale brown, the edge of each segment paler. Fore wings rather narrow and elongated; costa gently arched; apex squarely angulated; hind margin almost straight and hardly oblique; colour bright light purple-brown, dusted with white, with a deeper purple space on the dorsal half from the base to the first line, the costal portion of the same shaded with white; first line placed near the middle of the wing, erect, slightly sinuous, double, deep black, but enclosing a white line, and itself enclosed in a broad clouded black or red-black band; second line slender, dull white closely edged on each side with red or red-black; discal spot a nearly erect black crescent, or streak, thickened at each end; hind marginal region dusted with grey-white, and edged with short black streaks; cilia shining smoky-brown. Hind wings ample, much rounded behind, shining smoky-brown; cilia paler. Female similar, but the antennæ thread-like throughout.

Undersides of all the wings glistening smoky-brown; costa of the fore wings pale brown. Body dull brown. Legs darker, dusted on the inner sides with white.

On the wing in June and July.

LARVA about five-eighths of an inch long; head a little narrower than the second segment but as wide as the third, rounded at the lobes, dark velvety green, with indistinct

grey freckles ; body cylindrical and nearly uniform, wrinkled and velvety, dark green ; dorsal line double, slender, grey ; interrupted ; subdorsal lines similar, followed by two more above the spiracles, and another along them ; dorsal plate smooth and rather horny and polished ; ventral surface dark green, powdered with white at the segmental divisions. (G. T. Porritt—condensed.)

July to September or even October ; on elm, especially frequenting elm-*bushes* ; under a white web on the upper side of the midrib of an elm leaf, the leaf remaining flatly open and not distorted or spun together. In confinement found also to feed on birch.

PUPA rather slender, limb covers tolerably compact, wing covers large and long, the whole of this portion tolerably smooth and without noticeable sculpture, deep green ; dorsal region faintly punctured, brownish-green ; segments of the back and abdomen much sculptured into fine pits, each having a smooth hoop at the back, light chestnut with a faint green tinge ; anal segment black brown ; cremaster short and squared, armed with a minute bunch of bristles. In a soft silken cocoon, in the earth, or in rotten wood.

The moth conceals itself in thick hedges of elm, and if beaten out seems almost always to fall to the ground and hide itself ; but flies at dusk and till rather late at night, and comes readily to light, indeed it used to be a frequent visitor to gas lamps in the southern suburbs of London. Otherwise it is rarely captured, and the large majority of specimens in cabinets have been reared from the larva state. It now appears to have become rare in these suburbs, and elsewhere is exceedingly local, but may be found in suitable places in Kent, Surrey, Hants, Herts, Cambs, Essex, Norfolk, and Suffolk. These counties seem to indicate its range in the United Kingdom. Abroad it is found throughout Central Europe, Dalmatia, Russia, Pontus, Armenia, and Persia.

5. *S. obductella*, *Fab.*—Expanse  $\frac{7}{8}$  to 1 inch. Fore wings elongate, pale red-brown or purple-red, the lines represented by vague white clouding and dusting, which is continued between them; hind wings silky pale yellowish-brown.

Antennæ of the male simple, but the second joint expanded and edged above with a ridge of black scales, red-brown; palpi small, bluntly pointed, purple-brown; head and thorax purplish-red; abdomen pale brown. Fore wings narrow, elongated; costa scarcely arched; apex squarely angulated; hind margin faintly oblique and a little rounded; dull red-brown or purplish-red; first line white, irregular and diffused, but including two black dots on nervures; second line indicated by a series of white dusted dashes, on one of which, near the dorsal margin, is a black dot; two elongated black dots, one over the other, suggest the discal spot; the middle area is loosely dusted with white; hind margin obscurely edged with black; cilia shining grey-brown. Hind wings ample; the apex pointed, and hind margin rounded; smoky-brown, the cilia rather paler but intersected by a brown line. Female similar, with the usual difference in the antennæ.

Underside of the fore wings smoky yellow-brown; of the hind wings more yellowish, but very glossy. Body and legs pale brown.

In some specimens the dorsal area is more tinged with ochreous, and a narrow creamy-brown line runs along the costa.

On the wing in July and August.

LARVA pale green, with ill-defined grey-brown longitudinal stripes, and small deep black raised dots, edged with paler. Head and dorsal plate dull black; anal plate with a triangular brown spot. (Hofmann.)

May and June on *Mentha arvensis*, *Origanum vulgare*, *Calamintha* and *Clinopodium*, feeding between joined together leaves.

PUPA light brown, in a white web. (Hofmann.)

This is a species of which we know, in this country, next to nothing. A specimen was taken in the afternoon of August 31, 1888, by Mr. Sydney Webb, on the side of a hill just outside Dover; and another was secured by Mr. W. Purdey in the Warren at Folkestone. About these there is no question. Other specimens are asserted to have been taken about the year 1870, one account says in Kent, another in Norfolk, and great and reasonable doubt was felt as to their nativity; but the only *certain* records are, as above, from Kent.

Abroad it is common and widely distributed through Central and Southern Europe, Livonia, Southern and Eastern Russia, Bithynia, Armenia, and Syria.

6. *S. carnella*, L., *semirubella*, *Staud. Cat.*—Expanse 1 inch (24–27 mm.). Fore wings elongate, blunt, purplish-crimson, shading into pale yellow at the dorsal margin, and sometimes with a white stripe along the costa. Hind wings pale smoky-brown or smoky-white.

Antennæ of the male thick, simple, but with an expansion on the upper side of the second joint, yellow-brown tinged in front with purple; palpi broad but pointed, rather prominent, pale purple, more yellowish-white inside; head pale drab; thorax ochreous, tinged on either side with purple; abdomen very pale brown. Fore wings rather broad, but elongated; costa gently arched; apex bluntly or squarely angulated; hind margin faintly rounded, colour rich purple-crimson shading off broadly to ochreous in the dorsal area; without markings; cilia pale purple. Hind wings ample, rounded behind, pale smoky-brown, very glossy; cilia pale purple. Female with threadlike antennæ, otherwise similar.

Underside of the fore wings smoky-grey, shading whiter toward the dorsal margin; cilia tinged with purple. Hind

wings smoky-white, with a purple tinge toward the apex. Body and legs yellow-brown.

A frequent variety, in both sexes, has a narrow pure white stripe, very distinctly, running along the costa of the fore wings; and sometimes this is edged by a darker shade of crimson-purple.

On the wing in July, August, and the beginning of September.

LARVA nearly an inch long, head and second segment deep dull black; papillae pinkish-grey tipped with black; mouth grey with a black streak midway across the upper lip; dorsal line black, and from it to the spiracles on either side, are four black, and five green, ragged-edged lines, making a total of nineteen lines from one spiracular region to the other, as it approaches full growth the green lines become more indistinct or even pale drab or dirty white on the thoracic segments; undersurface dingy green, with a ventral black line; a black ring is round each ventral proleg. (W. Buckler.)

August till June or July on *Lotus corniculatus*, and *Trifolium repens*, sometimes several in company, drawing together the young shoots with fine silken threads. Hybernating while still small.

PUPA moderately stout, broadest across the thorax and wing covers, rounded above and sloped suddenly toward the head; wing covers long and close to the body; anal tip rounded and furnished with two widely separated thorny points; dark mahogany brown, darkest on the back of the abdomen, the tip black; wing covers and under parts lighter brown; the whole surface shining. (W. Buckler.)

The moth is restricted to chalk districts, and hides among the short herbage on open downs, whence it may sometimes be disturbed in the daytime, but will then only fly in the sunshine. Its natural flight is at night, and it will come to

light and also to the sugar used to attract *noctua*. An exceedingly local species, found in Kent, Sussex, the Isle of Wight; the Isles of Portland and Purbeck in Dorset; near Exmouth, and Torquay, Devon; formerly in Herts; and once taken in Norfolk. This list of localities is so meagre that one is tempted to think it somewhere overlooked. These, however, are all the records that I possess, and I have never taken the insect myself. In Ireland Mr. Kane records its capture at Dursey Island, Kerry. Abroad its range extends all over Europe, except the arctic portion, also Western Asia, Tartary, India, China, and Japan.

#### Genus 5. PEMPELIA.

Antennæ slender, simple, but in the male the second joint elbowed and furnished at the back with a tuft of scales; palpi blunt and thick, curved up; fore wings narrow, and with the cell very narrow; hind wings ample, vein 5 absent.

Our two species are readily separated by the form of the second line, which in *P. ornatella* is very oblique and only a little waved; while in *P. dilutella* it is more upright, decidedly angulated, and repeatedly indented.

1. *P. ornatella*, *Schiff.*—Expanse  $\frac{3}{4}$  to 1 inch (19–25 mm.). Fore wings rich yellow-brown, with red, brown, and white clouding toward the costa; first and second lines both oblique, though in opposite directions; both direct. Hind wings pale smoky-brown.

Antennæ of the male thickened at the base, the second joint twisted and having a tuft of scales in the hollow; brown faintly barred with white; palpi rather flattened, upraised but blunt, ashy-brown; head and thorax pale reddish-brown; abdomen leaden-brown; fore wings elongated, rather narrow; costa nearly straight, but arched toward the apex, which is bluntly angulated; hind margin gently curved; colour pale yellow-brown or clay-brown,

sprinkled along the nervures and very strongly along the costa with white dots and clouding in which are dark brown atoms; this is broken by the first line, situate far from the base and consisting of three cloudy dark brown spots edged inside distinctly with white; second line very oblique and rather sinuous, but without indentations, yellowish-white, edged on both sides with dark brown; two black dots in some white clouding indicate the discal spot; hind margin dotted with dark brown in a white cloud; cilia shining grey. Hind wings ample, rounded behind; shining smoky-brown; cilia concolorous. Female with simple antennæ, otherwise similar.

Under side of the fore wings shining dark smoke-colour, blacker toward the costa, and there divided by an oblique yellowish-white streak; dorsal margin whitish. Hind wings shining pale smoky-brown, with darker nervures. Body pale grey-brown; legs brown.

On the wing in July and August.

LARVA.—Hofmann says that it lives in May upon *Thymus serpyllum* (wild thyme), but gives no particulars. It has hitherto eluded our search, and this may not be the correct food-plant. Mr. Sydney Webb says: "I have bred it from tube-like webs found among or close to the roots of cistus and thyme, especially the latter, but I made no note of the appearance of the larva, and after thirty years would not attempt to recall it from memory."

PUPA unknown.

This moth is almost confined, with us, to the south coast, and to a few of our more southern chalk hills and downs. Here it hides among the large clumps of soft grass, and the short herbage of the turf, starting up when almost trodden upon, to fly to a short distance. It flies of its own will about half an hour before dusk on warm evenings. It is exceedingly local, and the only localities known to me are in Kent,

Surrey, Sussex, the Isle of Wight, Berks, and Oxfordshire, and (rarely) in Devonshire. Abroad it is found throughout Central Europe, Italy, Aragon, Southern Russia, Asia Minor, Syria, Armenia, and the Western Himalayahs.

2. **P. dilutella**, *Steph.*; **adornatella**, *Tr.*; **subornatella**, *Dup.*—Expanse  $\frac{5}{8}$  to  $\frac{7}{8}$  inch (15–22 mm.). Fore wings purple-brown, dusted with white; lines whitish, oppositely oblique, the second angulated and much indented; often a white stripe before the first line, and white clouds on the costa. Hind wings smoky-brown.

Antennæ of the male thickened at the base, the second joint flattened and twisted, edged with a tuft of scales, reddish-brown; palpi short and upraised, very blunt, chocolate-brown; head and thorax reddish-brown; abdomen grey-brown, with the edges of the segments paler. Fore wings elongated, narrow; costa very flatly arched; apex angulated; hind margin oblique, hardly curved; colour purple-brown or yellow-brown, clouded with white, and dusted with darker purple-brown; first line far from the base, erect, formed of detached purple or purple-black cloudy spots, edged broadly, on the inner side, with white; second line moderately oblique, with a projecting angle in the middle, and otherwise indented throughout, white, enclosed by purple-brown or purple-black parallel shades; two black dots represent the discal spot, and are surrounded by a large white costal cloud; hind margin clouded with white, in which is a row of black dots; cilia purplish-grey. Hind wings ample, rounded behind, shining smoky-brown, with the nervures a little darker; extreme hind margin edged by two faint brown lines; cilia brownish-white. Female very similar, but with thread-like antennæ.

Underside of the fore wings shining dark smoky-brown, with a yellowish dot on the costa before the apex. Hind wings shining smoke-colour, whiter behind. Body dark grey-brown; anal tuft ochreous.

Exceedingly variable, and in local forms, or races, which, however, shade imperceptibly into one another. The specimens usually found on chalk hills inland have the purple-brown colour but little clouded with white, the white bar before the first line, the white clouding along the middle of the costa, and the hinder white cloud, being in them often absent, leaving the surface purple-brown, with only very slight indications of paler transverse lines; while those from the rocks of the sea coast, especially away from the chalk, show the whiter cloudings in varying degrees and often very brightly, and are altogether handsomer and more striking looking insects. This last form was introduced, in 1866, to our lists as a distinct species, under Duponchel's name of *subornatella*, while, both having previously been included in *dilatella*, Steph., the name of *adornatella*, Tr., was resuscitated for the other supposed species. Now that it is known that both shade imperceptibly into one another, and that the food-plant and habits are identical, the present name has been resumed.

On the wing from June till the beginning of September, apparently in a single generation, of slow emergence.

LARVA five-eighths of an inch long; head and second segment black, slightly glistening; body dull greenish-grey, more yellowish upon the back; dorsal and subdorsal lines narrow, dark greenish-grey; third, fourth, and fifth segments much wrinkled upon the back; raised dots shining black; legs black.

May to June or July, but possibly from the preceding autumn, on wild thyme (*Thymus serpyllum*), living in a long loose tube of thin silk, almost like spider's web, on the ground, among the prostrate branches of the plant; feeding on the leaves. Very partial to plants growing on a rock or on hard stony soil, and I found it constantly associated with yellow ants (*Formica flava*), its tube completely mixed with their nests, *débris*, and excavations. Apparently it was absolutely secure from any injury by them.

PUPA moderately stout; wing covers long and closely packed; eye-covers large; the abdomen tapering, but ending in a blunt tip with a few excessively minute curly-topped bristles; glossy light reddish-ochreous-brown; eyes and tip of the abdomen black; a dark blotch on either side of the back; wing covers rather pale. In a silken cocoon on the ground among the leaves of its food-plant.

The moth hides during the day upon the ground among short grass or the close herbage of rocks, downs, or chalk hills; in the afternoon it will readily fly up from the foot-step, rising to some height in the air and then dashing swiftly away, to settle at some distance in a similar place. Most common on chalk hills; but widely distributed also on the oolite, in limestone districts, and along the cliffs of the sea-coast; found in Kent, Sussex, Surrey, the Isle of Wight, Dorset, Devon, Cornwall, Somerset, Wilts, Berks, Oxfordshire, Suffolk, Norfolk, Gloucestershire, Herefordshire, Cheshire, Somersetshire, and Durham. In Wales in Pembrokeshire and also in Anglesea; rather common in the Isle of Man; in Scotland near Edinburgh, in Perthshire, Kirkcudbright, and Wigtownshire; in Ireland on the coast of Dublin, in Galway, and rarely in Down. Abroad it is common throughout Central Europe, especially upon the mountains, also in Corsica, Livonia, Bulgaria, and Russia.

#### Genus 6. **EPISCHNIA.**

Antennæ simple, the basal joint, in the male, long and thick; second joint elbowed, but not perceptibly thickened; palpi rather slender, porrected, pointed; tongue long; fore wings narrow, discal cell also narrow. Hind wings moderately ample, the cell open, and vein 5 absent.

This genus includes, abroad, a number of closely allied species, but we have only two, and those not very similar—

*E. banksiella* is a rather large species, the fore wings silvery grey, and the hind white; *E. farrella* is smaller, fore wings yellow-brown, with a white costal stripe, the hind smoky-brown.

1. ***E. banksiella***, Richardson.—Expanse 1 inch. Fore wings elongate, broad, rounded behind, pale slate, or whitish-grey, with the nervures irregularly streaked with grey-black. Hind wings shining white.

Antennæ of the male simple, the basal joint thickened and elongated, the second channelled and slightly twisted, pale brown; palpi large, thickly tufted, apical joint bent down, whitish-grey; head whitish-grey, with a darker line down the middle of the face; thorax very pale grey, mixed with white; abdomen whitish-brown. Fore wings elongated, not very narrow; costa arched, especially so beyond the middle; apex decidedly rounded; hind margin rather oblique and gently curved; whitish-grey, streaked all over with short longitudinal darker grey lines, and dusted with the same colour; first line suggested by one or two long white angles at some distance from the base and attached to two grey-black streaks on nervures; second line scarcely indicated by a blackish dash near the anal angle, and others on the nervures a little darker than the rest; there is also a dusted blackish dash at each outer angle of the discal cell; nervures toward the hind margin rather more distinctly streaked with black dusting; cilia greyish-white. Hind wings of moderate size; margin flatly curved behind; shining white with, usually, a faint smoky tint from the base; cilia white. Female similar, with threadlike antennæ.

Underside of the fore wings smoky-grey, edge of the costa and the cilia white. Hind wings faint smoky-white, with the cilia white. Body and legs very pale grey.

Mr. Richardson reports that it is now found to be variable, some specimens being so pale as almost to be cream-coloured, but with the usual grey markings on the nervures; and that,

on the other hand, he has one example with the usual first and second lines quite distinct and dark.

On the wing in July, but in early seasons before the end of June; and on one such occasion Mr. Richardson has reared a specimen of a partial second generation in September.

LARVA about an inch in length, tapering a little toward each end, but especially to the head, which is less than one-half the breadth of the middle segments, and rather flattened, also somewhat polished, pale brown; the ground colour varies a little in tint, and may be described as putty-coloured, with a tinge of green, especially between the segments; dorsal and anal plates very similar, but a little more polished, also more distinctly marked, the longitudinal lines rather broken up into dots; these lines are dark purplish-brown, and consist of a dorsal line (a little darker than the rest) and five slightly wavy lines on each side at equal distances from each other; of these the fourth contains the spiracles, and the fifth lies along the skinfold below; there is also a medio-ventral line, and the prolegs and under surface are more or less marked with the same colour; spiracles and raised dots ringed with dark brown; bristles pale brown; hooklets dark brown. (N. M. Richardson.)

August till May, on *Inula crithmoides* (golden samphire), feeding on the young shoots and the leaves; hiding in a sort of nest of silken web, within which it forms a silken tube as a habitation, and thickens this for hybernation.

In the spring it seeks fresh food, and forms another nest. (N. M. R.)

PUPA about five lines long and very smooth and neat, the limbs closely compacted together; the antenna and wing cases extend to the end of the ninth segment, leaving the remaining four segments free; anal segment rather blunt, and has about six small, short, hooked, wire-like processes;

colour chestnut-brown, the wing-cases greenish, or entirely brown. (N. M. R.)

I am indebted for all that I know about this species, and for specimens, to Mr. N. M. Richardson. He discovered it at the Isle of Portland in the year 1887, and has taken a few specimens, with Mrs. Richardson's assistance, every year since that time, a few on the wing at night, but the majority at rest upon flowers, also at night. After some difficulty they also discovered the larva and food-plant. Within the last year or two the insect has extended its range—or a new locality for it has been discovered, by Mr. E. R. Bankes—on the coast of the Isle of Purbeck in the same County of Dorset; but, so far as is at present known, it has not been found in any other locality in the whole world. It is nearly allied to—though clearly distinct specifically from—*E. illotella*, Z., found in Southern Europe, and commonly in South Africa; *E. prodromella*, Hb., found in Central and Southern Europe, and in Asia; and to the rare *E. asteris*, Stgr., a French species, unknown to me.

2. ***E. farrella***, Curt.; ***boisduvalliella***, Gn.—Expanse  $\frac{3}{4}$  inch (17–20 mm.). Fore wings elongated, narrow, pale drab, darker toward the costa, where also is a silvery-white longitudinal stripe; discal dot black. Hind wings pale smoky-brown.

Antennæ of the male simple, but the basal joint thickened, and the second bent and channelled, red-brown; palpi thick, porrected, greyish-white; head pale grey-brown, with a white line down the inner-side of each eye; thorax reddish-drab; abdomen whitish-brown. Fore wings narrow; costa nearly straight; apex bluntly rounded; hind margin almost straight and rather oblique; pale yellow-brown or drab, shading toward reddish-brown above the middle, where it is cut off by a shiny white sub-costal stripe from the base to the apex; this stripe is so straight that it departs from the costal margin a little in that portion which is slightly arched, the

cut off bend being red-brown; near the dorsal margin, before the middle, are usually two faint smoky-black dots placed side by side; the discal spot is indicated by a more distinct black dot; cilia shining pale drab. Hind wings not large, rounded behind; glossy pale smoky-brown; cilia concolorous, shining. Female similar, with quite simple antennæ.

Underside of the fore wings shining, uniform, smoky reddish-drab. Hind wings smoky-white. Body and legs brownish-white.

Rather variable in size; and it is somewhat remarkable that the few specimens originally taken in this country, over sixty years ago, are decidedly larger than those found in recent years.

On the wing from the end of May till July; abroad it is said to appear in two generations—in May and August.

LARVA 9 mm. in length; upper surface red, slightly tinged with green, the dorsal region a little darker, having on each side three or four fine lines, faintly marked and slightly reddish, much confused and interrupted at the divisions of the segments; undersurface yellowish-green, brighter than the upper; head shining pale red; mouth reddish-black; thoracic plate large, shining, a little paler than the head; spiracles large, black; the first two larger still, the last two smaller, than all the rest; anal plate wanting. (M. Lafaury.)

August and September, in the seed pods of *Lotus corniculatus*, *Ononis arcensis*, *Anthyllis vulneraria*, and *Astragalus*; entering the pod at the apex, eating out the seeds, and leaving it at the lower end to enter a fresh pod. Hibernating when full fed in a round ball of silk and sand; leaving this hybernaculum in the spring to crawl about and spin up, in some suitable corner, in an oval silken cocoon, of a pure white, covered with grains of sand.

PUPA apparently undescribed.

The moth with us frequents sea-sandhills, flying about sunset, close to the ground, among the short sandhill herbage, on warm sunny evenings. Excessively local, and apparently confined, so far as this country is concerned, to the coast of Norfolk and Suffolk. The first specimens known here seem to have been captured about the year 1840 at the lighthouse, Lowestoft, by the late Mr. H. F. Farr. Shortly afterwards he left that district, and no more specimens seem to have been met with until 1880, when a few were taken on the north coast of Norfolk by Mr. E. A. Atmore. He also has taken it in subsequent years, and in 1884 saw it in some numbers. I have myself searched for it on the same coast but without result, and have no knowledge of any more recent captures. Except a doubtful record of a specimen at Deal, Kent, no other locality for this species is known in the British Isles. Other supposed records appear in all cases to refer to a well-known variety of *Anerastia lotella* in which the costa is dull white.

Abroad the present species is found in sandy districts in the South and West of France, in Holland, Belgium, North and West Germany, Hungary, the Trans-Caspian districts, Northern Africa, and even in North America.

#### Genus 7. HYPOCHALCIA.

Antennæ of the male not pectinated, thickened to one half their length, the basal joint more thickened, and the second flattened and elbowed; palpi long, pointed and conspicuously porrected; tongue small, covered in front with scales; thorax not slender; fore wings rather broad, more so behind, but the cell narrow; hind wings very ample. Female much smaller.

We have but one species—several others are found on the Continent of Europe.

1. *H. ahenella*, Schiff.—Expanse  $\frac{3}{4}$  to  $1\frac{1}{2}$  inch. Fore wings elongated but broad, and rather squared behind.

glossy, yet of a very dull greasy brown, sometimes tinged with red or red-brown; transverse lines very obscure. Hind wings smoky purple-brown. Female darker, much smaller.

Antennæ of the male simple but much thickened, the basal joint still more so, and the second twisted and bent, bronzy-brown; palpi very long, porrected and nearly straight, brown; head and thorax dull reddish-brown, the latter rather robust; abdomen grey-brown. Fore wings elongated, broad behind, and very evenly increasing in breadth from the base; costa almost straight; apex bluntly rounded; hind margin smoothly curved and a little oblique; colour yellow-drab, brown-drab, or reddish-drab; first line obscure, almost an erect faint purplish-red cloud; second line more oblique and a little angulated above the middle but cloudy and faint, of the same colour; beyond it is a still fainter transverse similar cloud; cilia yellow-drab. Hind wings very broad and ample, the hind margin sinuous yet rounded; dark smoky-brown; cilia brownish-white.

Underside reddish-drab, shading to yellowish-white toward the dorsal margin. Hind wings smoky-white with a reddish tinge in front. Body and legs brown.

Female much smaller, often not more than one half the expanse of wings, but the thorax and abdomen rather thicker, the fore wings narrower and rather more shining; the two lines usually broader and more distinct, either brown or purple; the hind wings, and the underside, decidedly darker or greyer.

Variable in both sexes in the fore wings to whitish-grey on the one hand, to deep dark purple-brown on the other: the hind wings paler or darker in accordance therewith.

On the wing from June till the beginning of August.

LARVA and pupa apparently undescribed. Herr A. Schmidt says that the larva feeds in May on *Helianthemum vulgare* and *Artemisia campestris*, in a tubular silken passage

beneath the radical leaves; living in sandy regions. In this country some other food-plant is surely selected.

The moth sits during the day on, or close to, the ground, frequenting dry rough slopes, and stony places where herbage is scanty, railway banks, the bottoms of open quarries, and the slopes of chalk hills, but is so timid that it is impossible to see what so obscure looking an insect is resting upon, before it starts wildly up and flies a considerable distance, to drop again to the ground, often turning back to near the original spot. Perhaps from their close growth to the ground and the good cover that they afford, the patches of *Hieracium pilosella* seem to be more particularly chosen for its hiding places. In the South of Scotland Mr. Adam Elliot has found it show a similar preference for wild thyme. The female is less wild and may occasionally be seen when at rest; it sits cross-ways upon grass and not at all in the manner of the *Crambidæ*, its appearance is then more metallic than when preserved. A very local species, but found in Kent, Sussex, Surrey, the Isle of Wight, Dorset, Devon, Cornwall, Somerset, Wilts, Berks, Oxfordshire, Gloucestershire, Cambridgeshire, Suffolk, and Norfolk; formerly in South Yorkshire and Westmoreland, and has been taken in Durham. In Wales I found it, rarely, in Pembrokeshire; in Scotland it occurs, uncommonly, in Roxburghshire, Fife, and Perthshire; but I have found no record in Ireland.

Abroad its range extends through Central Europe, the temperate portions of Northern Europe, Italy, Dahnatia, Southern Russia, Asia Minor, and Armenia.

## ADDITIONS AND CORRECTIONS.

Vol. I. (page 155).—**Vanessa Huntera**, *Fab.* With respect to the specimen recorded as having been taken by Miss C. L. Pole-Carew near Torpoint, Devon, Lord Waldegrave now informs me that it was taken by Miss Pole-Carew (now Mrs. F. Loring) in the garden of Antony House, near Torpoint, in Cornwall (not Devon), on September 20, 1876, and that it is now in his own collection, having been given to his lordship by Mrs. Loring in 1902.

Vol. IV. (page 367).—**Xylophasia Zollikoferi**, *Frr.*—A second specimen of this rare European species was taken in September 1871 by Mr. Tait at Inverurie, near Aberdeen. It was sent to the late Mr. Henry Doubleday, who possessed the original example, and was determined by him. Nothing is known to indicate that this specimen was other than a genuine migrant.

In the past year (2nd September, 1903) Mr. T. Ashton Lofthouse took a specimen at sugar in his garden at Linthorpe, Middlesborough, Yorkshire, which is before me. It is very nearly of the size of *Agrotis saucia*, and at first glance strongly reminds one of that species, but its fore wings are broader and more blunt at the apex; moreover, its third pair of legs is far smaller, shorter, and with shorter spurs, altogether very different from those of any *Agrotis*. Its antennæ are quite simple, long and slender, its thorax very robust, ashy-brown, abdomen also stout, greyish-white, with

the tufts whiter, fore wings broad, blunt, ashy-brown or grey-brown, almost devoid of markings, except that the place usually occupied by the base of the reniform stigma contains an obscure darker grey-brown spot, lying on the outer angle of the nervures forming the discal cell, but ill-defined and almost formless; beyond it is a row of very faint minute blackish dots. Hind wings rather ample, white or greyish-white with brown nervures, those of the middle of the wings conspicuous, and increasing its resemblance to an *Agrotis*; cilia very short, white.

Mr. Lofthouse has allowed this specimen to be figured for the purpose of this work.

It appears reasonable that now, after being taken in three different years, this should be included among recognised British species. It is a rare species on the Continent, but found in Turkey and the East.

Vol. V. (page 155).—**Leucania l-album**, *L.*—This species now seems to have made its way to this country, though it is still doubtful whether it has established itself. Mr. Eustace R. Banks has captured a female specimen in South Devon, and he mentions the occurrence of one or two other specimens. It is a very pretty species, and widely distributed abroad.

Vol. V. (p. 158).—**Leucania loreyi**, *Dup.*—This excessively rare species (in this country) has been taken at Torquay, also in South Devon, by Mr. Alfred E. Holdaway, who has allowed me to examine the specimen. The capture of one or two other specimens this year is recorded.

(The same rich district—South Devon—has this year furnished a specimen of *Ophiusa stolidus*, *Fab.*, a South European species which does not appear ever to have been noticed before in these Islands. This specimen was taken at sugar near Dartmouth, by Mr. J. Jager, on September 23, 1903. It is in fine condition, and Mr. Jager states that he

found it among its food-plant, bramble, and is of opinion that it was bred upon the spot. No doubt whatever attaches to this capture, but it may be well to wait for further evidence before publishing it as a native species.)

(The same difficulty attaches to the pretty *Geometra* moth, *Thalera fimbrialis*, Scop., of which a specimen was taken by Mr. Charles Capper, sitting upon grass upon Beachy Head, Sussex, on the 7th August, 1903. This beautiful species, which closely resembles *Hemitea thymiaria*, but has pectinated antennæ in the male, is widely distributed in the southern half of Europe, and may prove to have a home with us. There is no indication of its having been introduced in any accidental manner, yet it seems also in this case advisable to pause for more information before including the species in the British list.)

1821

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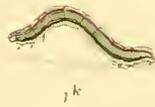
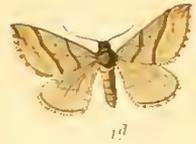




PLATE CCCLXXVII.

FIG. 1. Mesotype lineolata, male.

- |     |    |    |                         |
|-----|----|----|-------------------------|
| 1a. | .. | .. | female.                 |
| 1b. | .. | .. | male, var.              |
| 1c. | .. | .. | .. ..                   |
| 1d. | .. | .. | .. ..                   |
| 1e. | .. | .. | .. .. Mr. S. J. Capper. |
| 1f. | .. | .. | female, var. .. ..      |
| 1g. | .. | .. | .. .. Mr. Sydney Webb.  |
| 1h. | .. | .. | .. ..                   |
| 1i. | .. | .. | .. ..                   |
| 1j. | .. | .. | .. ..                   |
| 1k. | .. | .. | larva, Mr. W. Buckler.  |



W. G. C. del. et lith.

Vincent Brooks, Day & Son, 100 Inj.





PLATE CCCLXXVIII.

Fig. 1. *Eubolia palumbaria*, male.

- |     |    |    |                                |
|-----|----|----|--------------------------------|
| 1a. | .. | .. | female.                        |
| 1b. | .. | .. | .. var.                        |
| 1c. | .. | .. | .. ..                          |
| 1d. | .. | .. | male, var.                     |
| 1e. | .. | .. | .. .. Mr. G. T. Porritt.       |
| 1f. | .. | .. | female, var. Mr. S. J. Capper. |
| 1g. | .. | .. | .. .. " "                      |
| 1h. | .. | .. | .. .. Mr. Sydney Webb.         |
| 1i. | .. | .. | male .. .. "                   |
| 1j. | .. | .. | larva, Mr. W. Buckler.         |



1



1<sup>a</sup>



1<sup>b</sup>



1<sup>c</sup>



1<sup>d</sup>



1<sup>e</sup>



1<sup>f</sup>



1<sup>g</sup>



1<sup>h</sup>



1<sup>i</sup>



1<sup>j</sup>

Edw. Knight, del et lit.

Vincent Brooks, Day & Son, L<sup>td</sup> Imp.

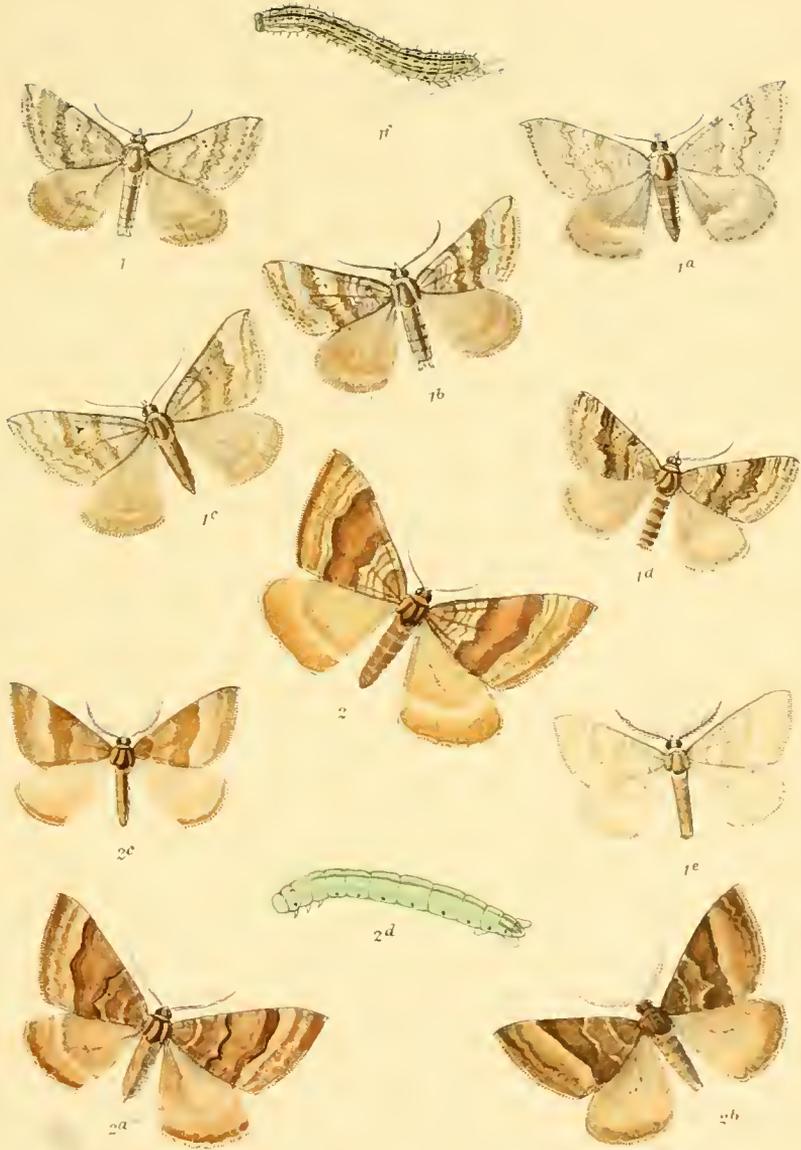




PLATE CCCLXXIX.

FIG. 1. *Eubolia bipunctaria*, male, chalk districts.

- |     |   |                  |         |                       |                        |
|-----|---|------------------|---------|-----------------------|------------------------|
| 1a. | „ | „                | female  | „                     | „                      |
| 1b. | „ | „                | male,   | limestone.            |                        |
| 1c. | „ | „                | female  | „                     |                        |
| 1d. | „ | „                | male,   | var. Mr. Sydney Webb. |                        |
| 1e. | „ | „                | „       | „                     | „                      |
| 1f. | „ | „                | larva,  | Mr. W. Buckler.       |                        |
| 2.  | „ | cervinata, male. |         |                       |                        |
| 2a. | „ | „                | female. |                       |                        |
| 2b. | „ | „                | male,   | var.                  |                        |
| 2c. | „ | „                | „       | „                     | Rev. C. F. Thornehill. |
| 2d. | „ | „                | larva,  | Mr. W. Buckler.       |                        |



C. Knight del. et lith.

Wm. and Brooks, Day & Son, L<sup>o</sup>ding

L. Reeve C<sup>o</sup> London





PLATE CCCLXXX.

FIG. 1. *Eubolia mensuraria*, male.

1*a.*    "        "        female.

1*b.*    "        "        male, var.

1*c.*    "        "        female, var.

1*d.*    "        "        "        "        Mr. S. J. Capper.

1*e.*    "        "        larva, Mr. W. Buckler.

2. *Collix sparsata*, male.

2*a.*    "        "        female.

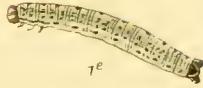
2*b.*    "        "        larva, Mr. W. Buckler.



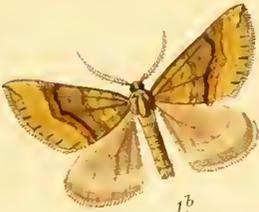
1



1a



1c



1b



1c



1d



2

E. C. Knight del et lith.



2b



2a

Vincent Brooks, Day & Son Lithop





PLATE CCCLXXXI.

FIG. 1. *Eupithecia togata*, male, Perthshire.

1 <i>a.</i>	..	..	female	..
1 <i>b.</i>	..	..	var.	..
1 <i>c.</i>	..	..	..	..
1 <i>d.</i>	..	..	..	..
1 <i>e.</i>	..	..	..	..
1 <i>f.</i>	..	..	..	..
1 <i>g.</i>	..	..	..	South of England.
1 <i>h.</i>	..	..	larva,	Mr. W. Buckler.
2.	..		<i>consignata</i> ,	male.
2 <i>a.</i>	..	..	female.	
2 <i>b.</i>	..	..	larva,	Mr. W. Buckler.



1



1a



1b



1c



1d



1d



1e



1f



1g



2



2a



2b

E. Krugger del et lith

London: J. G. Day & Son, 1877

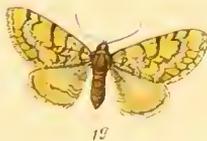
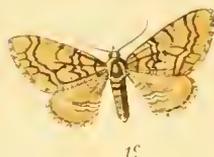




PLATE CCCLXXXII.

FIG. 1. *Eupithecia venosata*, male.

1 <i>a.</i>	..	..	female.
1 <i>b.</i>	..	..	var. Mr. Sydney Webb.
1 <i>c.</i>	..	..	.. North Wales, Mr. Sydney Webb.
1 <i>d.</i>	..	..	.. " " "
1 <i>e.</i>	..	..	.. Forres, N.B.
1 <i>f.</i>	..	..	male var. Isle of Lewis.
1 <i>g.</i>	..	..	female .. " "
1 <i>h.</i>	..	..	var. Orkney, Mr. F. J. Hanbury.
1 <i>i.</i>	..	..	.. Shetland.
1 <i>j.</i>	..	..	.. " "
1 <i>k.</i>	..	..	larva, Mr. W. Buckler.



E. C. Krught del. et lith.

Vincent Brooks Day & Son, Lith. Imp.





PLATE CCCLXXXIII.

FIG. 1. *Eupithecia extensaria*, male.

1a.	..	..	female.			
1b.	..	..	..	var.		
1c.	..	..	..	..		
1d.	..	..	male	..		
1e.	..	..	..	..		
1f.	..	..	..	..		
1g.	..	..	female	..	Mr. E. A. Atmore.	
1h.	..	..	..	..	..	..
1i.	..	..	..	..	..	..
1j.	..	..	..	..	..	..
1k.	..	..	larva,	Miss Violet Barrett.		



Fig. 1. a-l

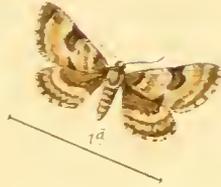
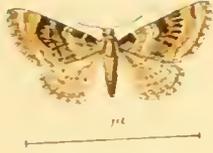




PLATE CCCLXXXIV.

FIG. 1. *Eupithecia pulchellata*, male (enlarged).

- |             |   |   |                    |   |                                  |
|-------------|---|---|--------------------|---|----------------------------------|
| 1 <i>a.</i> | „ | „ | female             | „ |                                  |
| 1 <i>b.</i> | „ | „ | var.               | „ |                                  |
| 1 <i>c.</i> | „ | „ | „                  | „ | Mr. Sidney Webb.                 |
| 1 <i>d.</i> | „ | „ | „                  | „ | „                                |
| 1 <i>e.</i> | „ | „ | „                  | „ | „, Yorkshire, Mr. G. T. Porritt. |
| 1 <i>f.</i> | „ | „ | „                  | „ | „                                |
| 1 <i>g.</i> | „ | „ | larva,             | „ | Mr. W. Buekler.                  |
| 2.          | „ |   | <i>linariata</i> , |   | male (enlarged).                 |
| 2 <i>a.</i> | „ | „ | female             | „ |                                  |
| 2 <i>b.</i> | „ | „ | var.               | „ |                                  |
| 2 <i>c.</i> | „ | „ | larva,             | „ | Mr. W. Buckler.                  |



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PLATE CCCLXXXV.

FIG. 1. *Eupithecia centaureata*.

- |     |   |                |        |                   |
|-----|---|----------------|--------|-------------------|
| 1a. | „ | „              | var.   |                   |
| 1b. | „ | „              | larva, | Mr. W. Buckler.   |
| 2.  | „ | succenturiata. |        |                   |
| 2a. | „ | „              | var.   | Mr. S. J. Capper. |
| 2b. | „ | „              | „      | Mr. Sydney Webb.  |
| 2c. | „ | „              | larva, | Mr. W. Buckler.   |
| 3.  | „ | subfulvata.    |        |                   |
| 3a. | „ | „              | var.   | Mr. Sydney Webb.  |
| 3b. | „ | „              | „      | „                 |
| 3c. | „ | „              | „      | „                 |
| 3d. | „ | „              | larva, | Mr. W. Buckler.   |

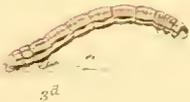
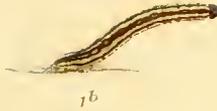


PLATE 35

PLATE 35





PLATE CCCLXX XVI.

FIG. 1. *Eupithecia subumbrata*, male.

- |             |   |                    |                        |
|-------------|---|--------------------|------------------------|
| 1 <i>a.</i> | „ | „                  | female.                |
| 1 <i>b.</i> | „ | „                  | larva, Mr. W. Buckler. |
| 2.          | „ | <i>irriguata</i> . |                        |
| 2 <i>a.</i> | „ | „                  | var.                   |
| 2 <i>b.</i> | „ | „                  | larva, Mr. W. Buckler. |
| 3.          | „ | <i>pusillata</i> , | male, Mr. Sydney Webb. |
| 3 <i>a.</i> | „ | „                  | female.                |
| 3 <i>b.</i> | „ | „                  | larva, Mr. W. Buckler. |
| 4.          | „ | <i>indigata</i> ,  | male.                  |
| 4 <i>a.</i> | „ | „                  | female.                |
| 4 <i>b.</i> | „ | „                  | larva, Mr. W. Buckler. |







PLATE CCCLXXXVII.

FIG. 1. *Eupithecia nanata*, male.

- |              |   |   |                        |
|--------------|---|---|------------------------|
| 1 <i>a</i> . | „ | „ | female.                |
| 1 <i>b</i> . | „ | „ | var. Mr. Sydney Webb.  |
| 1 <i>c</i> . | „ | „ | „ Mr. S. J. Capper.    |
| 1 <i>d</i> . | „ | „ | „ „ „                  |
| 1 <i>e</i> . | „ | „ | larva, Mr. W. Buckler. |
| 2.           | „ |   | <i>constrictata</i> .  |
| 2 <i>a</i> . | „ | „ | var.                   |
| 2 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |
| 3.           | „ |   | <i>virgaureata</i> .   |
| 3 <i>a</i> . | „ | „ | larva, Mr. W. Buckler. |



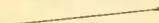
1e



3a



2b



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PLATE CCCLXXXVIII.

FIG. 1. *Eupithecia lariciata*.

- |              |   |               |                        |
|--------------|---|---------------|------------------------|
| 1 <i>a</i> . | „ | „             | var.                   |
| 1 <i>b</i> . | „ | „             | larva, Mr. W. Buckler. |
| 2.           | „ | castigata.    |                        |
| 2 <i>a</i> . | „ | „             | var.                   |
| 2 <i>b</i> . | „ | „             | larva, Mr. W. Buckler. |
| 3.           | „ | albipunctata. |                        |
| 3 <i>a</i> . | „ | „             | var.                   |
| 3 <i>b</i> . | „ | „             | larva, Mr. W. Buckler. |
| 4.           | „ | pimpinellata. |                        |
| 4 <i>a</i> . | „ | „             | var. Mr. Sidney Webb.  |
| 4 <i>b</i> . | „ | „             | larva, Mr. W. Buckler. |







PLATE CCCLXXXIX.

FIG. 1. *Eupithecia helveticata*.

- |              |   |   |                          |
|--------------|---|---|--------------------------|
| 1 <i>a</i> . | „ | „ | var. <i>arceuthata</i> . |
| 1 <i>b</i> . | „ | „ | larva, Mr. W. Buckler.   |
| 2.           | „ |   | <i>satyrata</i> .        |
| 2 <i>a</i> . | „ | „ | var. <i>callunaria</i> . |
| 2 <i>b</i> . | „ | „ | „ <i>Curzoni</i> .       |
| 2 <i>c</i> . | „ | „ | „ „ Mr. F. J. Hanbury.   |
| 2 <i>d</i> . | „ | „ | var. Mr. Sydney Webb.    |
| 2 <i>e</i> . | „ | „ | larva, Mr. W. Buckler.   |
| 3.           | „ |   | <i>plumbeolata</i> .     |
| 3 <i>a</i> . | „ | „ | larva, Mr. W. Buckler.   |
| 4.           | „ |   | <i>isogrammata</i> .     |
| 4 <i>a</i> . | „ | „ | larva, Mr. W. Buckler.   |

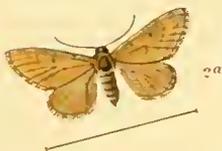
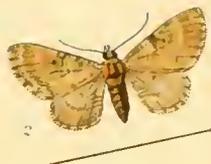


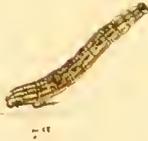
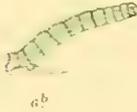
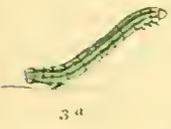




PLATE CCCXC.

FIG. 1. *Eupithecia pygmaeata*.

- |              |   |              |                        |
|--------------|---|--------------|------------------------|
| 1 <i>a</i> . | „ | „            | larva, Mr. W. Buckler. |
| 2.           | „ | tresignata.  |                        |
| 2 <i>a</i> . | „ | „            | larva, Mr. W. Buckler. |
| 3.           | „ | valerianata. |                        |
| 3 <i>a</i> . | „ | „            | larva, Mr. W. Buckler. |
| 4.           | „ | fraxinata.   |                        |
| 4 <i>a</i> . | „ | „            | larva, Mr. W. Buckler. |
| 5.           | „ | innotata.    |                        |
| 5 <i>a</i> . | „ | „            | larva, Mr. W. Buckler. |
| 6.           | „ | subnotata,   | male.                  |
| 6 <i>a</i> . | „ | „            | female.                |
| 6 <i>b</i> . | „ | „            | larva, Mr. W. Buckler. |
| 7.           | „ | campanulata. |                        |
| 7 <i>a</i> . | „ | „            | larva, Mr. W. Buckler. |



Wright and al. 1861

Wright and al. 1861

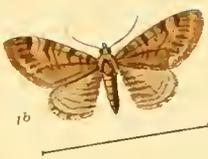




PLATE CCCXCI.

FIG. 1. *Eupithecia vulgata*, male.

- |              |    |    |                        |
|--------------|----|----|------------------------|
| 1 <i>a</i> . | .. | .. | female.                |
| 1 <i>b</i> . | .. | .. | var.                   |
| 1 <i>c</i> . | .. | .. | larva, Mr. W. Buckler. |
| 2.           | .. |    | <i>expallidata</i> .   |
| 2 <i>a</i> . | .. | .. | larva, Mr. W. Buckler. |
| 3.           | .. |    | <i>absynthiata</i> .   |
| 3 <i>a</i> . | .. | .. | var.                   |
| 3 <i>b</i> . | .. | .. | larva, Mr. W. Buckler. |
| 4.           | .. |    | <i>minutata</i> .      |
| 4 <i>a</i> . | .. | .. | larva, Mr. W. Buckler. |
| 5.           | .. |    | <i>assinillata</i> .   |
| 5 <i>a</i> . | .. | .. | var. Mr. Sidney Webb.  |
| 5 <i>b</i> . | .. | .. | larva, Mr. W. Buckler. |



Knight del et lit

Wm. H. Burmeister del et lit





PLATE CCCXCII.

- FIG. 1. *Eupithecia jasionæata*, Mr. Sydney Webb.
- |             |   |                           |                        |
|-------------|---|---------------------------|------------------------|
| 1 <i>a.</i> | „ | „                         | larva, Mr. W. Buckler. |
| 2.          | „ | <i>tenuiata</i> .         |                        |
| 2 <i>a.</i> | „ | „                         | larva, Mr. W. Buckler. |
| 3.          | „ | <i>subciliata</i> .       |                        |
| 3 <i>a.</i> | „ | „                         | larva, Mr. W. Buckler. |
| 4.          | „ | <i>dodonæata</i> —Oak.    |                        |
| 4 <i>a.</i> | „ | „                         | —Hawthorn.             |
| 4 <i>b.</i> | „ | „                         | larva, Mr. W. Buckler. |
| 5.          | „ | <i>abbreviata</i> , male. |                        |
| 5 <i>a.</i> | „ | „                         | female.                |
| 5 <i>b.</i> | „ | „                         | var. Pembrokeshire.    |
| 5 <i>c.</i> | „ | „                         | larva. Mr. W. Buckler. |



1a



2a



3a



4a



5



5a



5a



5b



5b

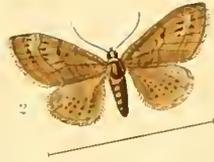
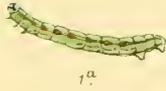




PLATE CCCXCIII.

FIG. 1. *Eupithecia exiguata*.

- |              |    |            |                           |
|--------------|----|------------|---------------------------|
| 1 <i>a</i> . | „  | ..         | larva, Mr. W. Buckler.    |
| 2.           | „  | sobrinata. |                           |
| 2 <i>a</i> . | .. | ..         | var. Scotland.            |
| 2 <i>b</i> . | .. | „          | „ „                       |
| 2 <i>c</i> . | .. | „          | „ Stevensata.             |
| 2 <i>d</i> . | .. | „          | „ „ Mr. Sydney Webb.      |
| 2 <i>e</i> . | „  | ..         | larva, Mr. W. Buckler.    |
| 3.           | „  | debiliata. |                           |
| 3 <i>a</i> . | „  | ..         | var. Mr. F. C. Woodforde. |
| 3 <i>b</i> . | „  | „          | larva, Mr. W. Buckler.    |
| 4.           | .. | coronata.  |                           |
| 4 <i>a</i> . | „  | ..         | larva, Mr. W. Buckler.    |



E. C. Knight del et lith

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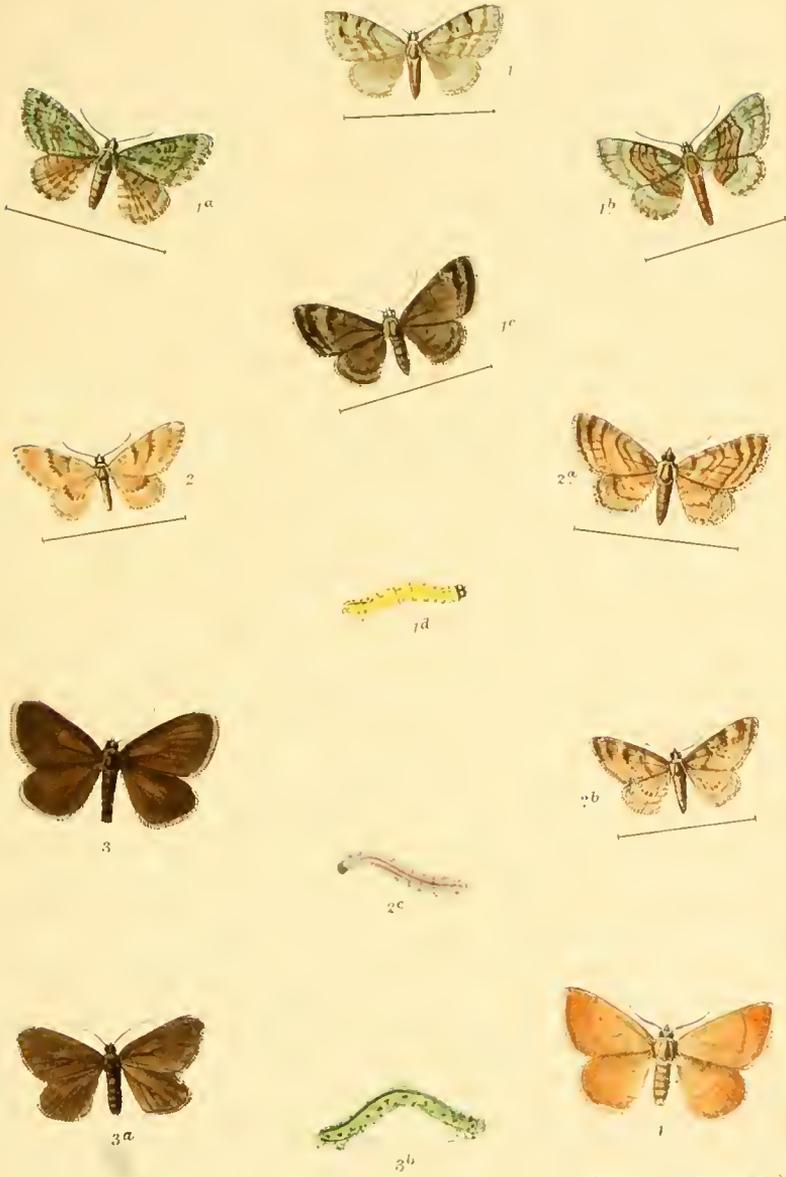




PLATE CCCXCIV.

FIG. I. *Eupithecia rectangulata*.

- 1*a.* .. .. var.  
1*b.* .. .. Mr. S. J. Capper.  
1*c.* .. .. London.  
1*d.* .. .. larva, Mr. W. Buckler.  
2. .. *pumilata*, male.  
2*a.* .. .. female.  
2*b.* .. .. var.  
2*c.* .. .. larva, Mr. W. Buckler.  
3. *Tanagra chærophyllata*, male.  
3*a.* .. .. female.  
3*b.* .. .. larva, Mr. W. Buckler.  
4. *Aplasta ononaria*.



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PLATE CCCXCV.

- FIG. 1. *Odontia dentalis*, male.  
1*a.*     ,,        ..     female.  
1*b.*     ..        ..     larva, Mr. W. Buckler.  
2.   *Pyrausta purpuralis*, male.  
2*a.*     ,,        ..     female.  
2*b.*     ,,        ,,     var.  
3.     ,,        *ostrinalis*, male.  
3*a.*     ,,        ..     female.  
4.     ,,        *punicealis*, male.  
4*a.*     ,,        ,,     female.  
4*b.*     ..        ,,     larva, Mr. W. Buckler.  
5.     ..        *sanguinalis*, Lancashire.  
5*a.*     ,,        ..     West of Ireland.







PLATE CCCXCVI.

FIG. 1. *Pyrausta cespitalis*, male.

- |             |   |   |                              |
|-------------|---|---|------------------------------|
| 1 <i>a.</i> | „ | „ | female.                      |
| 1 <i>b.</i> | „ | „ | larva, Mr. W. Buckler.       |
| 2.          | „ |   | <i>cingulalis</i> , male.    |
| 2 <i>a.</i> | „ | „ | female.                      |
| 3.          | „ |   | <i>anguinalis</i> , male.    |
| 3 <i>a.</i> | „ | „ | female.                      |
| 3 <i>b.</i> | „ | „ | larva, Mr. W. Buckler.       |
| 4.          | „ |   | <i>octomaculalis</i> , male. |
| 4 <i>a.</i> | „ | „ | female.                      |
| 4 <i>b.</i> | „ | „ | male, var.                   |
| 4 <i>c.</i> | „ | „ | larva, Mr. W. Buckler.       |



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Vincent Brooks Lay

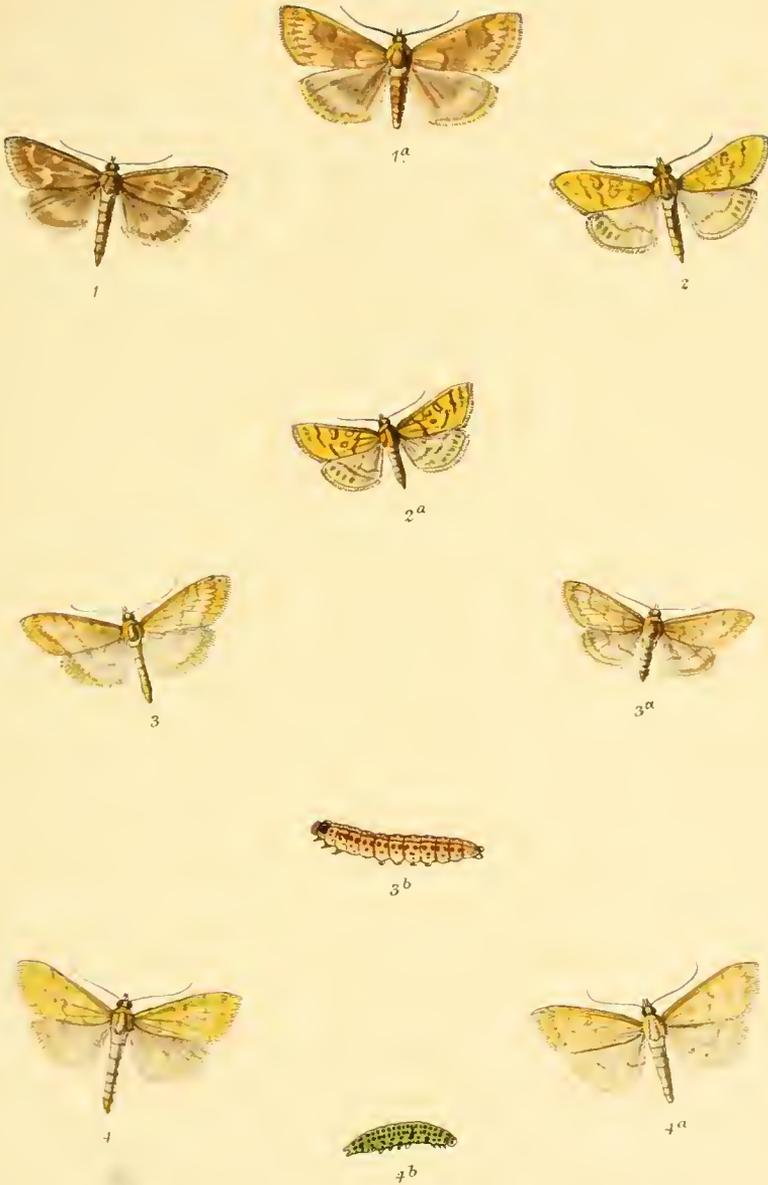
L.F. Levee





PLATE CCCXCVII.

- FIG. 1. *Botys nubilalis*, male.  
1*a.* ,, ,, female.  
2. ,, *flavalis*, male.  
2*a.* ,, ,, female.  
3. ,, *pandalis*, male.  
3*a.* ,, ,, female.  
3*b.* ,, ,, larva, Mr. W. Buckler.  
4. ,, *hyalinalis*, male.  
4*a.* ,, ,, female.  
4*b.* ,, ,, larva, Mr. W. Buckler.



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Reeve & C<sup>o</sup> London





PLATE CCCXCVIII.

FIG. 1. *Botys uliginosalis*, male.

1*a.* „ „ „ var.

1*b.* „ „ female.

1*c.* „ „ „ var.

2. „ *fuscalis*, male.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

3. „ *terrealis*, male.

3*a.* „ „ female.

3*b.* „ „ larva, Mr. W. Buckler.



1



1<sup>a</sup>



2<sup>b</sup>



1<sup>b</sup>



1<sup>c</sup>



2



2<sup>a</sup>



3<sup>b</sup>



3



3<sup>a</sup>

E. C. Knight del et lith

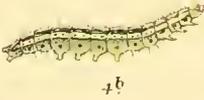
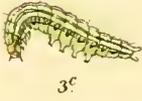
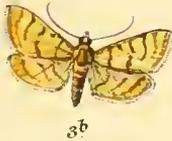
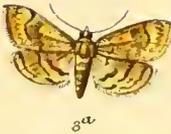
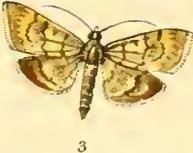
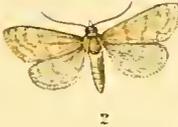
Vincent Brooks, Day & Son Lith





PLATE CCCXCIX.

- FIG. 1. *Botys asinalis*, male.  
1*a.* „ „ female.  
1*b.* „ „ larva, Mr. W. Buckler.  
2. „ *repandalis*.  
3. „ *verbascalis*, male.  
3*a.* „ „ female.  
3*b.* „ „ var.  
3*c.* „ „ larva, Mr. W. Buckler.  
4. „ *sambucalis*, male.  
4*a.* „ „ female.  
4*b.* „ „ larva, Mr. W. Buckler.



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PLATE CCCC

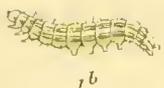
- Fig 1. *Bopyrus strobiloides*, male.  
 2a. - - - - - female.  
 3a. - - - - - larva. Mr. W. Buckler.  
 4. - - - - - *trocealis*, male.  
 5a. - - - - - female.  
 6a. - - - - - larva. Mr. W. Buckler.  
 7. - - - - - *ferruginea*, male.  
 8a. - - - - - female.  
 9. - - - - - var.  
 9a. - - - - -  
 10. - - - - - larva. Mr. W. Buckler.



1



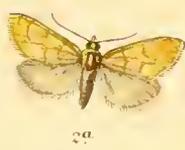
1<sup>a</sup>



1<sup>b</sup>



2



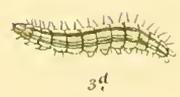
2<sup>a</sup>



3



3<sup>b</sup>



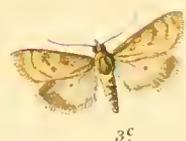
3<sup>d</sup>



3<sup>a</sup>



3<sup>b</sup>



3<sup>c</sup>

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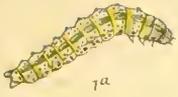
Vincent Brooks, Day & Son Lt<sup>d</sup> Imp

L Reeve & C<sup>o</sup> London

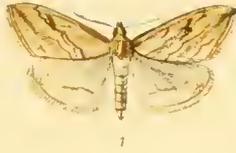
PLATE CCCCI.

FIG. 1. *Botys forficalis*.

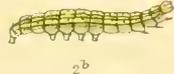
- 1a.    ,,       ,,       larva, Mr. W. Buckler.
- 2.     ,,       lutealis, male.
- 2a.    ,,       ,,       female.
- 2b.    ,,       ,,       larva, Mr. W. Buckler.
- 3.     ,,       decrepitalis, male.
- 3a.    ,,       ,,       female.
- 4.     ,,       olivalis.
- 4a.    ,,       ,,       larva, Mr. W. Buckler.
- 5.     ,,       prunalis, male.
- 5a.    ,,       ,,       female.
- 5b.    ,,       ,,       larva, Mr. W. Buckler.



1a



1



2b



2



2a



3



4



4a



3a



5



5b



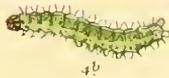
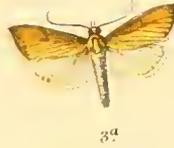
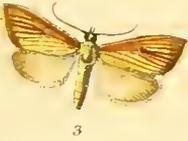
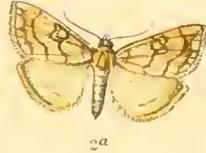
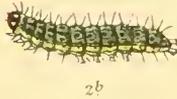
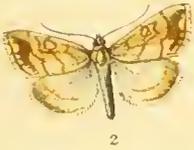
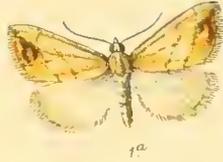
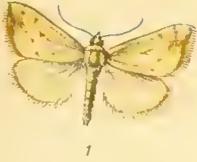
5a

W. L. Knight del: lith.

Vincent Brooks, Day & Son, Lith.

PLATE CCCCII.

- FIG. 1. *Pionea margaritalis*, male.  
1*a.*    ,,            ,,        female.  
1*b.*    ,,            ,,        larva, Mr. W. Buckler.  
2.       ,,        *stramentalis*, male.  
2*a.*    ,,            ,,        female.  
2*b.*    ,,            ,,        larva, Mr. W. Buckler.  
3.    *Nascia ciliaris*, male.  
3*a.*    ,,            ,,        female.  
3*b.*    ,,            ,,        larva { Miss Violet Barrett, from  
  } larva furnished by Mr. W.  
  } H. B. Fletcher, J.P.  
4.    *Perinephile lancealis*, male.  
4*a.*    ,,            ,,        female.  
4*b.*    ,,            ,,        larva, Mr. W. Buckler.



E.C.Krught del, et lith

Vincent Brooks Day & Son Lith Imp





PLATE CCCCIII.

FIG. 1. *Spilodes sticticalis*, male.

1a.    ,,            ,,        female.

1b.    ,,            ,,        larva, Mr. W. Buckler.

2.     ,,        palealis, male.

2a.    ,,            ,,        female.

2b.    ,,            ,,        var.

2c.    ,,            ,,        larva { Miss Violet Barrett, from  
  larva furnished by Mr.  
  C. W. Watts.

3.     ,,        cinctalis, male.

3a.    ,,            ,,        female.

4.     ,,        verticalis.

4a.    ,,            ,,        larva, Mr. W. Buckler.



1



1a



1b



2c



2



2a



2b



3



3a



4



1a

E. C. Knight del. et lith.

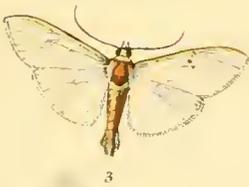
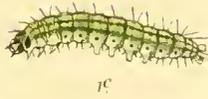
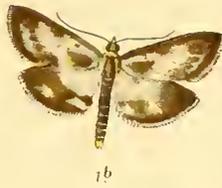
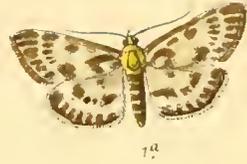
Vincent Brookes Day & Son Lith.





PLATE CCCCIV.

- FIG. 1. *Spilodes urticae*, male.  
1*a.* „ „ female.  
1*b.* „ „ var. London.  
1*c.* „ „ larva, Mr. W. Buckler.  
2. *Mecyna polygonalis*, male.  
2*a.* „ „ female.  
3. *Margarodes unionalis*, male.  
3*a.* „ „ female { Yarmouth, Nor-  
folk, Dr. Wheeler.  
4. *Antigastra catalaunalis*, Mr. W. C. Boyd.



E. C. Wright del et hth.

Vincent Brooks, Day & Son, Ltd. Imp.





PLATE CCCCXV.

- FIG. 1. *Diasemis literalis*, male.  
1a. .. .. female.  
2 .. .. *ramburialis*.  
3. *Agrotera nemoralis*, male.  
3a. .. .. female.  
3b. .. .. larva, Mr. W. Buckler.  
4. *Lemiodes pulveralis*, male.  
4a. .. .. female.  
5. *Nomophila hybridalis*, male.  
5a. .. .. female.  
5b. .. .. male, var.  
5c. .. .. larva, Mr. E. P. Felt.



Ed. T. Light del. et. Lith.

W. C. Cresson, Esq. Del. et. Lith.

Reese & Co. Del.





PLATE CCCCVI.

- FIG. 1. *Cledeobia angustalis*, male.  
1*a.*    "        "        female.  
1*b.*    "        "        male, var.  
1*c.*    "        "        larva, Mr. W. Buckler.  
2. *Pyralis farinalis*, male.  
2*a.*    "        "        female.  
2*b.*    "        "        male, var.  
2*c.*    "        "        larva, Mr. W. Buckler.  
3.     "        *lienigialis*.  
4.     "        *costalis*, male.  
4*a.*    "        "        female.



1



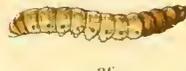
1b



1a



1c



2c



2a



2



2b



3



4



4a

E.C. Knight del et lith

Vincent Brooks, Day & Son, Lith





PLATE CCCCVII.

- FIG. 1. *Pyralis glaucinalis*, male.  
1*a.*    "            "        female.  
1*b.*    "            "        larva, Mr. W. Buckler.  
2. *Aglossa pinguinalis*, male.  
2*a.*    "            "        female.  
2*b.*    "            "        larva, Mr. W. Buckler.  
3.     "        *cuprealis*, male.  
3*a.*    "            "        female.  
3*b.*    "            "        larva, Mr. W. Buckler.  
4. *Cataclysta lemnae*, male.  
4*a.*    "            "        female.  
4*b.*    "            "        larva, Mr. W. Buckler.



1



1<sup>b</sup>



1<sup>a</sup>



2



2<sup>a</sup>



2<sup>b</sup>



3



3<sup>a</sup>



3<sup>b</sup>



4



4<sup>b</sup>



4<sup>a</sup>

E. C. Knight del et lith

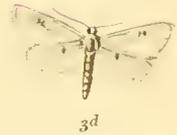
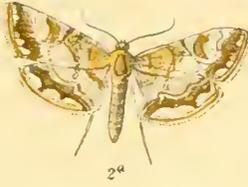
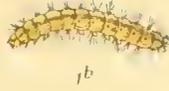
Vincent Brooks Day & Son Lithrs





PLATE CCCCVIII.

- FIG. 1. *Paraponyx stratiotalis*, male.  
1*a.*        "        "        female.  
1*b.*        "        "        larva, Mr. W. Buckler.  
2. *Hydrocampa nymphæalis*, male.  
2*a.*        "        "        female.  
2*b.*        "        "        var.  
2*c.*        "        "        "  
2*d.*        "        "        larva, Mr. W. Buckler.  
2*e.*        "        "        larva-case.   "    "  
3.        "        *stagnalis*, male.  
3*a.*        "        "        female  
3*b.*        "        "        var. Norfolk Fens.  
3*c.*        "        "        "    "    "  
3*d.*        "        "        "    Ireland, Mr. G. T. Porritt.  
3*e.*        "        "        larva, Mr. W. Buckler.



E C Knight del et lith

Vincent Brooks Day & Son Ltd Imp





PLATE CCCCIX.

- FIG. 1. *Stenia punctalis*, male.  
1*a.*    "        "        female.  
1*b.*    "        "        larva, Mr. W. Buckler.  
2.    *Acentropus niveus*, male.  
2*a.*    "        "        female.  
2*b.*    "        "        larva, Mr. W. Buckler.  
3.    *Endotricha flammealis*, male.  
3*a.*    "        "        female.  
3*b.*    "        "        var.  
3*c.*    "        "        larva, Mr. W. Buckler.  
4.    *Scoparia cembrae*, male.  
4*a.*    "        "        female.  
4*b.*    "        "        var.  
4*c.*    "        "        "        Zelleri.



1



1a



1b



2



2a



2b



3



3a



3b



4



4a



4b



4b



4c

Wm. Wood & Co. Lith.

Vincent Brooks, Day & Co. Lith. Imp.





PLATE CCCCX.

- Fig. 1. *Scoparia basistrigalis*, male.  
 1*a.*    ,,        ,,        female.  
 1*b.*    ,,        ,,        var.  
 2.       ,,        *ambigualis*, male.  
 2*a.*    ,,        ,,        female.  
 2*b.*    ,,        ,,        var.—marshes.  
 3.       ,,        *atomalis*, male.  
 3*a.*    ,,        ,,        female.  
 4        ,,        *uhmella*, male.  
 4*a.*    ,,        ,,        female.  
 5.       ,,        *dubitalis*.  
 5*a.*    ,,        ,,        var.  
 5*b.*    ,,        ,,        var. *ingratella*.  
 5*c.*    ,,        ,,        white var.



1



1a



1b



2



2a



2b



3



3a



4



4a



5



5a



5b



5c

— Knight del et lit.

— [illegible]

[illegible]





PLATE CCCXI.

FIG. 1. *Scoparia murana*, male.

- |              |    |                       |                           |
|--------------|----|-----------------------|---------------------------|
| 1 <i>a</i> . | .. | ..                    | female.                   |
| 2.           | .. | <i>truncicollis</i> . | male.                     |
| 2 <i>a</i> . | .. | ..                    | female.                   |
| 3.           | .. | <i>resinea</i> .      |                           |
| 4.           | .. | <i>cratægella</i> .   |                           |
| 4 <i>a</i> . | .. | ..                    | var.                      |
| 4 <i>b</i> . | .. | ..                    | larva, Mr. W. Buckler.    |
| 5.           | .. | <i>mercuris</i> .     | male.                     |
| 5 <i>a</i> . | .. | ..                    | female.                   |
| 5 <i>b</i> . | .. | ..                    | var.                      |
| 5 <i>c</i> . | .. | ..                    | <i>portandica</i> , male. |
| 5 <i>d</i> . | .. | ..                    | .. .. female.             |
| 5 <i>e</i> . | .. | ..                    | larva, Mr. W. Buckler.    |



1



1a



2a



2



3



4b



4



4a



5



5a



5b



5c



5c



5d





PLATE CCCXII.

FIG. 1. *Scoparia lineola*, male.

- |              |    |    |   |    |
|--------------|----|----|---|----|
| 1 <i>a</i> . | .. | .. | female.   |    |
| 1 <i>b</i> . | .. | .. | larva, Mr. W. Buckler.  |    |
| 2.           | .. |    | <i>angustea</i> , male.   |    |
| 2 <i>a</i> . | .. | .. | female.   |    |
| 2 <i>b</i> . | .. | .. | var.  |    |
| 2 <i>c</i> . | .. | .. | larva, Mr. W. Buckler.  |    |
| 3.           | .. |    | <i>alpina</i> , male, Mr. K. J. Morton.   |    |
| 3 <i>a</i>   | .. | .. | female  | .. |
| 3 <i>b</i> . | .. | .. | var.  | .. |
| 3 <i>c</i> . | .. | .. | male, var. <i>gracilalis</i> , lent by Mr. Kenneth<br>J. Morton, captured by Mrs. Fraser. |    |
| 4.           | .. |    | <i>pallida</i> , male.  |    |
| 4 <i>a</i> . | .. | .. | female.   |    |
| 4 <i>b</i> . | .. | .. | var.  |    |



1



1a



1b



2



2b



2a



3



3a



3b



4b



4a



4



4a



4b

E. C. Knight del. et lith.

PLATE 2

PLATE 2





PLATE CCCCXIII.

- FIG. 1. *Agdistis bennettii*, male.  
1*a.* .. .. female.  
1*b.* .. .. larva, Mr. W. Buckler.  
2. *Chemidophorus rhododactylus*, male.  
2*a.* .. .. female.  
2*b.* .. .. larva, Mr. W. Buckler.  
3. *Platyptilus ochrodactylus*, male.  
3*a.* .. .. female.  
3*b.* .. .. var. *dichrodactylus*.  
3*c.* .. .. larva, Mr. W. Buckler.  
4. .. .. *isodactylus*, male.  
4*a.* .. .. female.  
4*b.* .. .. second generation.  
4*c.* .. .. larva, Mr. W. Buckler.



1



1b



14



2



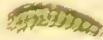
2b



11



3



3b



12



37



13



38



4



15

*Platyphaca*

*Platyphaca*





PLATE CCCXIV.

- FIG. 1. *Platyptilus gonodactylus*, male.  
1*a.*     ..             ..             female.  
2.       ..         *zetterstedtii*.  
3.       ..         *tesseradactylus*.  
4. *Amblyptilus acanthodactylus*.  
4*a.*     ..             ..             larva. Mr. W. Buckler.  
5.       ..         *punctidactylus*.  
5*a.*     ..             ..             larva. Mr. W. Buckler.  
6. *Oxyptilus parvidactylus*.  
7.       ..         *distans*, male.  
7*a.*     ..             ..             female.



1a



2



3



4a



4b

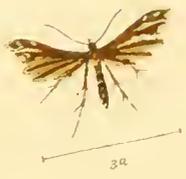
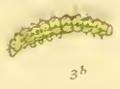






PLATE CCCCXV.

- FIG. 1. *Oxyptilus hieracii*,  
 2.        "       *pilosella*,  
 3.        "       *teuerii*, male,  
 3*a*.       "       "       female,  
 3*b*.       "       "       larva, Mr. W. Buckler,  
 4. *Mimesioptilus phæodactylus*, male,  
 4*a*       "       "       female,  
 4*b*.       "       "       larva, Mr. W. Buckler,  
 5.        "       *bipunctidactylus*,  
 5*a*.       "       "       var. *plagiodactylus*,  
 5*b*.       "       "       var. from Lancashire,  
 5*c*.       "       "       larva, Mr. W. Buckler.



E. Knight del et lith.

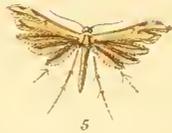
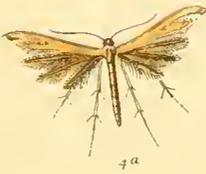
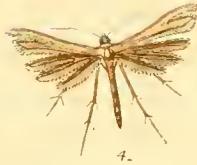
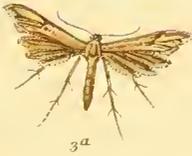
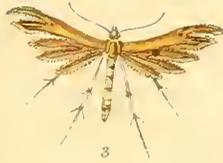
Vincent Brooks, engraver & Lithographer





PLATE CCCCXVI.

- FIG. 1. *Minnesioptilus zophodactylus*.  
2.        "        *ptero-dactylus* (*fuscus*).  
3. *Oedematophorus lithodactylus*, male.  
3*a*.       "        "        female.  
3*b*.       "        "        larva, Mr. W. Buckler.  
4. *Pterophorus monodactylus*.  
4*a*.       "        "        var.  
5. *Leioptilus lienigianus*.  
5*a*.       "        "        larva, Mr. W. Buckler.  
6.        "        *tephradactylus*.  
6*a*.       "        "        larva, Mr. W. Buckler.



E.C. Krught del et lith.

Vincent Brooks, Day & Son, Ltd. Imp.

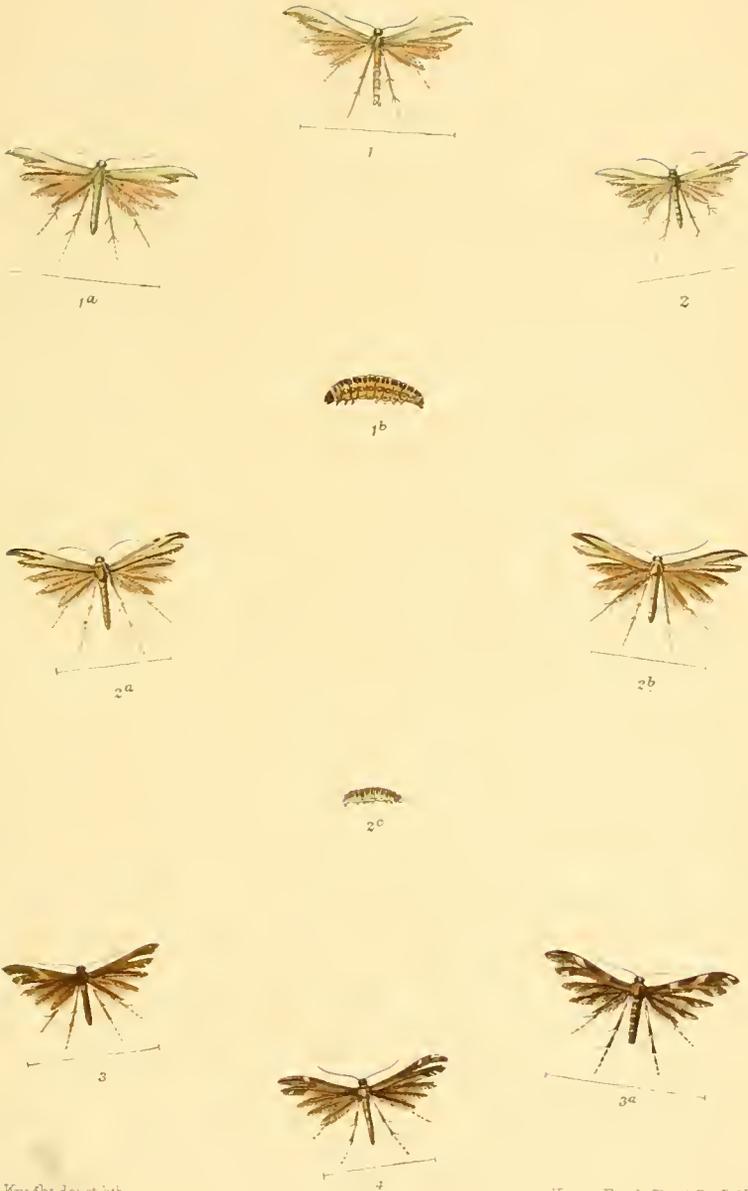
L. Reeve & Co. London.





PLATE CCCCXVII.

- FIG. 1. *Leioptilus osteodactylus*, male.  
1*a.*    "            "            female.  
1*b.*    "            "            larva, Mr. W. Buckler.  
2.      "            *microdactylus*, male.  
2*a.*    "            "            female.  
2*b.*    "            "            var.  
2*c.*    "            "            larva, Mr. W. Buckler.  
3.      "            *brachydactylus*, male.  
3*a.*    "            "            female.  
4. *Trichoptilus paludum*.



E C Knight del et lith.

Vincent Brooks Day & Son, Lit & Imp.

L. Reeve & P. London.





PLATE CCCCXVIII.

FIG. 1. *Aciptilus galactodactylus*, male.

- |             |   |                        |                        |
|-------------|---|------------------------|------------------------|
| 1 <i>a.</i> | „ | „                      | female.                |
| 1 <i>b.</i> | „ | „                      | larva, Mr. W. Buckler. |
| 2.          | „ | <i>spilodactylus</i> , | male.                  |
| 2 <i>a.</i> | „ | „                      | female.                |
| 2 <i>b.</i> | „ | „                      | var.                   |
| 2 <i>c.</i> | „ | „                      | larva, Mr. W. Buckler. |
| 3.          | „ | <i>baliodactylus</i> , | male.                  |
| 3 <i>a.</i> | „ | „                      | female.                |
| 3 <i>b.</i> | „ | „                      | var.                   |
| 3 <i>c.</i> | „ | „                      | larva, Mr. W. Buckler. |



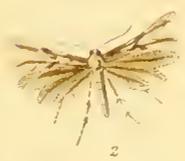
1



1a



1b



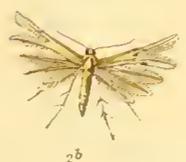
2



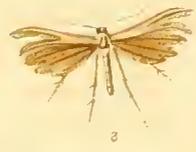
2a



2c



2b



3



3c



3a



3b

E. C. Krught del. et lith.

Vincent Broeze Day & Son Lith.





PLATE CCCCXIX.

FIG. 1. *Aciptilus tetradactylus*, male.

1*a.* „ „ female.

1*b.* „ „ var.

2. „ *pentadactylus*, male.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

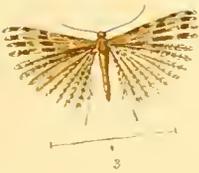
3. *Orneodes polydactyla*, male.

3*a.* „ „ female.

3*b.* „ „ var.

3*c.* „ „ small var. Scotland.

3*d.* „ „ larva, Mr. W. Buckler.



E. Krugth del. et sculp.

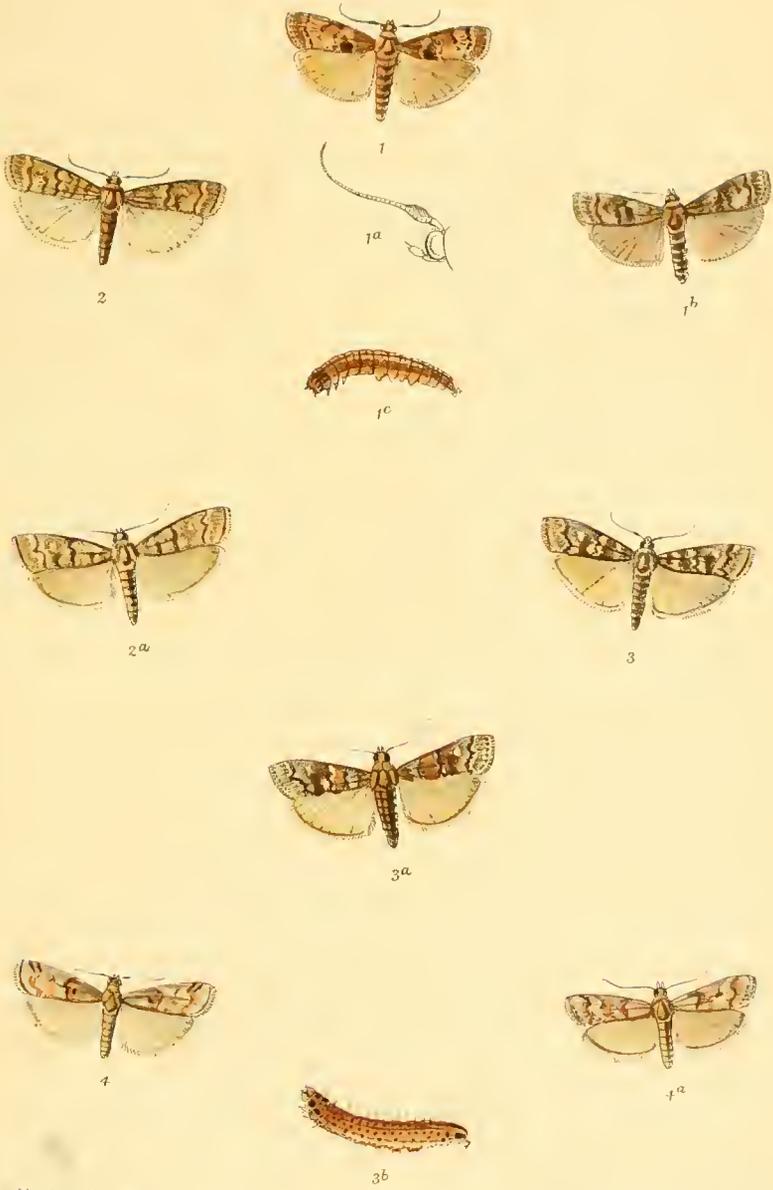
Van der Brack, D., & Sa. 1867





PLATE CCCCXX.

- FIG. 1. *Phycita spissicella*, male.  
1*a.*    ,,        ,,        female.  
1*b.*    ,,        ,,        larva, Mr. W. Buckler.  
1*c.*    ,,        ,,        Part head of male, showing thickened antenna.  
2.    *Dioryctria decuriella*, male.  
2*a.*    ,,        ,,        female.  
3.    ,,        *splendidella*, male.  
3*a.*    ,,        ,,        female.  
3*b.*    ,,        ,,        larva, Mr. W. Buckler.  
4.    ,,        *palumbella*, male.  
4*a.*    ,,        ,,        female.



E. Knight del et lith

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PLATE CCCCXXI.

FIG. 1. *Nephopteryx genistella*, male.

1*a.*        ,,            ,,        female.

1*b.*        ,,            ,,        larva, Mr. W. Buckler.

2.         ,,            *similella*.

3. *Salebria hostilis*, male.

3*a.*        ..            ..        female.

3*b.*        ..            ..        larva, Mr. W. Buckler.

4.         ..            *betulæ*, male.

4*a.*        ..            ..        female.

4*b.*        ..            ..        larva, Mr. W. Buckler.

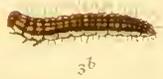
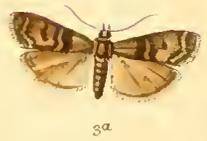
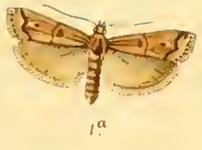






PLATE CCCCXXII.

FIG. 1. *Salebria fusca*, male.

- |     |    |    |                         |
|-----|----|----|-------------------------|
| 1a. | .. | .. | female.                 |
| 2.  | ., |    | <i>formosa</i> , male.  |
| 2a. | .. | ., | female.                 |
| 2b. | .. | ., | larva, Mr. W. Buckler.  |
| 3.  | .. |    | <i>obducteila</i> .     |
| 3a. | .. | .. | var.                    |
| 4.  | ., |    | <i>carnella</i> , male. |
| 4a. | .. | .. | female.                 |
| 4b. | .. | .. | var.                    |
| 4c. | .. | .. | larva, Mr. W. Buckler.  |



1



1a



2



2a



3



2b



3a



4



4c



4a



4b

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## PLATE CCCCXIII

FIG. 1. *Pempelia ornatella*, male.

1 <i>a.</i>	,,	..	female.				
2.	,,	<i>dilatella</i> .	male.				
2 <i>a.</i>	,,	..	female.				
2 <i>b.</i>	,,	..	var. <i>adornatella</i> ,	male.	Surrey.		
2 <i>c.</i>	,,	..	female,	Gloucestershire.			
2 <i>d.</i>	,,	..	var. <i>subornatella</i> ,	male.	South Wales.		
2 <i>e.</i>	,,	..	..	..	female	..	..
2 <i>f.</i>	,,	..	..	..	Scotland.		
2 <i>g.</i>	,,	..	..	..	Ireland.		
2 <i>h.</i>	,,	..	larva.	Mr. W. Buckler.			



1



1a



2



2a



2b



2c



2d



2e



2f



2g



2h

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PLATE CCCXXIV.

- FIG. 1. *Epischmia banksiella*, male, Mr. N. M. Richardson.  
1*a.*     "            "     female     "            "  
1*b.*     "            "     at rest, Mrs. Richardson.  
1*c.*     "            "     larva     "            "  
2.     "     *farrella*.  
3.   *Hypochoalcia ahenella*, male.  
3*a.*     "            "     female.  
3*b.*     "            "     male, var.  
4.   *Leucania l-album*.  
5.   *Nylophasia zollikoferi*.













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