

THE
LEPIDOPTERA
OF THE
BRITISH ISLANDS
VOL. III.



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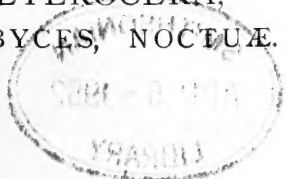
THE
LEPIDOPTERA
OF THE
BRITISH ISLANDS

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

BY
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HETEROCERA,
BOMBYCES, NOCTUÆ.



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LEPIDOPTERA.

Family 10. **BOMBYCIDÆ.**

Antennæ pectinated, with long solid teeth in the male; either with shorter teeth, or merely notched, in the female; palpi and tongue minute and apparently functionless, or else absent; thorax stout and thickly covered with fur-like scales; abdomen of female very much stouter than that of the male; wings in both sexes broad and rather ample, the hinder often very broad, and projecting in front.

Larvæ usually hairy or downy, but the hairs short and not arranged in conspicuous tufts; often handsomely coloured.

Pupæ smooth, rather soft, often short and broad; contained in a silken cocoon; in some species of very solid texture; in others tough, strong, and shining.

A family of robust, vigorous species; and, in some of the genera, very noble-looking insects; the prevailing colours various shades of rich warm brown. In most respects forming a strong contrast with the last group.

Genus 1. **PÆCILOCAMPA.**

Antennæ of the male strongly and, broadly pectinated to near the apex, whence the teeth diminish to the tip; abdomen not densely tufted in either sex; fore wings elongated, hind rather short, both thinly covered with scales.

There is but one species; and so far as I can ascertain, it has no very near ally in any part of the world.

1. *P. populi*, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Blackish-brown, with a whitish collar, and a whitish line across the middle of all the wings.

Antennæ of the male strongly pectinated, the rows of teeth rather inclining together, smoky-black, shaft light brown; head densely tufted with blackish scales which are tipped with light brown; collar conspicuously covered with long whitish scales which are tinged at the base with reddish; thorax stout, densely covered with long black scales, those upon the shoulder-flaps tinged with reddish; abdomen less stout, covered with long loose blackish scales, except at the base, which is reddish; anal tuft rather long and loose. Fore wings long and almost bluntly triangular; base very narrow; costa but slightly rounded; apex bluntly angulated; hind margin long and very oblique, gently rounded; dorsal margin short and rather straight; smoky-black, rather thinly covered with scales, and somewhat diaphanous, tinged with reddish-brown at the base and along the dorsal margin; first line placed near the base, curved, slender, yellowish or reddish; second line also slender, yellowish-white, oblique, indented, and having several slight curves, and one, more decided bend, back to the costa; cilia reddish-brown with yellowish dashes, but more densely scaled than the rest of the wings and forming an opaque edge. Hind wings rounded, not very broad; semi-transparent purplish-grey with a broad indistinct yellowish-white transverse stripe, expanding into a blotch at the anterior margin, edged inside with darker grey; hind margin with a dark grey line; cilia reddish-brown dashed with yellowish, and forming a very pretty edging.

Female stouter, with antennæ shortly but regularly pectinated; collar reddish; abdomen stout, reddish; fore wings decidedly longer and larger, with the pale second line broader and more conspicuous; otherwise similar. Underside of the wings in the male blackish, faintly tinged with reddish-

brown, much more strongly so in the female, and having a faintly yellowish stripe, internally edged with grey, running across all the wings; cilia reddish-brown with yellowish dashes; body and legs smoky-black, tinged with brown.

Hardly variable; but in the late Mr. F. Bond's collection is a specimen of a semi-transparent pale smoky-buff colour.

On the wing in October, November, and December.

LARVA of even thickness, flattened beneath, and with an appearance of being rather flattened and spread at the sides; soft, and covered with a great abundance of very fine short hairs. Head rather small, pale grey or grey-brown; body slate-coloured or bluish-grey with a double dorsal row of pale grey or reddish-brown spots edged with black, and a subdorsal row of large, round, raised, deep black spots, each with a spreading bunch of short hairs; sides clouded with smoky-grey or brown: or the dorsal series of spots is sometimes enclosed in a broad chain of squares united at the corners; or of urn-shaped black markings, each having four yellow spots; or grey with a dorsal series of oblique crimson dashes, enclosing, and united by, curved black link-like markings. The back of the second segment is sometimes ornamented with a double row of black dots or double curves; but all the markings are obscured by the soft grey hairs, which are longer at the sides, and partially hide the legs and prolegs, though the latter are all rather spreading. Under surface orange-coloured with black spots. When younger the larva has the hairs proportionately longer; it is of a pale bluish-grey with the head browner, an orange spot on the second segment and two yellowish dorsal lines.

March or April to June, on oak, birch, sawow, alder, elm, hawthorn, aspen, lime, ash, and poplar, but by no means so frequently upon the latter as its name would seem to indicate. The eggs are laid in the late autumn or early winter, and usually do not hatch till April, but the young larvæ feed up rather rapidly. When well grown they love to rest on the

bark of branches and trunks of trees, which from colour and spreading hairs they resemble very accurately, clinging closely and very tightly, and lying often perfectly straight.

PUPA short and stout, rich red-brown and rather glossy. In a short ovate dark grey-brown cocoon which seems extremely small for the size of the larva; among rubbish or leaves on the ground, or more frequently just below the surface of the ground at the foot of a tree. The Rev. Joseph Greene says: "Sometimes it will be found firmly glued to the inside of a piece of loose bark, or to the tree itself; at others spun up tightly among decayed leaves, dead grass, &c."

The male moth flies actively late at night, and may often be seen dashing in the wildest manner round a gas lamp at from 10 P.M. to midnight, on a mild winter night, when it looks more like a circling beetle than a moth. After midnight it settles down quietly on the gas lamp till towards the morning. Probably, if not deluded by a light, it also has a period of rest between the flights. The female is rarely observed on the wing, but certainly flies late at night. It is an exceedingly hardy species; the male has been seen on the wing during moderately severe frost, and a specimen has even been found enveloped in ice, and successfully thawed, when it perfectly recovered. Not especially attached to woods, though perhaps most common in such situations, but found among trees about fields, roadsides, open parks, and the suburbs of towns, and very widely distributed. Plentiful in Devon and moderately common throughout the Southern, Eastern, and Western counties, and South Wales, and, more locally, through the Midland and Northern counties to Yorkshire and Cumberland. In Scotland still more local, but recorded from Roxburgh, Dunoon, Troon, Inverurie, Fyvie, Pitcaple and elsewhere in Aberdeenshire, and perhaps existing in most suitable districts, to Moray and Argyle. Probably in all fairly wooded localities in Ireland, since it is recorded from Dublin, Wicklow, Kerry, Galway, Tyrone,

Armagh, and Antrim, and the Messrs. Campbell have found it, even abundantly, at Londonderry.

Abroad it is common throughout Central and Northern Europe, except the extreme north, and in Southern France, Southern Spain, and Northern Italy.

Genus 2. **TRICHIURA.**

Antennæ rather short, thorax stout, abdomen rather slender in the male, and having at its extremity a bifid tuft; stout in the female and with a dense woolly tuft; wings broad but short.

We have only a single species, but the genus is well represented and has many allies among exotic insects.

1. **T. cratægi**, *L.*—Expanse $1\frac{1}{8}$ to $1\frac{1}{4}$ inch. Fore wings short and broad; pale grey or pale brown, with a complete darker central band.

Antennæ of the male short, densely pectinated with long teeth, the two rows lying rather towards each other, teeth grey, shaft greyish-white. Head tufted, brownish-grey; collar whitish or ashy-grey; thorax stout, densely covered with long, loose, pale brownish-grey scales; abdomen not stout, rather tapering, clothed with long whitey-brown scales, and having a long divided anal tuft of a similar colour. Fore wings short and broad, narrow at the base, but rapidly widening, with costal and dorsal margins almost straight; apex and hind margin much rounded, and the latter very little oblique; greyish-white with a tuft of whitey-brown scales at the base of the dorsal margin; first line black-brown, usually making a full curve from the costal margin back to the base, but occasionally attaining the dorsal margin; second line oblique, black, four times broadly angulated; the space between these two lines forms a purplish-grey central transverse band, and contains an obscure blackish dot at the end of the discal cell; beyond the second line is an indistinct cloudy-grey undulating line before the hind

margin; cilia whitish, faintly spotted with purplish-grey. Hind wings nearly as long as the fore wings, ample and very fully rounded; pale grey with a straight, darker grey stripe across the middle, edged outwardly with whitish; cilia pale grey. Female with the antennæ very short and small, slightly toothed, pale brown; head and thorax brown; abdomen very stout, whitey-brown, with a dense brown anal tuft. Fore wings slightly narrower than in the male, pale brown with the lines and central band rather deeper brown and edged with whitish clouding; cilia pale brown spotted with darker. Hind wings pale brown, often whiter toward the base. Otherwise resembling the male, and but little larger. Underside in both sexes pale greyish-brown or dull brown, with a darker brown cloudy stripe through the middle of fore and hind wings; body whitey-brown. Legs tufted, grey in the male, brown in the female.

The male is variable in the ground colour of the fore wings from grey to nearly white. In the late Mr. H. Doubleday's collection in Bethnal Green Museum are specimens having the ground colour of a lovely creamy-white; and Dr. Mason has one of a blackish-grey, with the band still darker.

On the wing at the end of August and in September.

LARVA cylindrical, elongate, hairy; head rounded, black; body sooty-black, sides greyer and paler; the whole body covered with fulvous hairs, not sufficiently densely so to obscure the markings; a broad irregular whitish subdorsal stripe, interrupted with orange, and having a black dash beneath it on each segment; two orange dorsal spots on each segment; a thread-like fulvous line above the spiracles, which are black, edged with white; beneath them a waved fulvous line. Legs black; prolegs yellowish. The hairs which arise from the pairs of dorsal spots are longer and darker than those on the rest of the body. This larva is beautiful and exceedingly variable. Another form is black

on the back and sides, with a brilliant white subdorsal stripe composed of numerous blotches; beneath it an ill-defined series of small yellowish spots, and two orange dorsal spots on each segment. Another has the back black, sides dark bluish-grey, a broad and much interrupted orange-tawny subdorsal band, and a transverse, dorsal, similarly coloured stripe on each segment. Below the tawny band is a broad white stripe much interrupted with black spots, and shading into the grey ground colour at the sides. Again, another is sooty-black, with broad velvety-black transverse bands, one on the back of each segment; a series of very conspicuous orange subdorsal dashes—two on each segment—alternating with small whitish blotches, the latter being only visible when the larva is curled up; hairs yellowish-brown. And a variety from Scotland is velvety-black, having on the sides a series of cream-coloured blotches conspicuously produced transversely, and interrupting the black ground colour; the blotches alternate with small lateral silvery-white spots; upper part of each of the larger blotches shaded with orange; hairs pale greyish-brown. (C. Fenn.) The head has sometimes white spots on the lobes or a red bar across the upper portion; the dorsal spots are sometimes brilliant orange-red; and all possible variations from clear white to yellow and brilliant red seem to be produced, while the ground colour in some cases is of a slate-blue.

March or April to the beginning of June; on oak, hazel, birch, hawthorn, blackthorn, willow, and rarely on poplar. The egg is acorn-shaped, and of a rich chestnut colour. It is laid in the autumn, and covered by the parent with down from her anal tuft; hatches in the early spring, and the larva feeds up tolerably rapidly. It remains usually on the leaves of trees or large bushes, and rarely shows itself on the trunk, though fond of sunning itself on the leaves. A statement has been made that in the north-east of Scotland it does not feed up within the year, but hibernates as a larva, producing the moth in the following season; but this appears so improbable

that one is led to suspect a confusion with the larva of one of the larger Bombyces.

PUPA very stout and round; wing-cases short; tail rounded, with a small projection having minute hooked bristles. Red-brown or dull red; wing-covers and incisions of the segments darker; spiracles black and prominent. In a hard, compact, grey, oval cocoon, which is lined inside with white silk; among rubbish on the ground. (C. Fenn.) The cocoon is covered externally with earth.

The moth flies actively early in the evening and again late at night, but is not often observed in the imago state. The male may sometimes be attracted by a strong light. It is mainly confined to woods and wooded districts, though not wholly so. Fairly common in Kent, Surrey, Sussex and Berkshire, and generally distributed over the southern half of England to Norfolk and Herefordshire, though scarce in the Midland counties and rare in Staffordshire; rare also in Lincolnshire, Yorkshire, Cheshire and Lancashire. In Scotland, rather widely distributed in the southern districts to Ayrshire; also in Aberdeenshire, Inverness-shire and Argyle-shire. In Ireland it is only recorded from Killarney. Abroad, generally distributed in Central and Northern Europe, except the extreme north; in Spain, Northern Italy, Turkey and Armenia.

Genus 3. **ERIOGASTER.**

Antennæ rather short; stiffly pectinated in the male, shortly so in the female; thorax stout; abdomen in the male not stout, but with a considerable anal tuft; in the female cylindrical, very thick, and with a large dense mass of scales forming the anal tuft; fore wings rather long; hind wings short; both rather thinly clothed with scales.

Like the preceding, a genus well represented and widely distributed in the world, though we have but one native species.

1. **E. lanestris**, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Chestnut-brown; fore wings with a white spot at the base and another in the middle, and one white transverse line.

Antennæ of the male rather short, densely pectinated with rather short stiff teeth, the two rows inclining toward each other; light-brown. Head rather small, tufted with long purplish-brown scales; thorax stout, densely covered with similar long scales, paler on the hinder portion; abdomen short, rather thick, covered with long, loose, brown scales, and with a very long, loose, divided, greyish-brown anal tuft. Fore wings broad and somewhat triangular, narrow at the base, but widening rapidly; costal margin slightly but regularly concave to near the apex, where it becomes a little rounded; apex bluntly pointed; hind margin long and very oblique, gently rounded off with a regular curve which includes the anal angle and dorsal margin; purplish-chocolate, having at the base an ovate, brown-centred, white spot, the outside edge of which seems to represent an extremely contracted first line; second line, whitish, very oblique, broader where it attains the margins; at the end of the discal cell is a conspicuous white spot of a roughly ovate or triangular shape; space before the hind margin faintly dusted with white; cilia very short, dark chocolate. Hind wings rounded, but with the anterior margin strongly arched toward the base, so that it projects slightly in front of the fore wings when closed; pale purplish-chocolate with the anterior margin whitish, and a whitish, central, cloudy transverse stripe; cilia pale chocolate, very short. Female decidedly larger, with antennæ very shortly toothed; fore wings both larger and broader; abdomen stout, cylindrical, and having a very large obtuse and somewhat bulbous anal tuft, composed of silky, blackish, and silvery-grey scales; otherwise similar to the male. Underside of the wings paler purplish-chocolate, with the central white spot of the fore wings of a more lunate shape, a faint white central dot on the hind wings, and the transverse pale stripe through each wing as on the upper side; body as

above; legs reddish-brown. Very rarely variable, but a specimen having an elongated white central spot, and no trace of the white transverse line, exists in the cabinet of the late Mr. F. Bond, and another is in that of Mr. S. Stevens. There is, moreover, a record that three such were reared at Worcester a good many years ago. Mr. Stevens has also a specimen devoid of the central white spot.

On the wing in February and March, but in confinement may be reared from January to April, though the middle of February is the favourite time of emergence, should the weather be fine.

LARVA two inches long, rather slender and very soft and limp; even in thickness. Head small, rounded, with the lobes deeply divided; grey. Dorsal portion of the second segment black, edged behind with white; body blackish-grey, or slate-colour, with a large, somewhat squared, yellowish-white or yellow-brown blotch on each segment on each side of the dorsal line; these blotches are black-edged, and set each in a white frame; below is a row of black spots, and the under surface is light brown. Hairs on the dorsal surface very short, downy, and soft, bright brown; on the sides rather longer and in large tufts, orange-brown tipped with grey; legs black, prolegs red-brown or bright red, except the anal pair, which are black. A very handsome larva and not very variable, though the colour of the large dorsal spots varies from yellowish-white to red. When young it is of a paler slate colour, or greenish-grey, with the spots black.

April to July or August, on hawthorn and blackthorn, usually the former. The eggs are laid in February or March in a close mass, deposited spirally round a twig of the food-plant, and carefully and closely covered over with the mouse-coloured scales from the anal tuft of the female, forming thus a very pretty object. The young larvæ very soon construct a silken covering, or habitation, in which they live, leaving it to feed and returning to it to rest, when they lie closely

together, or even crawl one upon another, on the surface of the web, in fine weather basking in the sunshine; or crowd within it, when the weather is cold or wet, and show the utmost sociability of disposition. After the last moult they scatter and become quite solitary, wandering sometimes to a considerable distance before spinning up. If kept in confinement and not allowed plenty of air and sunshine they become, at this stage, excessively restless, and refuse to spin up, continuing to feed a little and wandering about, sometimes, until far into the autumn, after which most of them die. On the Continent, where the insect is more generally abundant, it feeds in addition on cherry, plum, lime, sawlow, and birch.

PUPA short and thick, rather broad; dark brown. In a small firm egg-shaped cocoon, very small for the size of the larva, and composed of silk mixed with a peculiar pasty material, which is secreted by the larva, and when dry has a somewhat chalky, dusty appearance. This substance, mixed with the silk, forms the outer surface of the cocoon, and is pierced with a number of minute holes, probably for the passage of air, but inside there is a silken lining which shows no trace of these breathing pores. When the moth emerges a lid is pushed off at one end of the cocoon, having been to all appearance carefully cut partially through, from the inside, by the pupa, for this purpose. The pupa of this species has other strange peculiarities. Its time for production of the moth is quite problematical. Very few emerge in the spring following the change to pupa, many more, apparently, in the second and third years, others still later, up to seven, or it is even said to nine years after pupation. Yet if the cocoon is cut open and the pupa examined the moth is usually to be found fully formed therein, and an individual so liberated has even been known to spread its wings and assume in all respects the appearance of a moth which had emerged of its own accord. Moreover, the production of the moths may be stimulated, and that without any excessive delay, since I have myself, in

the middle of February, and after the emergence of the first specimen, put a large number of cocoons upon a warm mantelpiece, and obtained scores of moths within a few hours.

This insect is rarely seen alive in the perfect state. Even when sitting on a hawthorn spray it so accurately mimics a dead leaf twisted round the twig that it becomes almost impossible of recognition. Both sexes doubtless fly late at night, but it appears to be indifferent to the attraction of light, and consequently is never observed on the wing. Most plentiful in coast districts, but irregular and extremely uncertain in numbers; so abundant in some years, in its favoured districts, that several nests may be found in a single hedge within a few yards; in other years, and sometimes for several in succession, very scarce. With these limitations it may be said to be common in all the Southern Counties, and abundant in the Eastern, but very local in Devon, and apparently absent from the western portion of South Wales. More locally, found in Herefordshire, Worcestershire, Lancashire, Cheshire, Yorkshire, and Lincolnshire, and very rarely in North Staffordshire, where Mr. T. C. Woodforde informs me of the occurrence of a single brood of larvæ between Newcastle-under-Lyme and Market Drayton. In the southern portion of that county it is not so rare. Also found locally in the South of Scotland, including several localities in the Clyde district. Weaver recorded it from the neighbourhood of Ben Nevis in 1845. Mr. W. Reid states that it has become plentiful at Pitcaple, Aberdeenshire, in descent from larvæ introduced there from Essex. In Ireland it is very widely distributed, being recorded from Kilkenny, Galway and Londonderry—even abundant on the coast of the last-named county. Abroad it is plentiful in Central and Northern Europe, extending to Southern Lapland; also found among the mountains of Northern Italy, and in Turkey and Southern Russia.

Genus 4. **CLISIOCAMPA.**

Antennæ rather short, stoutly pectinated in the male, slightly so in the female; thorax broad, abdomen short and not tufted, thick and pointed in the female; wings rather short, the hind very broad, all densely clothed with scales.

The two species are very similar, but can at once be distinguished by the form of the first transverse line—which in *C. neustria* crosses the wing, but in *C. castrensis* curves in, to the base.

1. **C. neustria**, *L.*—Expanse of male $1\frac{1}{4}$ to $1\frac{3}{8}$ inch, of female $1\frac{1}{2}$ to $1\frac{3}{4}$.

Dull red-brown or buff; fore wings with a broad regular central band.

Antennæ of the male rather short and somewhat recurved beyond the middle, strongly pectinated with long curved teeth; shaft thick, but tapering to a point; entirely brown; head tufted, red-brown. Thorax stout, abdomen tapering and rather short, both densely clothed with long, loosely-disposed scales. Fore wings short and broad, somewhat triangular, with the costal margin nearly straight; apex angulated; hind margin very gently curved in a long sweep round the anal angle and dorsal margin. Hind wings rounded behind and with the anterior margin strongly arched near the base, so that in repose it projects distinctly in front of the fore wings. Head, thorax, abdomen and wings uniformly yellow-buff, yellow-brown, umbreous, chocolate, or red-brown; fore-wings with both first and second lines rather curved and sinuous, and more or less parallel, dark-brown or red-brown, but in the darker specimens often edged outwardly with buff, so as to give the impression that the lines are of that colour; cilia usually yellowish, irregularly spotted or blotched with chocolate, but in the darkest forms wholly red-brown. Hind wings often without markings, otherwise with a central cloudy transverse brown line or shade coincident with the

second line on the fore wings; cilia as in the fore wings. In the darker specimens the space between the two lines of the fore wings often appears as a dark central band, the pale edging of the two lines shading off so as to throw it conspicuously up. Female larger and stouter; antennæ very short, but distinctly though shortly pectinated, and curved back; abdomen very large and rather scantily clothed with scales. Fore wings long, and with the two transverse lines less parallel and very often drawing near together below the middle, so as to constrict the central band, which is usually rather dark; colour almost as variable as in the male, though rarely of the yellowish-buff; the usual tints are shades of purplish-brown, red-brown, or chocolate, always rather dull, and becoming in the darkest specimens almost unicolorous. Underside similar in colour to the upper, but in the buff specimens clouded with brown or reddish on the costa and hind margin; the second line of the upper side visible as a brown or reddish central line, and continued distinctly across the hind wings; body and legs agreeing with the general colour.

As already indicated, always variable, the produce of any single batch of eggs differing considerably from each other, but, broadly speaking, the yellow-buff and paler brown forms are more abundant in the south, the darker and more red-brown varieties northward, and sometimes extremely red forms in the Eastern Counties. Beyond these, aberrations are rare, but in the collection of the late Mr. F. Bond are males having the first and second lines drawn so near each other as nearly or quite to coalesce, and a female in which they have joined, and the central band has divided into distinct blotches. Others, of a rich brown, have the two lines white and the central band dusted with the same.

On the wing in July and August.

LARVA two inches long, cylindrical, of even thickness, exceedingly soft and limp. Head round, blue-grey, with

two black spots; second segment brown or grey, with two large angular black spots; dorsal portion of the remainder of the body red-brown, forming a broad dorsal stripe crossed by dark grey lines, and divided lengthwise by a slender white dorsal line edged with black on each side; below the broad red stripe is a slender brown or grey stripe, from which to the spiracles the whole lateral space is occupied by a broad blue stripe, edged just below the spiracles by a red-brown line. All these longitudinal stripes are separated by black lines. Whole upper surface densely covered with short soft yellowish hairs, those along the spiracular region rather longer. Under surface and all the legs blue-grey.

April to June, on blackthorn, hawthorn, oak, birch, willow, poplar, elm, maple, and especially on fruit trees. In suburban gardens it shows a strong preference for almond, and is not unfrequently found upon common laurel. The eggs are laid in July or August round a twig of the food-plant, placed closely together, regularly, ring after ring, and so firmly cemented that the whole may be slipped off the twig when it is dry and shrunken, and thus appear as a compact cylinder. They are not covered with the down of the female—she being deficient in that material—but remain on the trees through the winter, hatching in April. The young larvæ at once construct a silken covering, in which they live gregariously until well grown, and upon which they cast their skins; but if necessary they leave the original habitation and construct another, and others successively, on the tree, so as to secure plenty of food at hand. In fine weather, when shelter is unnecessary, they rest on the bark of a branch, crowding together in scores or hundreds, and covering a large space. When near full growth the nest is abandoned, and the larvæ seem to scatter as far from each other as possible, and sometimes travel rapidly considerable distances.

PUPA thick, tapering rapidly behind into a blunt point;

spiracles conspicuous, antenna-cases very distinct; back covered with minute bristles; colour dull dark brown. In a firm spindle-shaped cocoon, which is enclosed in a looser outer silken envelope; the inner cocoon being abundantly supplied with a yellow powder produced from the intestine of the larva, the use of which is not understood. The cocoon is placed in a curved leaf or on the bark of a twig, branch, or trunk, or on some neighbouring fence, wall, or other convenient place; always in a chink or corner, and the less conspicuous as it is not very unlike the egg-covering of a large spider.

The moth does not seem to fly at dusk, but late in the evening the male not unfrequently enters at an open window, attracted by a strong light, and, when in, goes at once to the ceiling, where it performs the wildest vagaries of flight. It is also a frequent visitor to the gas lamps in suburban roads, but, except for this, is rarely seen on the wing. Most irregular and uncertain in its appearances; abundant in some years, very scarce in others, and rather apt to continue abundant or scarce for several consecutive seasons. No explanation can reliably be given for this, and there is no reason whatever to suppose that it remains in cocoon to succeeding seasons. When abundant it is most destructive to trees, fruit trees especially being defoliated. Formerly the larvæ were to be seen by thousands in the outskirts of London, and the almond trees suffered greatly; but, so far as can be judged, there is a permanent change for the better in this respect; certainly no such abundance has recently been observed.

Usually plentiful throughout the South, East, and West of England, with South Wales, and often in North Wales; but scarce or absent in the Midland Counties, and apparently not observed north of Lancashire and Yorkshire, where it is very local or rare. Also found abundantly in some parts of the South and West of Ireland, but apparently very little north of Dublin and Galway. Abroad it is abundant and

often destructive, extending over the greater part of the Continent of Europe, except the extreme north, and into Siberia, Tartary, and a large portion of Eastern Asia. From Japan it is received under the name of *testacea* Kotze, but agreeing accurately, in both sexes, with our insect. There is also a very similar form found in America, and named *Californica*, which, though rather slender, seems doubtfully distinct.

2. **C. castrensis**, *L.*—Expanse of male, $1\frac{1}{4}$ inch, of female, $1\frac{1}{2}$ to $1\frac{3}{4}$. Yellowish-buff or red-brown, with a central band leading into the base of the fore wings. Hind wings nearly always dark-coloured.

Antennæ of the male rather short and recurved, strongly pectinated, reddish-brown. Thorax broad and squared, abdomen short and tapering; both, with the head, densely clothed with long fluffy scales; pale ochreous, reddish-ochreous, or red-brown; abdomen browner than the rest. Fore wings short and broad, bluntly triangular; base narrow, costa straight; apex bluntly angulated; dorsal and hind margins regularly rounded; straw colour, pale ochreous, pale buff, reddish-ochreous, or red-brown; first line reddish-brown, arising in the middle of the costa, and making a wide curve into the base of the dorsal margin; second line oblique and moderately straight; between this and the hind margin is usually a line of indistinct reddish or brownish clouds; occasionally the base and middle area of the wings are faintly clouded with the same, but when the wings are of a red-brown these markings are absorbed or very faint; cilia yellowish, with irregular reddish-brown dashes. Hind wings short, with the hind margin very slightly and flatly rounded; but the anterior margin is so much arched near the base that a curved-up flap appears conspicuously in front of the fore wings when the moth is at rest. Colour of the hind wings pale, or deep purplish-brown or chocolate, strikingly contrasted in colour with the fore wings in the lighter-coloured specimens; a little darker, but less conspicuously so, in the

red-brown forms; sometimes also having a faint yellowish transverse central shade; cilia yellow, in some cases blotched with dark brown. Female very different; antennæ short, with minute regular pectinations; fore wings much larger, and with the hind margin more curved; pale or dark reddish-brown, with the lines, in some cases, rendered conspicuous by a broad edging of pale yellow, in others hardly visible; cilia in some specimens unicolorous brown, in others alternately blotched with brown and yellow. Hind wings red-brown, without markings; abdomen rather long, stout, and clumsy.

Underside of the paler males light brown, often with a yellowish central cloudy stripe, and the hind margin and apex spotted with yellowish; hind wings pale yellow, with a light brown central stripe, and some clouding towards the hind margin; in dark males, and in females, unicolorous reddish-brown or pale brown, or in some instances with a yellowish central shade; body and legs agreeing in colour with the rest of the under surface.

Variation, as already indicated, almost universal. Some of the males, with pale fore wings, have upon them very pretty shadings of brown, others are absolutely devoid of any lines or markings whatever; and some of the dark forms are similarly unicolorous. Mr. S. Stephens has a male specimen of which the fore wings are olive-brown, without transverse lines; Mr. C. A. Briggs has one of a smoky-brown, the hind wings especially so; and in the cabinet of the late Mr. F. Bond are females clouded with yellow, and with the central band constricted.

On the wing in July and August; reared specimens emerge occasionally in September.

LARVA cylindrical, moderately plump, covered with soft downy hairs, among which arise longer tufts of hairs from the usual structural spots. Head round, hairy, bluish-grey; second segment with a beautiful border of orange-coloured markings

at front and back ; general colour rich dark chestnut-brown, with slender dashes of light fulvous down the region of the dorsal line ; subdorsal stripes light blue, interrupted, and with still more interrupted light orange-red lines below them, beneath which last are fragmentary blue spiracular lines. The tufts of hairs are reddish, most abundant along the sides, but plentiful over the whole surface. Under surface blackish, legs black, prolegs dark grey, with light brown claspers. Sometimes there are complete blue dorsal, subdorsal, and spiracular stripes ; in other cases the intermediate orange-red or red-brown stripes are more conspicuous.

May, June, and the beginning of July, on low-growing plants in salt marshes—*Plantago maritima*, *Artemisia maritima*, *Atriplex portulacoides*, *A. littoralis*, *Statice limonium*, apparently almost any of the saltern plants, including grasses. In confinement will feed greedily upon *Polygonum aviculare*, rose, birch, apple, pear, cherry, plum, and blackthorn, especially after the leaves have been dipped in salt water. Not, however, very easy to rear in captivity, unless allowed plenty of sunshine and air, and also having upon its food, and even its body, an occasional sprinkling of water. In its natural condition it is well supplied with water, since the marsh beneath it is always wet, and very *high* tides invade its food. Indeed, the eggs, which are laid in August and do not hatch till May, must very frequently be under water during the equinoctial tides of both autumn and spring. The young larvæ construct a silken tent or web, low down among the marsh plants, in which they live gregariously when the weather is cool or dull, but sunshine arouses them, and they love to bask upon their food-plants. Mr. W. H. Wright wrote me in 1892 : “ The larvæ are in thousands on the salt marshes near Shoeburyness. I saw some yesterday (June 19th) not larger than ants, extremely small in fact ; others larger, in companies, in such abundance that it was difficult to avoid treading on them ; the half-grown larvæ lying side by side, in masses, on the sea-plantain and other

plants, all with their heads toward the sun, basking in the warmth, and so sensitive that on the least disturbance, or only on the approach of an intruder, every head would instantly be raised and thrown back. After the last moult the companies separate, and the larvæ feed up singly, and may be found so, nearly full fed, almost all over the marshes."

PUPA rather short and thick, narrowing suddenly at the eleventh and twelfth segments, and with the thirteenth rather prolonged, but blunt; antenna-cases and wing-covers very distinct; the thicker abdominal segments covered with short fine prostrate whitish bristles, general colour dull black. In a long spindle-shaped cocoon of tough silk, thin and semi-transparent, but enclosed in an outside looser silken covering, and provided with a quantity of loose yellowish powder, which appears to be produced from the intestine of the larva. Among plants and grasses, more especially the stiff hard grasses along the edge of the salt marshes.

The moth is very rarely observed on the wing, though it doubtless flies over the salt marshes at night. It has, however, been known to visit a strong light near the shore. Its home in this country is in a very restricted district—Gravesend, Erith, Southend, Shoeburyness, Sheerness, and generally the salt marshes of the estuaries of the Thames and Medway, situated in Kent and Essex. Probably also on the coast of Suffolk. Dr. Hele wrote, a few years ago, "Formerly abundant near the Haven at Thorpe, Suffolk, but has totally disappeared, probably from the sea having broken in during a heavy gale and flooded the plain." I know of no other localities in the United Kingdom. Abroad it is very widely distributed over the greater part of the Continent of Europe, Asia Minor, Northern Persia, Armenia, and Siberia, and is in no degree restricted to salt marshes, but inhabits woods and heaths and open waste ground, feeding on oak, birch, black-

thorn, *Helianthemum vulgare*, *Euphorbia cyparissias*, *Centaurea jacea*, *Geranium dissectum*, *Hieracium pilosella*, and even heather.

Genus 5. **LASIOCAMPA.**

Large insects. Antennæ in the male with long, stout pectinations, which are densely ciliated; in the female hardly toothed; palpi extremely small; thorax and abdomen very robust, the latter slightly tufted at the tip; wings very broad and powerful, and having a peculiarly substantial appearance.

The three species are readily distinguished—*L. rubi* has not the white spot which is conspicuous in the other two; *L. trifolii* has, nearly always visible, a curved paler stripe near the base, which is absent in *L. quercus*.

1. **L. trifolii**, *Esp.*—Expanse of male $1\frac{5}{8}$ to 2 inches, of female 2 to $2\frac{1}{2}$ inches. Dull reddish-brown, with a narrow paler stripe beyond the middle of the wings, and a white central spot. Fore wings rather pointed.

Antennæ of the male strongly and densely pectinated, the shaft whitish, the long pectinations brown; thorax stout; abdomen somewhat tapering; head, thorax, and abdomen densely clothed with long fluffy scales of a purple-brown or dark tawny colour, and the abdomen having a rather divided similar tuft at the anal segment. Fore wings broadly triangular; costa straight; apex sharply angulated; hind margin slightly rounded and hardly oblique; dorsal margin curved and densely fringed with long soft silky scales; light red-brown, with a faintly indicated, much curved, ashy or yellowish stripe from the costal margin to the middle of the base, the outer edge thereof indicating the usual first line; second line a yellowish-white transverse stripe beyond the middle of the wing, broadest toward the dorsal margin, gracefully curved and rather oblique; beyond this the hind marginal

space is dusted with yellowish scales; the nervures being distinctly darker than the interspaces; a rounded clear white spot lies at the end of the discal cell; cilia red-brown. Hind wings broadly rounded, red-brown, often unicolorous, otherwise with more or less indication of a rather slender yellowish-white transverse stripe beyond the middle, which is rarely distinct; basal half of the wings thickly clothed with long silky hairs; cilia red-brown.

Female larger and stouter; antennæ shortly toothed; fore wings larger and longer, with the costal margin rounded beyond the middle; red-brown, sometimes dusted all over, or in the basal, or hind marginal spaces, with dull buff scales; in other cases showing no trace of them; first transverse line more complete, often reaching the dorsal margin as the edge of a faintly paler basal patch; second stripe more oblique, less strongly marked; hind marginal space usually rather paler than the central portion; hind wings unicolorous; otherwise similar.

Underside drab-brown with a broad, gracefully curved, reddish-brown shade crossing the middle of all the wings; body and legs darker brown. Besides the slight variations above noted, the curved-in first stripe in the male is occasionally reduced to a mere loop, or totally absent; in other cases the second stripe is broader and very white and distinct. I have a female in which the two stripes are joined by a pale bar breaking the central darker space; and Mr. S. J. Capper has one devoid of transverse stripes. Specimens from the old Kentish locality were very much paler than those described, being of a light bright yellowish-brown; and of this form Dr. Mason has a specimen devoid of the stripes and the white spot, but with darkened nervures. In his collection is also a deep chocolate-red specimen taken in Hants. A gynandrous example is on record, of which the right side is male; the division of sexes in it being so marked as to form a line down the middle of the thorax and abdomen, especially visible on the underside.

On the wing in August and September.

LARVA two to two and one-half inches long, cylindrical, last two segments tapering a little. Head broad, with the lobes prominent and very distinctly marked, light brown, face yellow, lobes outlined with black; body covered with short soft hairs which form a raised line down the middle of the back; bright yellow-brown, rather paler yellow on the back, and having a very soft silky appearance; divisions of the segments black, and each segment crossed by one or more black wrinkles; subdorsal region with a row of small round or ovate black spots, two on each segment; and on the second, third, and fourth segments is an additional, larger, round spot lower down on each side; spiracular stripe and under surface bluish-grey; legs whitish; prolegs yellowish; hairs above the spiracles yellow, grey below. When young readily distinguished by a yellow collar.

A variety of the larva of which the hairs are all whitish is figured by Mr. W. Buckler.

September or October to June, hibernating when very small. On grasses of many kinds, but principally those which grow in sandy places. Also upon *Anthyllis vulneraria*, *Medicago falcata* and *M. sativa*, *Ononis spinosa*, *Lotus corniculatus*, *Trifolium medium*, and *T. pratense*, *Melilotus*, *Cytisus*, *Ulex*, sallow, bramble, and plantain, and in confinement said also to eat oak, beech, ash, poplar, willow, hawthorn, blackthorn, and raspberry. The larva hides close to the ground in the daytime, but about sunset crawls quite suddenly up to feed, and there seems little doubt that grass is most frequently chosen. Never gregarious.

PUPA short and broad, tapering off very rapidly behind; antenna-cases extremely prominent; colour light brown. In a small egg-shaped cocoon of rather brittle, almost papery texture, but very strong, most singularly covered with minute projecting clinging points; the fine larval hairs are disposed

irregularly all over the cocoon, but not laid in any kind of sequence; the blacker and more bristly hairs point straight outward as though pushed through, and produce the clinging sensation by entering the skin of one's hand.

The cocoon is usually placed under the surface of the sand, among grass roots, but sometimes on the surface.

The male moth flies after six o'clock P.M., and is fully on the wing about seven; at eight o'clock it may be assembled by means of a freshly reared female. The flight of the latter sex is rather later in the evening and is rarely observed; but that of the male is said to be of a very undulating character, rising and falling in the air with great swiftness, but keeping pretty closely to the wild sandy place in which it has reached maturity. In this country it is confined to the coast, and is now very much scarcer and more restricted in its distribution than formerly. In 1845 it was common on the Cornish coast; in 1856 hundreds of larvæ were found on the coast of Sussex feeding on grasses; in the same year an abundance at Plymouth, feeding on a great variety of plants; and in 1859 it was common in the New Forest district of Hants. Other southern localities are on record along the coast of Devon, Dorset, Kent, and even Suffolk. In most of these it appears now to be either very rare or extinct, but I hear from Mr. Webb that the light variety has quite recently been found in Kent. Formerly most abundant on the sandy coast of Lancashire and Cheshire, near Liverpool, but for a long time it has been scarcer there, though within the last two or three years there is fortunately some recovery, and many have been reared. When at Carlisle Mr. G. Dawson showed me specimens reared from larvæ found on the north part of the Cumberland coast, but apparently this is the extent northward of its range in these islands. Abroad it is by no means restricted to the coast, but is found even in woods and grassy places in many parts of Central and Southern Europe, Sweden, Livonia, Asia Minor, Syria, Armenia and

Northern Africa. At Tangier Mr. J. J. Walker, R.N., found the larva feeding commonly on the single-seeded white broom.

2. *L. quercûs*, *L.*—Expanse of the male $2\frac{1}{4}$ to $2\frac{1}{2}$ inches, of female $2\frac{3}{4}$ to $3\frac{1}{4}$ inches. Male rich chestnut; female yellow-brown; all the wings with a broad yellower band beyond the middle; fore wings with a white central spot.

Antennæ of male variable in length, stout, prominent, pointing forward and curved outward; very strongly pectinated with long stout teeth set closely together, and curled in at their tips; shaft yellow-brown; pectinations red-brown. Head, thorax, which is broad and powerful, and abdomen, which is stout but tapering, all densely covered with long fluffy red-brown scales; anal tuft similar, not very thick; fore wings broad and ample, very stout and strong; costal margin straight to beyond the middle, thence gently rounded; apex slightly rounded off, but rather square; hind margin nearly straight or slightly sinuous to near the anal angle, where it is boldly rounded off, the curve extending to the dorsal margin; rich red-brown or reddish-chocolate; first line absent; normal second line rather beyond the middle, gracefully sinuous and varying in position and form, but sharply defined and edged outwardly by a broad yellowish-fulvous stripe, shading off into the red-brown ground colour toward the hind margin; but this portion of the chestnut colouring is paler than that before the band, especially so between the nervures; at the extremity of the discal cell is a conspicuous black-edged pure white spot, and sometimes a yellow blotch or epaulet is visible rather near to the costa at the base of the wings; cilia dark red. Hind wings red-brown to beyond the middle, where is a narrower transverse yellow-fulvous stripe, its inner edge sharply defined and meeting that on the fore wings; outside this the yellow-fulvous shades off to the ground colour; cilia yellowish;

whole basal area abundantly covered with long silky hair-scales having a soft rich gloss.

Female much larger and stouter, with shorter antennæ, which are distinctly pectinated with short teeth; abdomen very large and heavy; fore wings longer and more ample, with the costal and hind margins more rounded, and the latter more oblique; hind wings also larger. Head, antennæ, thorax, abdomen, and wings pale yellow-brown, densely clothed (except the antennæ) with soft scales; the white spot of the fore wings large, and edged with chocolate; no trace of the basal yellow spot; the pale transverse band rather more curved and oblique; in other respects as in the male.

Underside of the wings of the male red-brown to beyond the middle, thence dull ochreous; the outer edge of the red-brown portion sharply defined, and nearly, though not quite, coincident with the second line of the upper side; margins rather clouded with red-brown; body red-brown; legs yellow-brown: of the female a paler or yellower reproduction of the upper side, but without the white central spot.

Variation in this species is very considerable, but mainly local or climatal. In typical southern specimens of the male, such as are above described, the transverse pale stripe of the fore wings is sometimes nearly perpendicular and very little waved; in other cases more oblique and more curved outwardly. In those from the north and west there is similar variation, but always more in the direction of oblique position and more graceful curves. In them the colour is intensified, becoming an exceedingly rich glossy dark chocolate, this colour extending further in both fore and hind wings, and pushing the second line and its attendant yellow stripe further back. Often the yellow stripe is narrower and the hind margin more broadly suffused with chocolate, and with still darker nervures; or else the yellow colour is thrown off in rays toward the hind margin between the dark nervures. In the dark forms the basal yellow blotch or epaulet becomes constant, more distinct, and even large and

conspicuous, and the insects are of rather remarkable beauty. The female varies in a somewhat similar direction, but without assuming any of the glossy brightness of the male; the ground colour becoming tinged more or less with reddish-brown, especially so in the basal half of the hind wings. The transverse line is also intensified in colour, and sometimes edged internally with dark brown, and the general dark clouding leaves the pale stripe more distinct. In some individuals, however, in both sexes the pale stripe disappears from the hind wings, leaving the outer half of the wings hardly paler in colour, but more thinly covered with scales than usual; in other instances the female is almost unicolorous reddish-brown, and has a very coarse dull colouring, which in rare cases is intensified to deep red-brown. One such, in the collection of Mr. Walker of Liverpool, remained two winters in the pupa state. All the darker forms constitute what has been called a distinct species, and named *L. callunæ*, but which has not the slightest claim to specific distinctness. The two forms are structurally identical, and in colouring are united by every possible intermediate gradation. Moreover, rich dark males of the pure *callunæ* variety, found plentifully in the far west corner of South Wales, are the mates of females of the purest soft yellow-brown southern form. On the other hand, Mr. H. Goss has a female reared from a larva found on the South Coast which closely approximates to the northern specimens, having the basal half of the wings clouded with dark brown. Mr. S. J. Capper has a female specimen wholly of a foxy-red brown, the band and hind margin of the fore wings somewhat paler. Specimens of the same sex in Mr. Sydney Webb's cabinet, reared from larvæ from the moors near Manchester, are semi-transparent from a very considerable failure of scales all over the wings; and others are entirely dark brown. Males in the same collection have strikingly large epaulets; and one in that of Dr. Mason has them of extraordinary dimensions. Mr. S. Stevens has a dark male with semi-transparent pale

yellowish hind wings; Mr. W. H. B. Fletcher another with the fore wings entirely deep red-brown, except a very narrow pale stripe; and I reared one in Pembrokeshire of which the outer halves of the fore wings are of the paler colour of the female. In the collection of the late Mr. F. Bond are two gynandrous examples, one being exactly divided, the left side male, but the other having male antennæ and large elongated blotches of the female colouring on the wings. Perhaps the most extraordinary variation yet noticed is one of a very dark red-brown which has the pale stripes olive-green, and rays of the same colour running toward the hind margin. Two such males and a female have been obtained in the West Riding of Yorkshire, and one is in the cabinet of Mr. G. T. Porritt. Very possibly the figure of *Lasiocampa dumeti* in Westwood and Humphrey's work may have been drawn from a specimen such as these. Even the central white spot varies in shape, from nearly round to diamond-shaped or irregularly angulated. In one male specimen, taken in Pembrokeshire, it is elongated and divided. Some indication of possible cause of variation of colour in this species has been furnished by Mr. F. Merri-field, who has brought out males of a rich red colour from pupæ of the northern dark chocolate race by keeping them at a temperature of 80 degrees F. Those of the southern race, kept under similar conditions, were of an unusually light colour; while those kept at 46 degrees F. were much darker. That the dark northern colouring is not wholly produced by length of time in the pupa state is proved by the rearing of dark specimens in the same summer as that in which the larvæ fed up; or, on the other hand, by the emergence of typical light forms from pupæ which have lain through the winter.

On the wing in July and August; occasionally at the end of June.

LARVA large, cylindrical, elongated, hairy; head rounded,

lobes dull purple dusted with grey; face ochreous with brown marking. Incisions of the segments velvety-black and without hairs; remainder of the dorsal region dark brown, covered with soft fulvous hairs of moderate and unequal length; there is a lateral interrupted white stripe, below which the sides are dark purplish-brown marbled with orange and with tawny hairs; spiracles white; an oval white spot, red or brown-centred, immediately above the lateral stripe on the third and fourth segments; front edge of the second segment dull orange; and when half grown having a short whitish diagonal dash meeting the lateral stripe; under surface black, with the sides ochreous and tawny, and in the anterior segments with a series of shining black spots; anal segment tinged with ferruginous; legs shining brown, spotted with black; prolegs tawny, with black dashes. (C. Fenn). When young variable, light or dark brown, with the dorsal markings more distinct, and the segmental divisions sometimes deep blue with black and white spots.

Northern larvæ are further variable, especially when young; bright golden brown, lighter or darker, with the white subdorsal line interrupted and broken into spots, lateral region reddish-brown with the hairs dark brown, and the red broken markings obscured, or sometimes absent. The younger larvæ often possess yellowish bars, or large spots, on the dorsal region, and in many individuals the segmental divisions are blue, sometimes even light blue or lilac, with these colours rather suffused on the sides.

August till June, or, in the north, till August, on heather, hawthorn, blackthorn, mountain-ash, dogwood, bramble, and indeed on shrubs generally and many low plants, not refusing ivy; feeding usually at night and hiding itself on the branches in the daytime. The larva hibernates, when about an inch long, in November, recommences to feed in April, and in the south usually feeds up rapidly. In Derbyshire and Staffordshire a portion of a brood will do this, the remainder feeding more slowly, and remaining in pupa

through the winter, and this also is the case in Cheshire and Lancashire; yet so far north as Dumfries a larva found feeding in May has been known to produce the moth in August of the same year. On the other hand, larvæ found in Hampshire and the Isle of Wight have fed up slowly and remained in pupa through the winter. Such instances as these last are rare, and, broadly speaking, the transformations of this species occupy one year in the south, two in the north. The hairs of this larva are slightly brittle, and minute portions of them are apt to break off and stick into the thin skin between the fingers when the larva is handled. To persons of very sensitive skin, irritation and inflammation is sometimes caused in this manner.

PUPA lively and very stout, incisions of segments deep; antenna- and limb-cases very distinct, spiracles prominent, anal extremity blunt and pubescent. Purplish-brown, abdomen paler; spiracles black. In a hard papery shell-like cocoon, oval in shape, spun in a slight web among the stems of plants near the surface of the ground, or occasionally beneath the surface. The inside of the cocoon is lined with smooth white silk. As already intimated, in pupa either for a very short time—about three weeks—or else through the winter and for a period of ten months; very rarely for an additional year.

The male flies with great swiftness, in the sunshine, over heaths, and at the sides of woods and fields, in eager search for the female. No other species assembles in greater numbers or with equal eagerness. A reared female carried in a box in the hand, or the pocket, or in the box of a vehicle, will bring together the males from every direction, some flying steadily to the spot and fluttering or running all over the place in which the female is hidden, or flapping here and there all round, or sweeping backwards and forwards in wide beats; while others go quite frantic, dash themselves on the ground among heather or plants, spin on their heads, or twirl

themselves among the vegetation, so as utterly to destroy their beauty. On one occasion I saw a somewhat different gathering. The wind was blowing a stiff gale right along the ridge of one of the highest hills of Hindhead, but the weather was fine and the sun shining brightly. At one end this hill is suddenly cut off by a steep hollow sweep down two hundred or three hundred feet, with a breadth of perhaps two hundred yards. In this hollow, which was in some degree of shelter, all the male moths of this species in the district appeared to be congregated, flying wildly about. For some reason unknown, they desired to pass over the ridge, and all were beating from side to side up the steep hollow to the top, then, trying to pass, were instantly carried by the furious gale far back over the valley and so tumbled ignominiously down, to renew the strife with the same ill success. There were certainly scores, perhaps hundreds. I struggled to the summit, and searched as closely as possible, in so fierce a storm of wind that I could not stand upright, but no female moth could be found, nor any place in which one could well shelter, for a long distance, nor did the male moths appear attracted towards any particular spot, their object was to get over the hill, no matter where, but their efforts were not, I fear, effective *that day!* The female flies probably but little, never before dusk, but possibly at night, though its flight is rarely observed.

Common in well-wooded and heath districts all over England and Scotland, including the Orkneys and Hebrides. In the Orkneys Mr. Arthur Horne has found the larva in abundance. Apparently not extending to Shetland, and not common in the Edinburgh and Fifeshire district. In Aberdeenshire, where it was formerly common, Mr. W. Reid finds that it is becoming scarce in consequence of the attentions of the black-headed gulls. Found in suitable places in most parts of Ireland, often commonly, both pale and dark forms being obtained, the latter the more plentifully, but the pale form has been reared by Mr. C. A. Watts from larvæ found near Belfast, of which the pupæ remained unchanged through the

winter. Common all over the Continent of Europe, also throughout Northern and Western Asia.

3. **L. rubi**, *L.*—Expanse, male 2 inches, female $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. Male foxy-red; female red-brown or grey-brown; each with two central pale transverse lines.

Antennæ of the male of moderate length, very stout and conspicuous, pointing forward and then curved outward; pectinated with very long, solid, ciliated, somewhat clubbed teeth set closely together, and with the rows inclining toward each other; shaft whitish-brown, pectinations red-brown. Head small; thorax very robust; abdomen stout but tapering a little; all clothed with long, dense, red-brown scales, or sometimes the front of the thorax is slightly clouded with blackish or paler brown; anal segments with a loose silky red-brown tuft. Fore wings rather short but extremely broad, very stout and strong; costa straight from the base to the middle, where it commences to curve; apex obtuse; hind margin slightly curved and but little oblique, with the anal angle very full; dorsal margin curved, and with the base of the wings clothed with long scales; deep red-brown or fox-colour (whence the insect is commonly called the fox-moth), with the nervures deeper red; first transverse line rather straight, and nearly perpendicular, but not always attaining the margins; second line very slightly curved and a little more oblique, placed just past the middle of the wing; both lines rather broad and conspicuous, pale yellow-brown; beyond the second a broad transverse space is faintly suffused with yellowish-brown scales, the outer edge of this space forming a sort of indented irregular line at some distance from the hind margin; sometimes this suffusion of paler scales is extended inward toward the base of the wing, in other cases it is totally absent; cilia red-brown. Hind wings rather ample [and more than usually rounded behind; red-brown; nervures slightly darker; cilia yellowish.

Female variable in size, usually much larger than the male;

antennæ short and slender, but decidedly pectinated with short stout teeth; pale-brown or grey-brown; thorax broad and stout; abdomen very large and heavy; both red-brown or pale, or dark, grey-brown, very dull in colour; fore wings coarsely scaled, larger and much longer than in the male, with the margins more curved, and the hind margin much more oblique; reddish-brown, or grey-brown, sometimes much shaded with ashy-grey or dark grey-brown, hardly two specimens being quite alike; transverse lines as in the male but rather more oblique, and in many cases having, on the sides nearer the base of the wing, a broad shade of whitish; but these whitish shades vary greatly in degree, and the lines themselves in their distance apart and consequently in their positions on the wings; the faint edging of the shade beyond the second line is just visible. Hind wings long, rather thinly scaled, dull brown, nervures decidedly darker; cilia whitish.

Underside of all the wings, in the male, red-brown or orange-brown; the cilia of the hind wings tinged with yellowish; of the female dull brown or grey-brown, with a faintly indented transverse pale line in the fore wings; body and legs of the colour of the wings, the latter with dense tufts of paler scales.

Besides the variation in pale shading in the male, and in grey or brown colouring and paler clouding in the female, the two transverse lines, as already remarked, are most unstable in position; in the case of some females placed so far apart as to enclose between them nearly one-third of the length of the wing; in others, and especially in some of the males, parallel and almost close together. In rare instances they actually coalesce; one such is in Mr. Sydney Webb's collection, another in that of the late Mr. H. Doubleday, in Bethnal Green Museum. In a female specimen in my own collection, obtained at Belfast, both lines are absent from the right fore wing, which has merely a whitish oblique cloud. Another has the first line bordered outwardly with black-brown. Dr.

Mason possesses specimens of the male of a pale drab, the locality of which does not appear to have been recorded.

On the wing in May and June.

LARVA large and very conspicuous, cylindrical, densely covered with short soft downy hair; head round, velvety black or dark purple-brown, lobes edged with yellowish; dorsal half of the body dark red or tawny with the incisions and wrinkles of the segments deep black and the edges shaded with black; subdorsal stripe broad, black-brown, set with purplish hairs; under-surface dull dark-brown, legs and pro-legs similar; hairs of the upper portion red-brown, dark brown below, still lower purplish-grey or blackish. When young much less hairy, dark purple-brown, with a yellow bar half way round each segment, giving the creature a ringed appearance above.

June to April. On heather and other species of heath, bramble, willow, sallow, strawberry, *Rosa spinosissima*, *Vaccinium myrtillus*, *Geranium sanguineum*, *Erodium cicutarium*, *Polygonum aviculare* and other low-growing plants. It feeds vigorously through the summer, becoming full grown in the late autumn, when it reposes at full length on any plant or on the ground in the sunshine, and is extremely conspicuous where abundant. Apparently it does not strictly hibernate, but hides on or in the ground in severe weather, coming out whenever the sunshine is bright and warm; this is, at any rate, the case from January onward, but it seems hardly to feed at this time, and when finally roused by the warm spring weather it takes no food at all, but basks in the sunshine, or travels in a restless manner as though seeking a place for pupation.

PUPA thick, round and rather short, anal segment extremely blunt, but showing anal structure with unusual distinctness; black-brown, with wing and limb-covers sooty black. In a large loose cocoon of considerable length and of thin tough texture, totally unlike those of the other two species, blackish-

brown ; usually just underground among the roots of grass or other plants, so near the surface that the rooks sometimes find and dig them up, leaving the emptied cocoons in evidence.

The male moth flies in the sunshine, especially late in the afternoon, in a wild and headlong manner, even a frantic manner occasionally, as once when I was leaning over the net to box a small *Tortrix*, one of these large insects plunged violently into it, creating a commotion by no means favourable to the boxing of the small moth. Sometimes it will beat round and across a field, or piece of common, examining every clump of furze or of fern, exploring every hollow, and all with a furious rapidity wonderful to see ; but if it plunges down into the herbage and does not emerge, examination of the spot is desirable, since its partner will there, in all probability, be found. She is quite sluggish and cannot be induced to fly in the day time, but may occasionally be seen at early dusk exhibiting a curious swift zig-zag flight like that of the female *Hepialus humuli*. She flies more frequently at night, and has even been known to come to a strong light, but the male appears to fly only in the day time.

The larva of this species is apt to furnish the insect collector with one of his most reliable, and most provoking, disappointments. When full grown it is so handsome, so conspicuous, and in suitable places so very common, that the temptation to collect a large number, and endeavour to keep them alive through the winter, is almost irresistible—and their death the nearly invariable result. Many years ago the late Mr. H. Doubleday furnished a receipt for avoiding this misfortune: "To rear the larvæ I take a large box about ten inches deep, with holes in the bottom for drainage, and the top covered with wire gauze. In this box I place a turf of heather cut to fit it. The larvæ are placed on the turf in the autumn and fed till they become torpid. They are left in the garden exposed to all the changes of weather. The first warm

days of March bring them out, they bask in the sunshine for a week or two, but never feed in the spring. About the middle of April they begin to spin their cocoons." A more simple plan, which has been successful, is to half fill a flower-pot with moss, placing a few larvæ therein; plant it in the ground, and tie it down with gauze; but this is not very reliable, and but few larvæ can be accommodated in a flower pot. The insect has been successfully reared by the larvæ being placed in a well ventilated box containing dead leaves, in an icehouse, for the winter; of a dozen larvæ so treated, eight were reared. It is even stated that full grown autumn larvæ may be cheated of their desire to hibernate by being confined in a place where the temperature is continuously high—as near a stove; but in all cases it is essential that they should have plenty of air. When the insect is so plentiful that larvæ can readily be found in the spring—at which time they are always far more scarce than in the autumn—it is obviously unnecessary to hibernate them in confinement. When secured in the spring and confined in a warm place they will at once spin up in sand, among vegetable refuse, or each in a separate chip box. An illustration of the docility of the creature at this period is before me. A friend, not an entomologist, was riding over a wild moor in the north of Ireland, one sunny spring day, when he was struck with the beauty of a large caterpillar. Looking around he discovered among the débris of some past picnic the neck of a bottle. In this he placed the caterpillar, plugged each end and put it into his pocket. When next looked at, the larva had formed its cocoon, and a few weeks later the moth duly emerged. This cocoon, in its curious receptacle, is carefully preserved. Apparently distributed over the whole of the United Kingdom, except the Shetland Isles, and possibly the Orkneys; frequenting heaths, moors, fens, rough pasture fields, and hill sides, also sea sandhills, and apparently almost all uncultivated places. Common throughout the continent of Europe, except the extreme north and south; also in Siberia.

Genus 6. **ODONESTIS.**

Large insects. Antennæ in the male very strongly pectinated, palpi in both sexes long and porrected; thorax and abdomen very stout, the latter tufted in the male; wings broad, the fore wings angulated at the tip.

We have only one species.

1. **O. potatoria**, *L.*—Expanse of the male, 2 to $2\frac{1}{4}$ inches, of the female $2\frac{1}{2}$ to $2\frac{3}{4}$. Male dull red, clouded with yellowish; female yellowish buff; both with beak-like palpi, and a long oblique line running to the tip of the fore wings, which have two small central white spots.

Antennæ of the male large, stout, very conspicuous, pectinated with long, closely-set teeth, which are regularly curved inward at their tips, the rows inclining toward each other; reddish-brown; palpi long, projecting forward like a beak, and, with the head, clothed with long purplish-brown scales; thorax broad, thickly covered with long scales, purplish-brown in front, reddish-chocolate shaded with yellow behind the collar; abdomen moderately stout, covered with fur-like red-brown scales, which also form a considerable anal tuft. Fore wings oblong, costal margin rather hollowed before the middle, rounded beyond; apex bluntly angulated, almost squared; hind margin at first perpendicular, but from the middle rounded off with a full sweep to the dorsal margin; dull ochreous, or yellowish buff, much clouded with rich reddish-chocolate along the costal, apical, and hind marginal regions, and through the middle area; first line slender, nearly perpendicular but slightly bent in the middle, red-brown, not conspicuous; second line sharply marked and distinct, arising on the dorsal margin before the middle, and proceeding with a smooth curve to the apex, dark chocolate edged outwardly with purplish; outside this, from the dorsal margin to near the apex, is a curved series of dark brown crescents placed between nervures; at

the end of the discal cell is a rounded, lunate, or irregular white spot, edged with dark brown, and usually having a dark brown centre; above it a smaller white spot also ringed with dark brown; cilia yellowish-chocolate, darker at the tips, and very faintly scalloped. Hind wings purplish-chocolate, with a paler dash at the base; nervures slightly dark; and a very faint transverse darker chocolate shade before the middle, not always visible; cilia long and dense, yellowish-chocolate.

Female usually much larger and stouter; antennæ short but distinctly toothed, yellowish-brown; palpi long, protuberant, and like a conspicuous beak, covered, as are the head and thorax, with dense yellowish-drab or brownish-ochreous scales; abdomen very stout, thickly covered with shorter dull yellowish scales, anal tuft small. Fore wings longer and much larger than in the male; costa more rounded; apex more pointed; hind margin more oblique; pale drab, pale ochreous, rich ochreous, or buff; spots and lines as in the male, but without the marginal clouding of purplish or reddish-chocolate; nervures reddish, distinct; and sometimes a slight shading of reddish near the middle of the wing, more especially outside the long, oblique second line; cilia rather sinuous or faintly scalloped; yellowish, sometimes tipped with brown. Hind wings pale drab varying to ochreous, with a distinct, transverse, purplish-brown shade in the middle, and sometimes considerable clouding of the same toward the hind margin; cilia pale ochreous.

Underside of the wings of the male dull pale brownish-ochreous, generally shaded with chocolate, with a cloudy chocolate stripe from the apex of the fore wings to the middle of the dorsal margin, and another across the middle of the hind wings; cilia yellowish, dappled in the fore wings, with dark chocolate, and appearing decidedly scalloped; body and legs reddish chocolate, densely covered with scales. Of the female, pale buff or pale ochreous, with the transverse stripes faintly brown and all the nervures conspicuously brownish ochreous; body and legs of the same colour.

Much variation exists in the males, in the degree of dark clouding of the fore wings, and some difference also in size, those from the fen districts of Norfolk being particularly large, and also very coarsely scaled. In the fens and adjoining districts of Cambridgeshire, where the insect is extremely abundant, a form of this sex is occasionally found which is wholly of the pale yellowish buff of the female, or even of a still whiter buff, and in some instances these have the nervures tinged with steely grey. Mr. H. Goss has also obtained this form at Brighton. In specimens in which the dark chocolate colouring is much extended over the wings there is often a straight narrow streak or patch of the paler colour from the white central spot toward the second line; this, with the white spot, shows a curious resemblance to a bull's-eye lamp and the stream of light proceeding from it. In still darker specimens this disappears, and in the extreme west of South Wales examples are occasionally obtained in which the whole of the fore and hind wings are of a deep rich glossy purplish-chocolate, except the white spots, and even these are apt to be diminished, one of my specimens having no trace of the upper, and only one-half—forming a crescent—of the lower. Some of these specimens, moreover, have the nervures of the fore wings very conspicuously blackish. Similar forms have been obtained from the coast of Sussex, but not commonly, and Mr. W. H. B. Fletcher has some from Sutherlandshire. In Lancashire is a variety of a peculiar reddish chestnut colour with no tinge of purplish. Variation in the female hardly follows that in the male, being mainly confined to increase of the darker shading outside the long second line, with occasionally some brownish colouring near the costa; the hind wings also become darkened outside the transverse shade. These forms occur more particularly in the western districts, and on the south coast, near the sea. In Mr. S. Webb's collection are two females of a very curious dull umbreous drab; and Mr. S. Stevens has one of a dull dark chocolate-brown, almost as dark as any male, also

another of the normal colour, but devoid of the long oblique transverse line. He has besides a very striking looking male with a large white central spot placed in a dark costal blotch.

On the wing in July and August.

LARVA large and conspicuous, of even thickness, with numerous small tufts of hairs. Head rounded, pale grey much striped with yellowish; body dull grey, dusted with minute whitish atoms, and plentifully sprinkled with yellowish dots and small spots; covered with short fine soft hairs of a reddish brown; two tufts of stronger, longer, brown hairs on the second segment; a still longer and thicker upright tuft on the twelfth; and a double row of short black tufts down the intermediate dorsal region. Along the spiracular region is another series of tufts of hairs, quite white, and pointing obliquely downward so as partially to conceal the feet; legs brown; prolegs rather spreading, dark grey; under-surface blackish. When it falls from its food, tightly coiled, the white lateral tufts form a complete and conspicuous ring. When young the colours are brighter and the dorsal region has blue spots instead of black tufts; the second segment then is expanded on each side and furnished with longer hairs.

August to June, on *Dactylis glomerata* and other coarse grasses, also on various species of *Poa*, including *P. annua*. It hibernates when about an inch long; and, in both autumn and spring, loves to extend itself on a grass culm in the sunshine; indeed it is, at all ages, quite conspicuous upon the grasses. It is also very fond of water, and will eagerly absorb a drop of dew, or water sprinkled on its food plant, and thrives better if so supplied. On the other hand, if shut up in any close tin box or other impervious vessel it perspires violently, and if a number of larva are so shut up they become drowned by saturation of the spiracles. Its common English name is "The Drinker;" its specific name indicates the same habit.

PUPA thick, rounded, obtuse in front and rather blunt behind; brown. In a spindle-shaped cocoon of tough yellow silk, attached to a thick grass-culm or other stem or stick, usually near the ground, but often quite conspicuously. This tough cocoon is lined within with looser softer silk. It is strongly fixed to the culm, or stem, remains attached long after the departure of the moth, and in some districts is quite one of the common objects of the hedge banks.

The moth flies only at night; the male with great vigour after dark, and till midnight, or later, coming with extraordinary persistence and determination to a strong light. The powerful lamps used for collecting in the fens attract these moths in such numbers that rarer species are beaten off, and some method of abating the nuisance has to be found. This is not easy, since (like *Arctia caja*) they are quite indifferent to a hard pinch, and it is almost impossible even to crush them on the soft, wet, fen mud. The female rarely comes to light, and is not often seen on the wing; being heavy, her flight is rather slow, and her time appears to be occupied in sticking her eggs, a few at a time, in conspicuous, irregular clusters, on the culms of the taller grasses.

Both sexes may be found sitting on hedge banks, or hanging to dead grass stems among the bushes, in the daytime, but may easily be passed over as withered leaves, the long curved second line of the fore wings closely resembling the midrib of a leaf, while the colour in each sex, the shading in the male, and the lines on the nervures in the female, greatly enhance the deception, but the female is decidedly the more conspicuous in such a situation.

Common in lanes almost everywhere, and on grassy banks, also plentiful on sea sandhills, but not often found in fields except close to the hedges. Very plentiful in the south of England, though less so in the extreme west of Wales, scarce in some parts of the Midlands, but found in most suitable places throughout the country to Yorkshire and Lancashire

at least. Also far from uncommon in the western half of Scotland, even to Sutherlandshire, much scarcer in the eastern half, and in Aberdeenshire and the Forth district very rare. Local in Ireland but widely distributed, occurring in Wicklow commonly, also in Galway, Tyrone, Armagh, at Enniskillen, and commonly at Londonderry.

Abroad it is common in Central Europe and also found in Piedmont, Sweden, Finland, Southern Russia, Siberia and Tartary. The pale variety of the male, already described, has been received from Japan, and has been named *Askoldensis*; while the rich dark chocolate-coloured form of the male, precisely as obtained in Pembrokeshire, but with a still more extreme variety of female—rich chocolate-red with the two white spots expanded into handsome silvery-white blotches—is named *albomaculata*.

Genus 7. **GASTROPACHA.**

Antennæ pectinated with rather short thick teeth in both sexes, palpi projecting in front like a short beak; tongue small, functionless; thorax and abdomen very stout, the latter tufted behind in the male, more pointed in the female; fore wings ample, hind wings short but very broad, both scalloped at the hind margins.

1. **G. quercifolia**, *L.*—Expanse of male $2\frac{1}{4}$ to $2\frac{1}{2}$ inches, of female 3 to $3\frac{1}{2}$. Wholly dark purplish-red, fore wings with three scalloped transverse lines, hind margins all scalloped.

Antennæ rather short and thick, strongly curved back; closely pectinated with rather short stout teeth of nearly equal length in both sexes; teeth black-brown, shaft black. Palpi long and porrected, black, the base covered with the long scales of the head, which are of a chocolate-brown; thorax very stout and strong, densely covered with compact, bright chocolate-brown scales, often with an indistinct

blackish stripe down the middle of the back, and sometimes with another along the margin of each shoulder-flap. Abdomen long, moderately robust in the male, very large and stout in the female; reddish-brown, clouded with dark chocolate; densely covered with rather long scales, which are longer in a lateral ridge; anal segment with a rather large, similar tuft in the male, and a small conical one in the female. Fore wings of a long ovate shape, with a very long curved costa; apex bluntly angulated; hind margin strongly curved and deeply scalloped between the nervures, the last excavation running far into the dorsal margin, which is otherwise extremely short, and rather rounded; deep rich chocolate-brown, dusted with reddish-brown, slightly clouded with blackish toward the costa, and with rusty-red along the dorsal margin; first line blackish, rather short, deeply elbowed and repeatedly angulated; second line slender, blackish, formed into a complete series of crescents between nervures, extending from the middle of the dorsal margin, in a direction parallel with the hind margin, to near the costa, where it makes a short elbow back before curving to the costal margin; beyond this line is a regular row of slender purplish-black crescented shades, nearly parallel; outside which the space before the hind margin is tinged with a more purplish-chocolate; at the end of the discal cell, which is short, is a black spot, streak, or lunule; nervures rust-red, not conspicuous; cilia reddish-brown. Hind wings rather short but with the portion from the base along the anterior margin strongly arched so as to protrude in front of the fore wings when they are closed, and so form a considerable flap or *lappet*, from which the moth receives its common English name; hind margin rounded and deeply scalloped between the nervures; purplish-chocolate, anterior margin more rust-red; base and middle often clouded with dark brown or blackish; across the middle are two ill-defined blackish stripes, more distinct in the female; the space between them often clouded with blackish so as to form a

faint cloudy band ; cilia red-brown. Sexes very similar, but the female by far the larger.

Underside red-brown, nervures more rust-red, costa clouded with blackish ; but in the female this colour is extended broadly over the under-surface of the wings ; a blackish central shade, or stripe, passes rather directly across the middle of both fore and hind wings, and sometimes a second appears nearer the hind margin of the hind wings ; cilia as on the upper side ; body and leg-tufts red-brown tinged with smoky-black ; legs black.

Very constant in markings and rarely variable in colour, but in the collection of Mr. S. Stevens is a very light brown specimen and another of a pale buff with the lines and shades grey. Occasionally it is suffused with smoky-black.

On the wing in June and July.

LARVA rounded, hairy, much flattened beneath, with fleshy protuberances on each segment in a line with the bases of the legs and prolegs, and emitting long hairs in a downward direction ; incisions of the segments, and the sides, wrinkled ; second and anal segments attenuated ; twelfth segment with a small dorsal hump ; head small, rounded, and hairy ; the whole of the body covered with moderately long and downy blackish hairs. Head dark grey, dusted with ochreous ; body dark grey dusted with blackish, incisions between the second to fourth segments blue-black ; on the fourth to the eleventh segment is a series of pairs of whitish, oblique, wedge-shaped, dorsal dashes, each dash preceded by a dull orange spot ; base of the hump on the twelfth segment shaded with dull orange ; undersurface orange, spotted with black, with a shining black spot on each segment. The lateral tubercles are paler below, and the hairs emitted by them form a fringe to the sides of the larva (C. Fenn). When young more dull in colour. Sometimes in the adult larva the ground colour is more reddish-brown with the sides grey, or the dorsal region is rippled with paler shades.

July to May on hawthorn, blackthorn, willow, buckthorn and various fruit trees; hiding upon the bark, generally low down, in the day time, crawling up to feed at dusk, and feeding through the night. It feeds but slowly during the autumn, and, while still rather small, hibernates upon the stem of its food plant. Mr. W. Holland writes: "I had some trouble to point them out, so well had they disposed themselves for the winter. They placed themselves straight along the twigs head downwards, spun a little silk to hold themselves firm, and, being so very flat beneath, laid so close to the twig as to look like a part of it. They are not easy to find even when fully grown, they are so much like the twigs and lie as closely along them as ever. They hide often inside a clipped hawthorn hedge where it is impossible to get at them." Another observer compares the young larvæ to bits of dead ivy stem, left clinging to the bark, the lateral protuberances imitating the pseudo-rootlets of the ivy. The well-grown larva, when stretched upon the bark of a fruit tree, has even been mistaken for a piece of discoloured string, such as that with which the young trees are tied to their supports.

Sometimes the well-grown larvæ are ornamented with whitish blotches, especially on the dorsal region. Upon this a most interesting experiment has been made by Professor Poulton. He divided a batch of eggs of this species, and fed one portion of the young larvæ on food plants of ordinary character, but the other portion on similar food, the stems of which were crusted with grey lichens. The larvæ of the first batch grew up of the usual dark colour, only one showing some indication of white blotching; but the larvæ fed up among the lichen-covered twigs were nearly all blotched with white, many most beautifully and extensively so. To produce this result, it appeared to be necessary to expose the larvæ to this peculiar influence when very young; a removal of those on the bare twigs, when older, to twigs covered with lichen, was productive of no observable result.

PUPA stout, rounded, somewhat blunt behind, black-brown thickly covered with a whitish bloom. In a long loose tough cocoon, of dark grey silk and larval hairs, fixed strongly to the stem of its foot-plant, among twigs pretty close to the ground, or in any densely thick shelter.

The moth flies only at night and is rarely seen on the wing, but the male is readily attracted by a strong light, and may occasionally be found on a gas lamp in the outskirts of a large town. When at rest its resemblance to a brown leaf is extraordinary; the projecting portion of the hind wing looking like an oblique side of the leaf, the costa of the fore wing like the midrib, and the remainder of the fore wing most admirably simulating the veined and clouded surface. Probably from this reason, combined with somewhat concealed habits, the moth is rarely seen at large in the daytime. The vast majority of cabinet specimens are reared.

Most common in the fens of Cambridgeshire, but widely distributed; rather frequent near Reading and elsewhere in Berks, and at St. Ives, Hunts; and may be found in all the southern counties, to Norfolk, Gloucestershire, Worcestershire, and Herefordshire; scarce in South Staffordshire, and very rare in Yorkshire. Apparently absent from Scotland and Ireland. Abroad it is found in Eastern, Central, and Southern Europe, including Spain; also in Finland, Bithynia, Armenia, Siberia, Tartary, and various parts of Asia Minor.

2. *G. ilicifolia*, *L.*—Expanse $1\frac{1}{2}$ inch. Leaf-like; dull reddish or purplish-brown, with two indistinct pale stripes, and scalloped margins.

Antennæ rather slender, not very short nor strongly curved, regularly pectinated in the male, and more shortly so in the female; light brown. Palpi rather short, forming a very slight beak; head and thorax densely clothed with light, or dark, brown scales; abdomen moderately stout, paler brown, anal segment tufted. Fore wings elongated

and rather narrow in the male, more ovate in the female; costa but slightly curved; apex pointed; hind margin long and obliquely rounded, regularly scalloped between the nervures; dorsal margin deeply excavated near the anal angle, rounded in the middle; light chestnut-brown; first and second lines dark brown, regularly indented on each nervure; starting near together on the dorsal margin and running almost parallel to near the costa, where the second line bends a little outward and almost touches the outer side of a dark brown or blackish lunule situated at the end of the discal cell, thence passes to the costa; a pale shade lies between these lines and forms a rather squared spot behind the lunule; half-way between the second transverse line and the hind margin, and parallel with the latter, is a regularly indented and scalloped dark-brown transverse line, edged broadly inside with pale brown or whitish; outside this the hind-marginal region is pale purplish grey. Hind wings rather narrow, except where the anterior margin is arched so as to project in front of the closed fore wings; apex excavated; hind margin rounded and deeply scalloped between the nervures; pale purplish brown, with the dorsal margin broadly paler or whitish, and a broad ill-defined whitish central transverse band. The scalloped margins of all the wings are sharply marked with a slender rich brown line, projecting at the tips of the nervures; between these the cilia are white. Sexes much alike, the female rather the larger.

Underside of all the wings whitish tinged with purple-brown, and having large, lighter brown clouds toward the front of all the wings; cilia white, with a brown basal line; body and legs light brown.

Apparently not variable with us. Continental specimens usually have a tinge of bluish over the central portion of the fore wings, which seems absent in all those obtained here.

On the wing in April and early in May.

LARVA cylindrical with rather prominent prolegs; covered

with short soft hairs which are most abundant above the legs; head round, light bluish-grey; body bright red-brown, barred on the segmental divisions with blue-grey, each bar divided, lengthwise and across, by black lines, and having on its front portion a large black central blotch. Front of the second segment inflated into yellowish folds; spiracular region dotted with black; legs and ventral prolegs blue-black; anal prolegs dark brown. Or rust-red, with two large white spots on each segment; the dorsal line black and expanded on each segment; or even with the white spots almost united into subdorsal stripes, shaded with bluish grey.

June to August on *Vaccinium myrtillus*; abroad, found feeding also on various species of willow and sallow.

PUPA thickest across the wing shoulders, with the head portion narrower; rounded, blunt, and rounded off behind; bluish-black shaded with brownish. In a rather large yellowish-white cocoon among the stems of its food-plant. In this state through the winter.

Very little is known of this insect here. The moth flies only at night, and sits on its food-plant, or on heather, by day, bearing a most accurate resemblance to a withered leaf. So close is this mimicry that the first recorded specimen was only found through the discoverer happening to kneel down close by it to pin a small *Tortrix*. This occurred in 1852, on the extensive moors of Cannock Chase, Staffordshire. About the same time larvæ are said to have been found on moors near Sheffield and Ripon, Yorkshire. Further captures of larvæ and even of pupæ in these two localities are on record in 1855-56-59-60 and 61 and a rather unusual number in 1857 at Cannock Chase, where also single larvæ were found so recently as 1879 and 1882. Respecting this species Dr. R. Freer, of Rugeley, writes me: "I hear that at one time the larvæ abounded on the bilberry (*Vaccinium myrtillus*), and were very easy to find. Pupæ, spun up in the bilberry and

adjacent heather were taken fairly plentifully in the winter, and imagines sitting on adjacent palings were occasionally met with. Its range was very restricted; a square patch on the extreme corner of the chase on the Rugeley side, with a half mile side, being the only place it was found in. In the year 1879, when a school-boy, my father told me of this moth, I having just begun to collect Lepidoptera. Mr. W. A. Bonney, now deceased, told me where they used to get it. I went up one day, and as far as I can recollect found three larvæ without much difficulty. I did not realise their value and took little trouble with them, so that they escaped in some way. In 1882 I went up again and found one larva; my brother found another and we succeeded in rearing one imago from these, which is still in my collection. From this time till 1886 I did next to nothing in collecting, but in that year I went up hoping to find *ilicifolia* again, when I found that the sacred acres were sacrificed to a fir plantation. A search in the plantation produced nothing, and subsequent searches no better result." From the habit of this species, of remaining in the pupa state through the winter, and with the cocoon so imperfectly concealed, it must be unusually exposed to the attacks of its foes, hence doubtless its extreme rarity in this country, and hence also the risk that it may have become exterminated in the district which has been so often and so perseveringly searched for it. But suitable localities are numerous, and so extensive in the northern hill districts, that there is still hope of its re-discovery. In the year 1864 a larva, believed to be of this species, was found near Lynton, North Devon, but was not reared. I know of no additional localities here. Abroad it is found in most parts of Central Europe, in Sweden, Finland, Piedmont, and in the Altai district of Siberia.

(*Eutricha pini*, L.—This large and handsome species—of a more purple-brown and with a distinct white spot in the fore wings—was formerly supposed to be native to this

country. A fine male was actually captured in Norwich in 1809, but was, most likely, accidentally introduced. A larva, supposed to be of this species, found upon hawthorn at Richmond at a still earlier date, was doubtless one of the marbled varieties of that of *Gastropacha quercifolia*. It was not reared. The species under consideration feeds upon pine, and is sometimes so abundant in pine forests on the Continent as to be a destructive pest. There is no reason to suppose it to be a British insect.)

Family 11. ENDROMIDÆ.

Genus 1. ENDROMIS.

Antennæ pectinated in the male, slightly so in the female; palpi hardly perceptible; tongue atrophied; thorax and abdomen stout, thickly clothed with very long silky scales; fore wings broad, oblong, variegated, thinly scaled.

LARVÆ without hairs, sphingiform.

PUPÆ smooth and rounded; in a soft slight cocoon.

1. *E. versicolora*, *L.*—Expanse of male $2\frac{1}{2}$ inches; of female $2\frac{3}{4}$ to 3 inches. Rich bright brown, with black transverse lines, and red-brown and white blotches; female larger and paler.

Antennæ of the male rather short and stout, very strongly pectinated, the long teeth lying obliquely forward; shining black. Head densely covered with scales, red-brown, with the palpi paler, and very inconspicuous; collar broadly white with a reddish tinge; thorax thickly covered with long, loosely erected scales of a rich red-brown; shoulder flaps edged with whitish-brown; abdomen moderately stout, thickly covered with long loose red-brown hair-scales, which are very silky and lie in no special direction; anal tuft similar, broad and fluffy. Fore wings ample, elongated,

almost oblong, with the costa faintly curved, apex blunt, hind margin rather straight and oblique; anal angle rounded off; and dorsal margin gracefully curved; pale fulvous, with a white tuft at the base; first transverse line thick, black, rather oblique, edged toward the base with white; second line also black, slender in the middle, thick toward both margins, strongly elbowed outwardly above the dorsal margin, then curved up and proceeding almost straight to the costa, where it is edged on the outside with white; between these lines, at the end of the discal cell, is a large oblique black lunule and the central space is also varied with several whitish clouds; at the anal angle is a wedge-shaped dark chestnut blotch, and above it the hind marginal space is varied with whitish dashes on the nervures; placed in an oblique series from the apex of the wing are three wedge-shaped pearly white spots; cilia extremely short, chestnut brown, except where the white streaks on the nervures spread out on the margin. Hind wings rather elongated and somewhat squared at the apex, with the hind margin rounded; bright fulvous, with a distinct, central, transverse, slender, dark brown stripe, much curved in its course; toward the anterior margin, nearer the base, is a large faintly brown lunule; outside the transverse stripe on the anterior margin is a dark brown blotch followed by two white spots; sometimes fainter tawny, or even blackish, clouds form a sort of band, parallel with the central stripe, across the wing; cilia very short, fulvous, sometimes with brown dashes or white clouds.

Antennæ of the female shorter, regularly pectinated with very short teeth, thorax broader, and abdomen much stouter than in the male, the former paler brown, the latter dark brown, much obscured with an abundance of long whitish-brown scales, and having no distinct anal tuft; fore wings similar in markings to those of the male, but longer, larger and much paler, being of a delicate pale yellowish fulvous, much variegated with whitish clouds, but more tawny at the

base; the markings all broader and the pale ones whiter. Hind wings whitish tinged with faint brownish; nervures pale brown; central transverse stripe dark brown, but in some instances hardly visible; outside it is the dark brown blotch followed by two white blotches toward the apex, and a faint, connected row of pointed dashes of a tawny colour.

Underside of the fore wings of the male dull pale tawny, with the transverse lines and central black spot indistinct and the whitish clouding absent, but the white sub-apical spots very distinct; hind wings brighter tawny, with the anterior margin whitish, the central transverse stripe, and another near the base, both black, central lunule blackish, and the brown and white apical blotches conspicuous; besides these there are faint dark-brown clouds near the hind margin; legs black; leg-tufts and body fulvous, except the abdominal portion, the centre of which is whitish. Underside of the female a repetition of the upper, but fainter in the fore wings, more distinct in the hind.

Variation appears to exist only in the intensity of colour and of clouding, but in some individuals the darker clouding is almost absent. In the collection of the late Mr. H. Doubleday is a very dark male; and in that of Mr. F. Bond a female with the hind wings nearly white. As a rule specimens from Scotland are of deeper, richer colour than those from the South of England.

On the wing in April, or even sometimes at the end of March, but in the north as late as the beginning of May.

LARVA much like that of a hawkmoth. Smooth and naked; stout behind, but tapering from the sixth segment to the head, which is quite small; twelfth segment with a singular pyramidal upright tubercle. Head pale green with white stripes; body pea-green with a slender, darker green dorsal line, and, sloping away from it, a series of broad oblique yellow dorsal stripes, edged with dark-green lines, proceeding half way down the sides, or even, in some cases, as yellow

stripes, quite to the prolegs. A broader and whiter stripe from the side of the head continues along the sides of the next three segments. On the twelfth segment one of the yellowish oblique stripes is followed by a broad deep yellow one, pointing towards but not reaching the anal prolegs; from this a curved yellowish stripe proceeds upward to the apex of the tubercle; legs pale greenish; prolegs very large, deep green with the feet crimson. Spiracles white, edged with black; spiracular region broadly and plentifully sprinkled with black atoms.

When very young the larva is black with dull greenish dots; after the first moult dull green dotted considerably with black; at the third moult paler green. Up to this stage it is gregarious in small companies. From this stage the black dots disappear as the adult colouring is assumed, and the larvæ gradually scatter, to feed separately, preferring the shade.

End of May to the beginning of July, on birch.

PUPA dull brown; head portion projecting forward with a rim-like edge, front of thorax concave, the leg and antenna covers lying very closely in the hollow; dorsal portion extremely convex; incisions of abdominal segments very deep; anal segment with a conical projection; dorsal portion of the abdominal segments covered with fine bristles. In a strong tough cocoon of large size, composed of a network of silk, through which the pupa is plainly visible. This cocoon is concealed by being covered with moss. Mr. Buckler says that about a week or ten days before the time of emergence the cocoon is pushed by the pupa from a prone to a vertical position, the upper end of the cocoon is ruptured and the pupa protrudes its head through the opening and continues to advance until it is exposed as far as the end of the wing covers and remains thus until the insect emerges. For this purpose the bristles on the abdomen are admirably fitted in connection with the very free and mobile segments.

In pupa through the winter, sometimes remaining so over a second winter, or even longer.

The male moth flies in the morning sunshine, and till about midday. At other times it and also the female sit upon the birch twigs or on heather, sometimes among the latter rather low down. Mr. W. Holland's remarks, from personal observation, are well worth quoting: "They are stupid, sleepy things, till the sun gets well up. Until about 10 o'clock or 10.30 A.M., I find the males hanging on the birch twigs just as the females do, in a loose-looking way as though trying to make themselves as much like dead leaves as possible. If this is their object they certainly succeed. They only *appear*, however, to hang loosely, for their legs are clasped quite round the birch twigs with a firm hold, but they allow me to pull them off like dead things. After 10 o'clock they begin to fly, and are then very active, flying swiftly in the sunshine, rather high, but in an undulating manner which now and then brings them within reach of the net; if missed they dodge or hasten their pace. I never netted one after noon, but found them at rest again on the twigs as before, or occasionally on the heather. I have not yet seen a female on the wing."

Mr. W. H. Tugwell, writing a good many years ago, said: "There is a peculiarity in the flight of this species which I have not noticed in any other, at least to the same extent. If struck at and alarmed they rise up in the air at a most furiously rapid pace, nearly perpendicularly, and continue their ascent till beyond the power of vision; the first and second time that I saw this I certainly was astonished." As I have no personal acquaintance with this species in its wild state, I quote the observations of those more fortunate in this respect, with peculiar pleasure. In an admirable paper upon this species in a very early volume of the *Entomologist*, by Mr. G. Gascoyne, of Newark, which is far too long for reproduction here, details with regard to the larva are given, which

have been repeatedly confirmed, and which are worthy of close attention. The eggs are placed in short double rows on a twig of birch and are most accurately of the brown colour of the twigs. The larvæ when hatched are, as already stated, black; they sit in little companies, when not feeding, upon the bark of the twigs. Now the twigs of birch are peculiar in having curious little black roughnesses, running into little pointed eminences. Mr. Gascoyne says: "All are now assembling near the tip of the twig to repose, ere they commence feeding; when at rest they adhere by the claspers, the anterior part of the body being erect; they closely resemble in colour, shape, and size those little black stumps so common on the twigs of the birch." But as they feed they grow, and obviously the resemblance to the "little black stumps" would soon be useless; so when they have cast the first skin they appear with a dull green colouring, the black colour only existing as small spots. "The larvæ are now become of a dull green colour, and as they sit in groups, have a remarkable resemblance to bunches of the birch-catkins; it requires a practised eye and close observation to distinguish one from the other." A second moult takes place, after which the larvæ "becoming too large to derive security from their resemblance to the catkins, disperse; their attitude and colour daily assume more resemblance to a leaf." As they become large the resemblance to a half-opened leaf—the side-ribs represented by the oblique stripes of the larva—is something remarkable. The result of this series of protective resemblances is, in due time, a moth which, whether male or female, is so close an imitation, when at rest, of the position and colour of a dead leaf or bunch of leaves that no one, except from close examination, would suspect it to be anything else. There seems to be, in this life history, food for much thought.

During the time of flight the males can be attracted in numbers by means of a freshly emerged female; they are then most reckless, dashing into the heather, or the birch trees, to the great damage of their wings. Upwards of a

hundred have been captured by this method in a very few days. The female soon commences to lay her eggs, clinging to a birch twig from below, and probably flying but a short distance, to another suitable twig; but she is never, I believe, seen on the wing by day.

An exceedingly local species; it has been found commonly at Tilgate Forest, Sussex, also at St. Leonard's Forest, and near Petersfield, in the same county; probably in Surrey, though the one specimen seen was not captured; in Berkshire, not uncommonly; formerly in several parts of Suffolk, but apparently now extinct in that county; in Herefordshire, formerly in Worcestershire, and still existing in Wyre Forest. In 1857 a specimen was taken at Monmouth; it is also found rarely in Devon and Somerset. In Scotland, more plentiful, large numbers having been, in favourable years, obtained in the Rannoch district of Perthshire, and in the Altyre Woods, near Forres, Moray; and smaller numbers elsewhere in Aberdeenshire, Kincardineshire and Argyleshire. The record by Mr. E. Birchall of the larva at Powerscourt, Co. Wicklow, Ireland, was, in all probability, an error; it has never been confirmed. Abroad this species is found throughout Central and Northern Europe, and in North Italy, but is not generally common.

Family 12. **SATURNIDÆ.**

Antennæ pectinated in both sexes, in the male very broadly and oppositely so; thorax and abdomen very stout, densely covered with long soft scales. Fore wings usually elongated at the apex; all the wings very broad and ample, usually with ocellated, or diaphanous, spots, or both.

LARVÆ with rows of divergent tufts of bristles.

PUPÆ broad and short, in dense, strong, silken cocoons.

It is to this family that belong most of the large and

handsome—in some cases magnificent—species, of which the silk of the cocoons is used, or suggested, for the manufacture of the stronger silk materials; many of them have transparent, window-like spots on the fore wings, which are not visible in our one species.

Genus 1. SATURNIA.

Antennæ pectinated in both sexes, very broadly so in the male, each joint having two pairs of long teeth; tongue minute, functionless; thorax and abdomen robust, wings broad, having ocellated spots; fore wings elongated.

1. *S. carpini*, *W.V.*; *pavonia*, *Staud. Cat.*—Expanse of male $2\frac{1}{2}$ to $2\frac{3}{4}$ inches, of female $2\frac{3}{4}$ to $3\frac{1}{4}$. Dark, or pale, purplish grey, with a large dark eye-spot in the middle of each wing.

Antennæ of the male rather short, stout and straight, strongly pectinated with very long teeth, the rows of which stand apart in nearly opposite directions and form a beautiful object, the teeth on each side being arranged in pairs, each pair connected by delicate rows of fine curved hairs; light brown. Head small, dark brown; collar broad, greyish-white or snowy-white; thorax broad and strong, densely covered with long fur-like golden-brown scales; abdomen short, not very stout, but tapering, similarly covered with dark golden-brown scales; anal tuft very small. Fore wings long and broad, with the apical portion extended; costa slightly hollowed in the middle but rounded beyond with a long curve sweeping smoothly quite round the apex down the hind margin, which also becomes slightly hollowed in the middle, then swells into a full curve which passes round the anal angle to the dorsal margin; colour dark purple-grey, exceedingly rich looking, minutely stippled, in a transverse direction, with paler dots and short lines; first transverse line somewhat broad and ill-defined, rather oblique, black,

edged on the inner side with a purple-red or red and white stripe, which again is edged by a black stripe, shaded off towards the base of the wing; second transverse line very long and oblique, black, regularly scalloped between the nervures, edged outwardly by a slender purple-red or reddish-white stripe, and this by a black line which disappears toward the costa; apex occupied by a large blotch of purple and yellow which partially encloses a large black spot on the costa. Between the first and second lines, lying in, and dividing, a long white blotch, is a large round ocellus or eye-like spot, black, irrorated with blue-black, and enclosing a complete yellowish ring, inside which is a pupil-like streak of silvery-white, and outside it a greyish half ring. Beyond the second transverse stripe, and parallel with the hind margin, is a white stripe, indented at the inner edge, and sharply defined. Margin pale golden brown, or grey tinged with yellow. Hind wings long and not very broad, apex rounded, hind margin rather straight, yet a little bent in the middle; anal angle squared and prominent; dorsal margin rather hollowed, and clothed, as is the base of the wing, with long golden-brown hair-scales. Colour yellowish-orange or orange-brown, with a large central ocellus similar to that upon the fore-wings; before it is an irregular and much-curved cloudy black-brown transverse line, often indistinct; beyond the ocellus another line, slender, scalloped, and indented; outside which is a broad blackish transverse stripe which does not attain the costal margin; base and dorsal area clouded with blackish-brown; hind margin shaded with purplish red; nervures brownish; cilia of all the wings extremely short, dark brown.

Female much larger and paler; antennæ short, pectinated with short stout teeth, which are not placed on opposite sides of the shaft as in the male; light brown. Collar broadly white; thorax very stout, covered with long fur-like dark-brown scales; abdomen extremely stout and broad, dark-brown with transverse whitish stripes. Wings all

broader than in the male. Fore wings ample and with the apex proportionately less produced; delicate pale purple-grey, stippled all over with paler grey; the white colour of the collar is continued a short distance along the costa and shades off to grey, and the remainder of the basal space is filled by a large dark brown blotch; markings similar to those of the male, but broader and paler and more diffused, except the ocellated spot, which is larger, but equally dark and conspicuous. Hind wings also with markings arranged as in the male, but the ocellated spot is preceded by a large lunate white blotch, and the ground colour is white or yellowish tinged with grey; nervures cloudy grey.

Underside in both sexes similar to the upper, but paler, more of a yellowish-fulvous in the male, pale purplish grey in the female, but the hind wings in the male are of a rich purple-crimson, with the space in which the ocellated spot is situated white or whitish and the pale stripe before the hind margin also white. Body and legs dull brown or whitish, but in the female the abdomen is banded with white. This is one of our most beautiful and striking British insects.

Variation in this species is mainly, in both sexes, in the degree of purple-red, or almost crimson, shading, and in the general depth of colour. It seems to be somewhat climatal, since specimens from the southern counties of England are usually richly and warmly coloured, the females especially showing beautiful reddish-purple stripes and shading; while those from the heaths of the north are of more dull or pale colouring. Every possible intermediate shade occurs, and specimens from the eastern fen districts are provided with proportionately large white blotches. In the collection of the late Mr. F. Bond is a male devoid of the ocellated spots, the large white blotch of the fore wings being continued unbroken along the central space; this was reared from a larva found feeding on sallow in Cambridgeshire. Another reared by him, and now in the National collection, is totally devoid of scales on the wings. Mr. H. Doubleday had male specimens

in which the margins of the hind wings were pale and almost without markings ; in the collection of Mr. S. J. Capper is one having the pupils of the eye-spots placed rather awry, giving the expression of a squint ; another of a dark smoky-grey with paler markings ; and others having the edges of the eye-spots somewhat angulated ; in Mr. A. H. Clarke's collection is a female, obtained at Tunbridge Wells, entirely of a smoky-black with still blacker markings ; Mr. R. Newstead reared, from a larva found in North Wales, a female of a remarkably rich dark colour, with deep red stripes ; and a somewhat similar specimen has been reared by Mr. W. Holland in Oxfordshire.

On the wing in April and the first half of May—rather later, or even into June, in the North.

LARVA cylindrical, but with the segments deeply divided, each being rounded, and crowned by a transverse row of conspicuously raised spots of large size, from each of which arise a few stiff divergent bristles. Head rounded, deep green, sometimes streaked with black ; body rich bright green, sometimes a little paler at the sides and with a vaguely indicated spiracular pale stripe ; tubercles bright yellow, pink, or purplish, ringed with black, either separate, or joined across the back in rows by a black line, or situated in a broad transverse black stripe ; legs and prolegs green. When full grown a remarkably beautiful larva. When young black, and hairy or bristly, with orange spiracular lines ; at about half growth, black with dull orange rings in which the black tubercles are situated. Gradually as it grows and moults the orange rings broaden, become dull yellow, brighter yellow, green, darker and lighter, until the adult colour is assumed. Occasionally, however, the black ground colour is maintained throughout. Mr. C. W. Watts has found such specimens, full grown, but deep black, with the usual bright coloured tubercles, among those of ordinary colouring, near Belfast ; and others are on record.

June to August on bramble, heather, willow, raspberry, hazle, hornbeam, blackthorn, birch, alder, the two common species of *Erica*, *Spircea ulmaria* and *Lythrum salicaria*. Although so easily satisfied as to food, it is not very easy to rear, but must be allowed plenty of air and sunshine.

PUPA rather flattened, very broad, dark brown, broadest across the middle; bluntly rounded in front, but with roughnesses indicating the shape of the head; antenna cases very strongly marked, and in the male showing the shape of the long divergent pectinations on both sides of the shaft; wing cases broad and distinct, abdomen rather short; anal segment with a large conspicuous scutcheon of minute hooks in rings, and behind it a line of long straight black bristles.

In a singular flask-shaped cocoon of the toughest, firmest silk cemented together into a hard, thin, brown case, but produced at the top to a sort of blunt point, where ends of firm silk threads, all pointing together, make an opening from which escape can be effected without rupture of any part of the cocoon, but which fit so closely together at the points that no ingress can be obtained. Spun up near the ground, at the bases of the heather stems, or among brambles or other close undergrowth. Well concealed and remaining in this state through the winter.

The male of this beautiful species is extremely active in the day time, especially in the sunshine, flying with great swiftness; but is seldom seen unless a freshly emerged female is at hand. Such an attraction, however, draws together considerable numbers in suitable localities. Even then they are sometimes shy and hard to secure; and they usually do not exhibit the frantic violence shown by the last species and by *Lasiocampa quercus*. The female may occasionally be found sitting on heather, but is rarely observed to fly, and probably does so only at night.

Moderately common on heaths, in marshes, osier beds, fens, and the edges of woods, in the Southern, Eastern, and Western counties of England, and in Wales to the extreme west; apparently absent from, or extremely rare in, some parts of the Midlands, though common at Sutton Park near Birmingham; much more common on heaths and mosses in Cheshire, Lancashire and Yorkshire, and probably to be found in such situations throughout the north of England. Also found throughout Scotland to Sutherlandshire and to the Hebrides and Orkneys—in the last-named islands rather commonly. Generally distributed in Ireland, and richly coloured, specimens of the male from the Belfast district having the hind wings of a remarkably clear orange. Abroad it is very widely distributed—nearly all over the continent of Europe, Asia Minor, Armenia, Siberia, and Tartary. In Lapland it is small, pale, and dull-coloured in both sexes. In Spain Mr. J. J. Walker, R.N., found it on the wing at the end of March; its larva feeding in May and showing a preference for *Helianthemum halimæfolium*.

Family 13. DREPANULIDÆ.

Head depressed; antennæ rather short, pectinated in the males, more shortly so or dentated in the females; tongue minute, apparently functionless; palpi very small. Thorax and abdomen usually slender; wings short and broad; fore wings elongated at the apex and usually more or less hooked.

LARVÆ singularly shaped, not hairy, ridged on the back and the sides; having only fourteen legs, a short horizontal point being substituted for the anal pair.

PUPÆ of ordinary form, in a thin cocoon among leaves.

This is a strongly marked group of comparatively small moths; not closely connected with the preceding, though related to the *Bombycidae* through many intermediate

species. In the larva stage it shows a remarkable resemblance to the group next to follow. From the slenderness of their bodies and the breadth of their wings the moths of this group are likely to be mistaken by a young collector for *Geometridæ*.

Genus 1. DREPANA.

Antennæ of the male pectinated, the pectinations not continued to the tip, which is merely dentate; fore wings with produced and somewhat hooked apex, and hind margin smoothly curved; hind wings broad.

1. *D. falcataria*, *L.*; *falcula*, *Schiff.*—Expanse $1\frac{1}{4}$ to $1\frac{5}{8}$ inch. Fore wings hooked; brown, with an oblique red-brown stripe crossing to the apex, and, before it, an ovate grey-brown blotch; hind wings paler.

Antennæ of the male pectinated to near the tip, where the teeth become prostrate and indistinct; each tooth ciliated, dark brown; shaft paler brown. Head brown, pressed closely to the thorax, which, with the abdomen, is slender, light brown, the scales lying smoothly down except upon the shoulder lappets, where they are longer and rather loose. Fore wings broad, costa strongly arched, especially toward the apex, which is gradually produced into a long and graceful hook pointed at the tip; hind margin sharply hollowed beneath it, then rounded and very full round the anal angle; dorsal margin straight; pale brown, with three slender, much indented and zigzagged transverse lines, all expanded upon the costa; the third bends toward the apex in a long point from which it turns back to the costal margin; outside this third line is a thick red-brown stripe, which, arising upon the dorsal margin, proceeds with a smooth and regular curve to the tip of the wing, where it becomes almost black; before this, in the middle of the wing and upon the third line is an ovate grey-brown blotch divided by black lines; preceding this two black dots lie longitudinally in the discal cell. Outside the curved stripe is a fourth, very slender, brown line, nearly

parallel with the hind margin till it reaches the curved stripe, which it crosses and then bends sharply back to the costa where it also is thickened. Hind margin from the tip down the concave portion strongly edged with black-brown, and inside this with bluish grey, lower portion reddish brown; cilia short, pale brown. Hind wings ample, rounded behind; pale brown, costal region broadly paler; from the dorsal margin arise four very slender indented brown lines, corresponding with those of the fore wings but extending only across a portion of the wings; just before the hind margin is another, even more slender, dotted on the nervures and zigzagged between them, but extending from margin to margin; outside this the hind margin is sharply edged with bright brown; cilia paler brown. Female rather larger; antennæ distinctly though very shortly pectinated; hind wings paler with the costal region whitish; otherwise similar.

Underside bright light brown; shading to deeper brown at the apex of the fore wings; beyond the middle are two curved transverse brown lines, those in the hind wings much scalloped; nervures brown; at the apex of the discal cell in the fore wings are two indistinct purplish brown spots. In the female paler, but showing the sub-marginal dark lines of the upper side, legs short, neat, not tufted, light brown; body very pale brown.

Variation is usually very slight, merely existing in the depth of the brown ground colour and distinctness of the transverse lines; but occasionally in the North of England, and more constantly in Scotland, is found, in company with the typical form, one in which the ground colour, in both sexes, is brownish white, in many cases very nearly white; in some of these the transverse lines near the base of the fore wings are very indistinct, while in others they are sharply accentuated, but on the underside the marginal markings are visible in both sexes. This whitish form is even, very rarely, found in the South of England. Mr. F. J. Hanbury possesses one taken in Essex. In the collection of Mr.

R. Adkin is a very curious specimen, having all the markings in the middle of the fore wings strongly developed.

On the wing in May and June, and a partial, or complete, second generation in August.

LARVA moderately stout, of even thickness except that the last three segments taper considerably, the thirteenth ending with a raised point and being destitute of the anal prolegs; on the third to the sixth segments are pairs of upright pointed dorsal tentacles. Head pale yellow, bifid, rather flattened in front, the lobes outlined with blackish and the mouth dark. The usual tubercles of the body faintly whitish and each emitting a hair. Dorsal half of the body yellow or ochreous; dorsal and subdorsal lines brownish, interrupted; incisions of the segments also brown; dorsal tubercles tipped with reddish; lower half of the body pale green, or greyish-green, with the legs, prolegs, and hairs of the same colour, the two body colours being separated by a dark brown lateral line, beneath which is a black dot below each tubercle. When younger the anterior segments are green between the tubercles, and the remaining dorsal surface is more purplish.

July, September, October; in two broods, on birch and occasionally upon alder, feeding quite openly upon the leaves, but much concealed by its resemblance to a rolled or shrivelled young leaf.

PUPA rather short and stout with a rather long curved anal spike, dark chestnut-brown, wing- and limb-cases more purple-brown. In a strong brown silken cocoon placed in a drawn-together leaf, or turned-down portion of a leaf, on the tree, the edges of the leaf firmly spun together. The pupæ from the later generation of larvæ fall to the ground with the leaves and lie through the winter.

The moth flies at night, but is easily disturbed during the day, when it flies wildly, with a dashing erratic motion, to

some other place of shelter. It sits usually upon the under-side of a leaf, though often on the upper side, on a birch-tree or bush, and as its wings are all laid quite flatly down, the fore wings partially concealing the hind, it bears the closest possible resemblance to a dead brown leaf. At night it comes freely to a strong light, the female showing equal partiality thereto, and both may often be found on gas lamps at night in suitable situations. Especially attached to such sandy heaths as have a good sprinkling of birch bushes, but also found in woods, and even hedges in woody districts, if its favourite tree exists. Generally common in such situations throughout the southern half of England, except perhaps in the Midland fen districts, where it seems to be more scarce and local. Found, though not commonly, in Derbyshire, Staffordshire, Worcestershire, Lancashire and Cheshire, more commonly in Lincolnshire, and in most parts of Yorkshire, also locally in Cumberland. Apparently scarce in Wales, but recorded from Glamorganshire, and probably to be found elsewhere. Much more common in Scotland, in Perthshire, Inverness-shire, in Clydesdale, and even in Ross; indeed, the south-east appears to be the only portion of the mainland of Scotland from which it is totally absent. In Ireland scarce but very widely distributed; Kerry, Mayo, Galway, Donegal, Tyrone, Londonderry and elsewhere. Its range abroad is very wide, through Central and Northern Europe except the coldest regions, Piedmont, Bithynia, and Southern Russia: also in North America, where it seems to have received a variety of names; the ordinary typical female, from New York and other parts of the United States, being called *fabula*, while *genicula* stands as a name for both sexes; another form from the United States, Canada, and Nova Scotia, in which the ovate grey-brown spot is only represented by one or two black dots, is called *arcuata*, but it agrees so accurately in every other detail with this species that its distinctness seems very doubtful.

2. **D. sicula**, *Schiff.*; **harpagula**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ inch.

Fore wings strongly hooked; soft, warm, light brown with large orange-brown central clouds, and bluish clouds edged with black before the hind margin.

Antennæ of the male strongly pectinated nearly to the tip, the remainder filiform; teeth grey, shaft brown. Head pale greyish-brown tinged above with yellow; collar also yellow; remainder of the thorax pale brown, rather smooth; abdomen short, light brown. Fore wings rather elongated and with a long, curved, hooked tip; costa a little arched at the base, then very straight for two-thirds of its length, but strongly arched toward the apex; hind margin deeply hollowed below the tip, then suddenly rounded and curving quite round the anal angle; dorsal margin very straight. Colour pale yellow-brown, much suffused with glistening purplish scales which give it a soft, warm, hue; first line indistinct, angulated, yellow-brown; second line similar in colour, more oblique and much scalloped; between these is a large irregularly pear-shaped yellow-brown blotch, extending from the subcostal nervure to the subdorsal, and containing in its broad upper portion two large yellowish spots which are cut up by the brown nervures. Outside the two middle scallops of the second line are two crescents formed by parallel lines of black atoms enclosing bluish clouds; opposite these are two more black crescents edged with blue, placed the opposite way, and beyond these a row of five cloudy black crescents; between which and the hind margin the space is filled by a bluish cloud divided by the nervures; hind margin, from the apex, edged with a strong black line; cilia pale brown intersected by a darker line. Hind wings rounded except at the anal angle; pale golden-brown suffused with glistening silvery-purplish scales except toward the costal margin, where the colour softens to pale yellowish; nervures browner; near the base is a curved yellow-brown transverse line, and in the

middle another, considerably indented, both rather indistinct; before the second is a faint double discal blotch of the same colour; cilia pale fulvous with a dark brown basal line. Female with the antennæ threadlike; slightly larger and paler, otherwise similar. Underside of all the wings bright light ochreous, without markings, except that the cilia of the fore wings are blackish; body and legs ochreous-brown.

Little or no variation has been observed, in this species, with us; but it seems here to have in some degree deteriorated from the typical characters, as regards, at least, the hind wings. Between the two faintly brown transverse lines of these wings, and in contact with the second, there is, in Continental examples, a large blotch of a delicate warm fawn colour, within which are two or three small, pale yellow spots, and just beyond the second line a pair of distinct, round, black dots, the lower being the larger. These yellow spots and black dots are nearly always obsolete in British specimens, and in the very rare instances in which the latter are faintly visible they are placed more closely together than in those from abroad. No corresponding discrepancy appears in the fore wings.

On the wing in the middle of June, but has been met with from the end of May to July. One specimen has been reared in October in confinement.

LARVA one inch long, moderately slender; head large and broad, deeply cleft above, flattened in front; pinkish, with the lobes outlined and dotted with brown, and some brown spots on the face; fourth segment with an elevated dorsal process, or hump, of a brown colour, divided into two blunt tubercles tipped with yellow; anal segment without prolegs, but produced into a long tapering point, curved a little upwards; thoracic segments yellowish-brown, blotched on the back with crimson-brown; behind the tubercles the colour of the back and sides is of a brilliant deep yellow, with minute elongated

dark brown freckles indicating the dorsal and subdorsal lines, and a dark spot on each side of the twelfth segment; the under surface, the legs, and some portions of the sides are pink, deeply tinged and freckled above with dark crimson-brown, which fluctuates in height along the sides in two long arches from the spiracular to the dorsal regions. When very young, dark chocolate-brown, changing to russet-brown, and as it grows the yellow colour of the back gradually appears in dots, bars, and then patches, and the mature appearance is quite gradually assumed. (Condensed from Buckler.)

Mr. Buckler further points out that Hübner in his great work gives two figures of larvæ under the name of *sicula*. One has two tubercles and is correct, the other has eight and is that of *D. falcula*. In copying from Hübner the mistake has, elsewhere, been made of selecting the wrong larva!

July to September or October on *Tilia parvifolia*; when very young feeding only on the upper surface, afterwards eating long narrow passages into the middle of the leaf from near the footstalk.

PUPA rounded and tolerably even in thickness to near the anal segment, which is prolonged into a spike bearing several curved bristles; rust-red, covered with a soft adhesive white powder or bloom. In a cocoon of tough silk, containing small apertures as though for admission of air, placed in a drawn-together lime leaf. In this condition through the winter.

A rare species and excessively local in this country. Discovered in 1837, when a single specimen was secured in Leigh Woods near Bristol; two more were found in the same place in 1856, several more in 1861 and one in 1873. In 1874 and for many following years a more systematic search was made by Mr. W. H. Grigg and others, a few being taken every year, and some also reared from the egg and from captured larvæ. From 1887 to 1891 I find no record, but specimens have since been met with, and there are good

reasons for hoping that it will not readily be exterminated in this, its one locality. The moth is one of the most sluggish of Lepidoptera; apparently it hardly ever flies of its own free will. Almost all that have been captured have been found sitting on the leaves of lime bushes or trees, and beating these bushes is hardly of use, since the moths drop, or flutter feebly to the ground. Even when reared and kept for pairing the male only flutters round a little about dusk, and it appears to be impossible to obtain males by the attraction of a bred female. Unfortunately the larvæ are difficult to rear from the egg, as they sometimes refuse to taste their food. The habit of the moth is usually to lay its eggs along the edge of a leaf, and the larvæ prefer to gnaw at once into the tip or edge when they leave the egg. If once persuaded to eat there is no great difficulty in rearing them. The only food which they can usually be induced to accept in this country is the small-leaved lime (*Tilia parvifolia*), but on the Continent this species is stated to feed also upon birch, oak, common lime, and even beech, and to go through two generations in the year. I am much indebted for information upon its life-history to Mr. G. C. Griffiths of Bristol.

The only locality in which it has hitherto been found in these Islands is that already indicated, Leigh Woods, Bristol. Abroad it is very rare in Switzerland, more common in Germany, Belgium, Eastern France, Hungary, Livonia and some parts of Russia, but apparently not met with in plenty anywhere.

3. **D. hamula**, *Esp.*; **binaria**, *Staud. Cat.*—Expanse 1 to $1\frac{3}{8}$ inch.

Yellow-brown; fore wings rather hooked and having two slender yellow transverse lines and two central black dots.

Antennæ of the male strongly pectinated two-thirds of their length, remainder threadlike; pectinations blackish; shaft glossy golden-brown. Head orange-yellow; thorax

very round, smooth, dull brown, with the collar yellowish; abdomen slender and short, brown, tinged with yellow on each side and having minute projecting lateral tufts of yellow scales. Fore wings with the costa slightly arched at the base, strongly so beyond the middle; apex produced to a blunt curved point, almost hooked; hind margin beneath it much hollowed, then straight, the anal angle being rather squared; dorsal margin straight; colour golden-brown, much irrorated, especially toward the base, with minute transverse blackish streaks of atoms; first transverse line slightly angulated, second rising perpendicularly from the dorsal margin, then bent toward the apex, but returning to the costal margin, both yellow, very slender and not margined; between these lines, at the ends of the divided discal cell, are two ill-defined black spots; hind margin, below the tip, clouded with black; cilia deep red-brown. Hind wings rather long, rounded from the costal margin but with the anal angle squared; golden-brown, with two very slender yellow transverse lines, the first near the base, the second in the middle of the wing; between them are two very faintly black spots; cilia dense, golden-brown. Female larger, with threadlike antennæ; fore wings slightly paler, with the lines and dots rather more distinct, and the dark shade below the apex broader and blacker; hind wings very pale fulvous, or dull yellow, tinged with brown along the dorsal margin, where are slight indications of the two transverse lines and of a third near the anal angle, these lines seeming to divide the brown shade into faint transverse bands. In both sexes there is, in some specimens, a faint indication of a scalloped line of dark shades edged with yellowish near the hind margin of fore or hind wings, or both. Underside in both sexes glossy pale fulvous or ochreous, without markings, but with the apex and hind margin of the fore wings slightly darker. Hardly variable except a little in the depth of colouring, but specimens of the second generation are commonly smaller than those of the first.

On the wing at the end of May and in June; and again in August and the beginning of September, in a partial second generation.

LARVA stout, head divided, flattened in front, larger than the second segment; fourth segment with a bifid dorsal eminence; anal prolegs absent, extremity terminating with a sharp point. Colour pale ochreous; dorsal line slightly darker but only extending to the protuberance on the fourth segment; head yellowish, edged with a purple line on each side, which is bordered outwardly with yellowish; anterior segments purplish, to, and including, the dorsal hump. From the head a yellowish line on each side join together on the sixth segment, branching off to the top of the dorsal hump; from the seventh segment they divide again, and then meet on the eleventh, forming a large diamond-shaped yellowish dorsal marking; from the eleventh segment they again separate, forming two oblique lateral bands, and are continued to the tail. The sides beneath the lateral lines are shaded with pale chocolate-brown, as is also the anal extremity; on the twelfth and thirteenth segments is a dark diamond-shaped spot. Legs, prolegs and under surface ochreous. (C. Fenn.)

When at rest it draws in its anterior segments, raising the fourth, with its tubercle, and also the hinder extremity, and has a very humped appearance.

End of June and July, and again in September, on oak.

PUPA moderately stout, rather short, light-brown, densely covered with white powdery bloom. In a strong cocoon of brown silk, in a small oak leaf tightly drawn together and strongly united at the edges. In this condition through the winter.

The moth sits in the daytime in oak-trees, on the leaves, and generally in the higher parts of the trees. It may sometimes be disturbed by beating, and more frequently by

throwing sticks into the trees, and males, when so disturbed, will pugnaciously follow an object thrown into the air, and so descend within reach. Occasionally it may even be seen flying about the upper branches of oak-trees in the afternoon, but its proper time of flight is at night, and both sexes are readily attracted by a strong light; indeed, it was formerly, by no means a rare circumstance, even in the outskirts of London, to find them sitting quite flat, with wings outspread, the fore wings only partially covering the hind, upon a gas lamp. Usually a wood-frequenting species, or else widely spread over well-wooded districts, always among oak; never plentiful, but widely distributed in nearly all the southern and eastern counties, though rare in Devon, and apparently not recorded from Cornwall. I find no record of its occurrence in Wales, though it can hardly be absent from the eastern portions; especially as it is moderately frequent in Gloucestershire, preferring the long narrow strips of woodland among the hills, and is also recorded from Worcestershire and Herefordshire. Records from the Midland counties north of Cambridgeshire and Huntingdonshire appear to be very rare, though it has been found at Knowle in Warwickshire, and its most northern known locality with us seems to be Lincolnshire. It is not known to occur in either Scotland or Ireland.

Abroad it is found over the greater portion of Central and Southern Europe and in Asia Minor.

4. **D. unguicula**, *Hüb.*; **cultraria**, *Staud. Cat.*—
 Expanse 1 to $1\frac{3}{8}$ inch.

Apex pointed, hardly hooked; wings yellowish, with a broad brown central band.

Antennæ of the male strongly pectinated four-fifths of their length, tip filiform; shaft light brown, teeth black. Head yellow-brown, small; thorax ovate, smooth, light brown; abdomen short, slender, pale yellow-brown. Fore wings with the costa regularly rounded to near the apex, where it is

strongly arched; tip produced, pointed, curved and almost hooked; hind margin below it hollowed, then slightly rounded, and rather full toward the anal angle, which is somewhat squared; dorsal margin slightly rounded; colour light yellowish-fulvous tinged with brown; first line brown, slightly curved, edged inwardly with yellowish; second line brown, curved outwards, but bent back to the costa, edged outside with yellowish; the space between these two lines filled up with umbreous, and forming a broad light brown band, in which is a dark brown dot at the apex of the discal cell; hind margin below the tip brownish with a slender yellowish edging; cilia dark brown, with a yellow line at the base. Hind wings very pale fulvous, with a partial, transverse, pale umbreous band, darker at the margins, situated before the middle, and two faint, ill-defined, abbreviated brownish bands near the anal angle. Female rather larger and paler, with simple antennæ, otherwise similar. Underside bright ochreous without markings; cilia below the apex narrowly brownish or smoky black; body and legs pale ochreous.

Hardly variable, except a little in the depth of ground colour of the wings, which sometimes is nearly as dark as that of the central band.

On the wing at the end of April, and in May and June; also in a second generation at the end of July and in August.

LARVA rather slender, attenuated to the anal segment, which is without prolegs and terminated by a sharp spike. Head large, the top bifurcated; on the fourth segment is a small hump; posterior segments raised horizontally. Reddish-brown, tinged with yellowish on the anterior segments, and with darker, or olive-brown, on the sides; dorsal line darker, threadlike; a conspicuous stripe of white lines, starting from the spiracular region immediately behind the head, curves upward to the dorsal line on the fifth and sixth segments, there uniting and forming a white patch, edged

beneath with dark olive or blackish-brown. This dark colour is continued on the sides, and encloses a large diamond-shaped paler blotch extending from the sixth to eleventh segment; the remaining posterior segments darker with a whitish lateral line. Head yellowish-brown, dusted with red-brown; under surface and legs very pale brown or whitish ochreous, tinged with greenish. (C. Fenn.)

June and July, and as a second generation, in September and October. On beech (*Fagus sylvatica*).

PUPA moderately stout, tapering considerably to the tail, which is fixed by anal hooks to the cocoon; dull dark bluish-grey with whitish efflorescence; incisions dull orange. In a dense cocoon of soft whitish silk tinged with orange, spun in the angle formed by a turned-down leaf, or between two leaves. (C. Fenn.)

Remaining in pupa through the winter.

The male flies about beech-trees in the daytime, sometimes high up, at others visiting the lower boughs. Both sexes fly after dark, but are strictly confined to the neighbourhood of the beech-woods, and usually to those which grow in chalk districts. When not flying it is not difficult to disturb them, in the daytime, by shaking or beating the leafy portions of the branches with a long stick, since the moth, like its allies, sits flatly upon a leaf. Common in beech-woods in Kent, Essex, Sussex, Surrey, Berkshire, Buckinghamshire, and Oxfordshire, and doubtless in Hants, Wilts, and Dorset. Also found in Norfolk, Suffolk, Cambridgeshire, Herefordshire, Gloucestershire and Somerset, though perhaps not so commonly, and in Devon local and rare. This appears to be the extent of its range in these Islands. Abroad it is common in beech-woods throughout Central Europe, also in Piedmont and Asia Minor.

Genus 2. **PLATYPTERYX.**

Antennæ in both sexes pectinated to the tip; fore wings hooked and with the hind margin toothed and scalloped; hind wings broad.

We have but one species.

1. **P. lacertinaria**, *L.*; **lacertula**, *Schiff.* — Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings light brown, with two darker brown lines, tip hooked, hind margin toothed; hind wings whitish.

Antennæ of the male rather shortly pectinated throughout; pale brown; head light brown; thorax narrow, smooth, pale brown; abdomen short, rather slender, greyish-white. Fore wings arched at the base, thence rounded with a long curve which becomes more decided toward the apex, the latter being bent down into a produced and blunt hook; hind margin hollowed below the apex, and then rounded, but having scalloped hollows and rounded projections throughout, except at the anal angle; dorsal margin gently rounded. Colour pale brown, with the nervures rather darker and the whole surface reticulated with very delicate transverse brown lines; first and second transverse lines nearly straight, but a little bent back to the costa, oblique and nearly parallel; the space beyond the second tinged with darker brown, darkest toward the margins; between the two lines at the apex of the discal cell is a black dot; costal margin toward the tip, and also the hind margin, especially round the projections, edged with dark brown, and the latter having blackish cilia, while those of the hollows are white. Hind wings rather long, hind margin undulating, almost scalloped; apex rather angulated; anal angle squared; white, tinged with brown, especially toward the hind margin, which is edged with a dark brown line; cilia mixed, brown and white. Female with the antennæ very shortly pectinated throughout, rather larger and stouter, otherwise similar.

Underside of the male white, with the costal region and hind margin of all the wings tinged with brown; a black central dot on all the wings, and a faint indication of a darker line from the costa; hind margins edged with blackish, especially on the projections of the fore wings; intermediate cilia white; legs rather short, pale brown, thickly clothed with scales; body pale yellowish. Female similar, except that the hind wings have a more yellow-brown tint.

Variation in this species is usually confined to the depth of ground colour and to the greater or less amount of reticulation of delicate brown lines. In some cases this is almost absent and the colour approaches yellow, while in other instances, especially in the north, the reticulations are so abundant and so dark that the whole surface of the fore wings is of a dark grey-brown. In Mr. J. E. Robson's collection is a male of this dark colour, but with a broad ill-defined white stripe before the hind margin and the cilia of the fore wings very strongly ornamented with bright white crescents. Another phase of variation is in the distance apart of the two transverse lines on the fore wings, and in Mr. Sydney Webb's collection is one in which they nearly unite.

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

LARVA warty, wrinkled; head bifid, orange-brown with whitish markings; third and fourth segments each with two bifid dorsal protuberances, and a smaller bifid eminence on the twelfth; anal prolegs absent, replaced by a small projecting, horizontal, red tail. Body pale yellowish-brown, shaded into reddish on the back and sides, all the usual spots slightly raised, frequently bifid, and clouded with dark brown; dorsal line a row of brown spots; subdorsal lines similar but less distinct. (C. Fenn.) This larva presents a most curious resemblance (in miniature) to a male Triton or newt (*Lacerta*). Hence the name of the moth.

At the end of June and in July; as a partial second generation again in September and October. On birch.

PUPA pale red, covered with a white bloom. In a strong cocoon of whitish or yellowish silk within the hollow of a living leaf, which is drawn together and carefully joined at the edges, except a small open space at the footstalk. Passes the winter in this state, the leaf falling to the ground.

The moth flies voluntarily only at night. In the daytime it hides in bushes, not by any means always in birch bushes, or sits underneath them on a grass blade or a twig. Its wings are not spread out at all, but very strongly arched when at rest, the hind wings being completely covered, and the fore wings so drawn together as to give it the strongest possible resemblance to a curled, dead, birch-leaf. Found principally in woods, and on heaths with scattered birch-trees, over the greater portion of the southern counties to Devon, where it becomes scarce. Also rare or absent in the Cambridge and Norfolk fen districts. Rather frequent at Cannock Chase and other parts of Staffordshire, and in woods in Warwickshire, Worcestershire, and Herefordshire; scarce in Cheshire, Derbyshire, and Lincolnshire, and very local in Lancashire, Yorkshire and Cumberland. In Scotland it is found in Clydesdale and in Argyleshire, also very locally in Ross. Widely distributed and sometimes rather common in Ireland, though local, occurring in Wicklow, Kerry, Galway, Donegal, Londonderry, Down, and elsewhere. It is common nearly all over Northern and Central Europe, including Lapland, Piedmont, and the Ural Mountain district. In North America it is also found, but of the colour of its paler varieties with us, and is known under the name of *bilineata*.

This species seems to stand alone in a remarkable manner. So far as I am aware, no other species of this group, having a scalloped hind margin, exists in the world.

Genus 3. **CILIX.**

Antennæ of the male pectinated to the tip, of the female dentate; fore wings with the apex elongated, rounded, not hooked; hind wings narrow. Wings drawn in to a vertical position in repose.

The little species which follows is the sole representative of this genus, and, like the last, has no near allies, the numerous exotic species placed in the same family being very different in appearance.

1. **C. spinula**, *Schiff.*; **glaucata**, *Staud. Cat.*—Expanse $\frac{3}{4}$ to 1 inch. Wings rounded at the apex, white; fore wings with a bluish-brown blotch on the dorsal margin, surmounted by a large brownish egg-shaped cloud.

Antennæ of the male short, but strongly pectinated to the tip with short, stout, curved teeth, brown, with the shaft white. Head closely pressed down, blackish, with a white line across the top; thorax slender, white; abdomen short and small, grey, with the base and apex white. Fore wings long, expanded at the apex, principal nervures thickened; costal margin gently rounded in a long flat curve to the tip, which is very blunt; hind margin also very gently curved, but long and oblique, the curve sweeping round the anal angle; dorsal margin nearly straight. Shining white, without the smallest indication of the two usual transverse lines; on the dorsal margin is a large ovate tawny blotch, obscured by broad bands of glistening, steely, bluish scales; above, and joining this, is a large oblique ovate blotch occupying the whole middle of the wing, of a very pale greyish-brown and containing silvery streaks on the nervures; outside this is a series of pale smoky-grey clouds, scalloped in accordance with a line of darker grey lunules, lying in white spaces along the hind margin; cilia long, white. Female with filiform antennæ, otherwise quite similar.

Underside of the fore wings white, extensively tinged, on

the costal and central area, with smoky-black, and having large smoky-black lunate markings along the hind margin; hind wings white, legs and body smoky-grey.

Not usually variable except in the depth of colour of the markings, but a specimen in the collection of the late Mr. F. Bond has scarcely any indication of the ovate central blotch.

On the wing in May and the beginning of June, and, as a second generation, at the end of July and in August.

LARVA stout, swollen in front, thickest at the fourth segment, thence tapering; head small, projecting over the second segment; third and fourth segments each with two small dorsal tubercles; no anal prolegs; anal segment terminating in a sharp spike. Colour reddish-chocolate; dorsal line, tubercles, and underside of the tail darker; head dark-brown, face paler; a large oval paler spot, often very indistinct, lies over the fourth to the sixth segments, and is continued, faintly, as a narrow band to the tail. A white spot lies between the two projections on the fourth segment, and two white lines margin the darker anal segment, which is tipped with dark brown. The dorsal line ends in a dark spot on the eleventh segment; there is a raised lateral line from the head to the fifth. (C. Fenn.)

In June and the beginning of July, and, as a second generation, in September and October; on hawthorn, apple, pear, and mountain ash. When young eating only the upper surface of the leaves and making brown blotches. When more grown feeding in the ordinary manner.

PUPA.—Head very blunt; abdomen tapering; tail blunt with a short spike. Wing-cases dark grey with a blue efflorescence; abdomen pale red; incisions brown. In a thin, tough, brown, silken cocoon among leaves or in crevices of bark. Pupa very lively, if disturbed it makes a noise by friction against its cocoon. (C. Fenn.)

The moth flies at night about hedges as well as woods, and is readily attracted to a light, and very gentle, sitting down

at once on a gas lamp and folding its wings down as closely together as a shut book, remaining in the same position for hours. In the daytime it sits in a similar position, or with the wings hardly so closely drawn together, upon a leaf, and bears a wonderful resemblance to a morsel of the excrement of a bird. Generally distributed throughout England and Wales, and plentiful in the more Southern districts, rare in the extreme west of Wales. Apparently confined to the south of Scotland, since I have no records beyond Roxburghshire, Clydesdale, and the Forth district. In Ireland it is found near Dublin, in Wicklow, Westmeath, Galway, King's County, Armagh and Tyrone, but not commonly, in some of these districts even rarely. Abroad in many parts of Central Europe, in the South of France, Spain, Italy, Corsica, Sardinia, Dalmatia, Greece, Southern Russia, various parts of Asia Minor, the hill districts of India, and in North America.

Family 14. NOTODONTIDÆ.

Tongue small and slender, not spiral, usually in separate filaments, apparently functionless; antennæ usually less than one half the length of the fore wings, pectinated in the male, either more shortly so, or simple, in the female; thorax stout, covered with loosely raised scales; abdomen moderately stout, blunt, tufted in the male. Fore wings rather long and narrow, or somewhat long-ovate, in very many species having a projecting tuft of scales on the dorsal margin; hind wings rather short and not very ample.

LARVÆ naked, or in a few instances downy; most variable in form, sometimes extremely grotesque; having either sixteen or fourteen legs; hinder portion usually, and the head in many cases, raised during repose. Feeding on leaves of trees or shrubs.

PUPÆ of ordinary moth shape, in a hard cocoon on bark; or

more usually, subterranean, in a cocoon of soft silk and earth ; occasionally without any cocoon.

With this family, the last of the Bombycina, we leave the comparatively heterogeneous forms having wings of all manner of breadths, and settle down to a series of genera of which the fore wings and other details of structure show a considerable approximation to the characters of the next great group, the Noctuina. But in habits and general structure they seem most emphatically to belong to the present (the Bombycina) group, to which they are usually assigned. This relationship in habits especially shows itself in their extreme sluggishness during the hours of rest, usually contrasted with great activity and even violence when aroused by darkness ; the ease with which they may in most instances be paired, and induced to deposit their eggs ; and their absolute indifference to the attraction of flowers, or food of any kind, in the imago state. But even in the daytime artificial darkness effectually rouses them, and the consequence of shutting up an insect of this group, a male especially, alive in a pill-box or chip-box, when captured, is, as the young collector soon discovers, that the creature beats its wings to fragments, and is totally spoiled.

Genus 1. **CERURA.**

Antennæ pectinated in both sexes with separate teeth, which are ciliated with minute hairs. The tips of the pectinations curled toward each other in the males, and the antennæ themselves usually curled when dry ; tongue short and flat ; body stout, softly downy beneath ; fore wings rather narrowly ovate, thinly covered with scales ; hind wings very short. First pair of legs with a compressed lobe upon the tibiæ.

LARVÆ glossy, grotesque, naked, head flattened, anal prolegs absent ; anal segment having two long points projecting

backward, forming hollow tubes which each contain a whip-like process.

PUPÆ in hard cocoons upon the bark of trees.

1. **C. bicuspis**, *Bhb.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch.

Creamy-white; back of thorax, central band, and sub-apical space of fore wings, purple-black; white area much dotted with black.

Antennæ of the male densely pectinated, the teeth solid, black and so closely curled-in that their tips meet or cross each other, shaft whitish; head snowy-white, with downy tufts at the bases of the antennæ; there is a black spot at the junction with the thorax above. Collar broad and deep, occupying the whole front of the thorax, and covered with long curved scales, pale yellowish or creamy-white, remainder of the thorax covered with broad curved transverse dark brown bands so that it seems wholly black-brown except at the margins and some faint intermediate spaces of creamy-white. Thorax and abdomen both stout, the latter grey, covered with white scales, more densely so at the sides, and having a creamy-white anal tuft. Fore wings long and narrow; costal margin straight to near the tip where it is rounded, the curve passing smoothly round the somewhat elongated apex; hind margin oblique, very gently and smoothly curved, the curve passing, in one sweep, round the anal angle and dorsal margin; clear creamy-white; a black dot on the subcostal nervure near the base is followed by a perpendicular transverse row of four or five similar dots just before the first line, which is black and forms the inner edge of a purple-black transverse band, variable in width, extending on the dorsal margin to the anal angle but tapering through the middle of the wing and again suddenly widening as it approaches the costa. Before the tip of the wing is an elongated purple-black blotch extending from the costa inward; between this and the central band are three black

spots on the costa, from the outer two of which arise black, indented, irregular, slender, transverse lines, both of which lose themselves in the broad dorsal portion of the transverse band; a third such line arises from the subapical blotch and zigzags to the anal angle. At the apex of the discal cell is a black spot, and on the hind margin a regular row of round black dots; cilia white. Hind wings short and rather narrow, semi-transparent; whitish, with faintly brownish nervures; a cloudy lunate spot at the end of the cell, and beyond it a faint greyish cloudy transverse band; hind margin rather sinuous, regularly spotted with black, the spots becoming cloudy and confluent near the anal angle; cilia white.

Female with the antennæ very shortly pectinated, the teeth often deflected, or prostrate, along the shaft, and indistinct, body stouter; hind wings rather more smoky-white; the black spot at end of the discal cell much smaller, sometimes a mere dot; otherwise similar.

Underside white; fore wings extensively banded and blotched with pale smoky-purplish, especially under the dark markings of the upper side; hind margins of all the wings strongly and sharply spotted with black; body covered with very soft downy white scales; legs purplish-black in front, but heavily tufted with white scales.

Usually not variable, but a specimen in the cabinet of Mr. Sydney Webb has the central band narrowed, deeply indented, and nearly divided in the middle; and one in Mr. Arthur Robinson's collection is a most exquisite specimen, having no indication of either central dark band or of the subapical blotch except that their margins exist as slender lines. Both were obtained in Tilgate Forest.

May, and to the middle of June.

LARVA rather stout; head flattened in front and partially withdrawn into the squared flat front of the second segment, which is large and conspicuous; fourth segment rather

shouldered ; body somewhat flattened on the back and sides, tapering to the tail, where are two rather short, straight points or tentacles, abundantly roughened with minute points at their base ; and above is a short point. Head dark reddish-brown, mouth paler ; at the back of the head commences, on the second segment, a broad rich reddish-brown dorsal blotch, which runs to a point on the back of the third segment, where is a slight elevation ; on the fourth it recommences and becomes broader on each segment to the eighth, where it extends below and encloses the spiracles, thence it narrows to the tenth, continuing on the eleventh and twelfth as a broad stripe, and widening on the thirteenth, where it again narrows to the tentacles ; in the broad portion of this dorsal marking are faint indications of two or three orange spots ; on each side it is broadly edged with pale yellow, and on the sixth, seventh, and eighth segments its margin is deeply indented. A faint double dorsal darker line is just visible. Sides of the body and under surface brilliant, velvety, yellow-green, with faintly dotted indications of spiracular lines ; spiracles green, faintly outlined with black ; legs red ; prolegs yellow ; under surface and prolegs sprinkled with minute red-brown spots ringed with yellow. (Buckler.)

July to the middle of August on birch and alder, eating the leaves, and usually resting on the upper side of a leaf.

The confusion among authors as to this larva is very great. This has been completely exposed by Mr. W. F. Kirby in the pages of the *Entomologist*. Even the figure in the most recent German illustrated work (1893) is inaccurate. The specimen from which Mr. Buckler made his figure and description was furnished by the collector (Mr. Tester) who has probably reared more examples of this species than have been obtained by any other person in this country ; it was found on birch in Tilgate Forest, and there is no room for doubt as to its accuracy.

PUPA undescribed ; in a hard cocoon of silk and raspings of

bark, placed on the surface, or in a chink, of the bark of the tree upon which the larva has fed; but so accurately resembling its surroundings that it can very rarely be discriminated from the bark. In pupa through the winter.

The moth sits upon the trunks of birches or alders in the daytime; but flies at night, and has been known to come to the attraction of a strong light. Very little, however, is known of its habits, and probably hardly a specimen has been taken on the wing here. Always a rarity, its most favourite resort in the South of England being Tilgate Forest in Sussex. Four or five specimens are recorded as having been taken in Devon, one in Oxfordshire, two near Leominster, Herefordshire, one in Carmarthenshire, two in Norfolk, and one or two in Suffolk. In the Northern Midlands it seems to be more frequent, having been obtained repeatedly in boggy heaths among alder in North Staffordshire and on the borders of Derbyshire, and more rarely among the hills of Cannock Chase, but its principal northern haunt is round Preston, Lancashire, where the first British specimen was obtained in the year 1847. It extends to several other localities, mainly in mosses, in Lancashire, and to York, Scarborough, Ripon, Guisboro' and elsewhere in Yorkshire; and two or three specimens appear to have been obtained in Cumberland. In all localities in which it has been found the collector appears to be bitterly tantalised by the easy discovery of *empty* cocoons, while full ones seem almost undiscoverable. I know of no captures of this species in Scotland or Ireland. Abroad, though not usually in any abundance, it is found in Belgium, Eastern France, Switzerland, Germany, South Sweden, Finland, and Central Russia. Also probably in North America, but bearing the name of *borealis*, Bdv.

2. **C. furcula**, L.—Expanse 1 to $1\frac{1}{2}$ inch. Fore wings narrow, with rounded apex; pale grey and white, with a broad purplish-grey central band, edged on both sides with black; outer side indented.

Antennæ of the male strongly pectinated, the teeth curved in so that their tips meet; black, shaft silvery-white. Head and collar white or greyish-white, the latter densely covered with long curved-back scales. Thorax broad, black on the back, but more or less barred with orange, and with whitish tufts at the sides; abdomen moderately stout, dark grey, narrowly barred at the edge of each segment with whitish, and having the apex and sides tufted with white scales. Fore wings narrow, costa very slightly curved, apex much rounded but elongated, the curve from it passing regularly down the hind margin round the anal angle, and becoming very slight on the dorsal margin; white; a black dot close to the base is followed by a transverse row of similar dots, beyond which is the first line, perpendicular, deep black, edged toward the base with orange; from this first line the space to the middle of the wing is occupied by a broad transverse purplish-grey band, the outer edge of which is bounded, from the costa, by a deep black line edged with orange, curved inward, and forming a hollow at the edge of the band, with a deep indentation, but becoming obliterated half across the wing, below which the band spreads out more broadly; just beyond this, in a clear space, is a long streak at the end of the discal cell, and above this four black costal spots, from three of which spring parallel slender blackish transverse lines, all of them forming similar crescents or scallops in their course to the dorsal margin near the anal angle; a broad hollow, or crescent, outside the third, and towards the apex, is occupied by a large ovate purplish-grey blotch; a broad clear white band, only divided by faintly brown nervures, lies before the hind margin, which is very distinctly spotted with black; cilia white, very short. Hind wings short and rather narrow; rounded behind; white, faintly tinged with grey; nervures faintly grey; central spot narrow, greyish; sometimes a faintly indicated greyish cloudy transverse band is visible in the middle; hind margin regularly and distinctly spotted with black, the spots nearest the anal angle aggregated together; cilia white.

Female a little larger; with the antennæ more shortly pectinated, and the body stouter; otherwise similar, except that the hind wings are sometimes a little more clouded with grey.

Underside of the fore wings smoky-grey; costal margin white blotched with black; hind margin white, with the black marginal spots very distinct; hind wings clear white, with black marginal dots, and a distinct elongated black central spot; beyond this is, in some cases, a faint elbowed transverse grey line. Body beneath rather densely clothed with downy white scales; legs grey in front, spotted with black, heavily tufted with white scales behind.

Variation is mainly toward a greyer tinge of ground colour, or suffusion over the fore wings of the purplish-grey of the central band; the black hollowed line, which edges the central band outwardly, is also subject to much change both in distinctness and direction, often becoming a faint grey line, sometimes disappearing except at its origin on the costal margin. Occasionally, well marked specimens have a considerable mottling or tinge of orange in the basal area and the pale portion beyond the dark band, and the orange edging of the lines increased.

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

LARVA smooth; head rounded, retractile; second segment squared in front, and projecting laterally; third segment peaked; anal prolegs wanting, replaced by two long horny tails covered with minute black spines. Bright yellowish-green dotted with yellow; dorsal line yellow to the third segment, afterwards darker; a broad dull green dorsal blotch, edged with dark red-brown, from the second segment, forms a blunt point on the apex of the third, but is continued to the tail as a large diamond-shaped dorsal marking. This marking is widest on the eighth segment where it reaches below the spiracles, narrowest on the eleventh and twelfth, widening again a little on the latter; the sides, within this

blotch, are clouded with dark rust colour and the whole dorsal blotch is edged with interrupted dark red-brown, and broadly margined externally with yellow. Spiracles dark reddish, legs and prolegs tinged with red; under surface with a dark brown line running from between the last pair of prolegs to the anus, having on each side a reddish patch edged with yellow. Tails reddish, darker at the tips, with two yellow spots. Head dull purple with a yellowish mark outside each lobe. (C. Fenn.)

End of June to September or even October. On sallow and willow.

PUPA cylindrical, of very even bulk throughout except the last two abdominal segments which taper a little, both ends being blunt and rounded. Deep red-brown; dull, except the tail, which is glossy; wing-cases tinged with green. (Hellins.) In a hard firm cocoon formed of silk and gnawings of bark; in a hollow gnawed out by the larva in the surface of the bark of a willow or sallow, and finished off so as accurately to resemble the surrounding bark; or else on any piece of dead wood within reach. In cocoon through the winter.

With very rare exceptions single-brooded. A solitary instance of a second emergence in the year, in this country, was observed by the Hon. F. Thelluson—"I beat out a larva from sallow in the last week in June 1893 at Rendlesham, Suffolk; it was then large, and before the end of July became a pupa, and to my astonishment the moth emerged on August 8th." A similar instance is recorded by Ochsenheimer. The moth flies at night and may be attracted by a strong light. In the daytime it sits on the trunk, or more usually on a branch, of one of its food-trees, its outstretched downy legs and grey markings giving it a most deceptive likeness to an entangled downy feather, or even a more close resemblance to a ripe sallow catkin from which the downy seeds are bursting. It is not very often taken in the imago state. The larva is

said to be especially attached to 'sallow bushes of no great size on hill sides, on railway embankments, and in the fens, and is not so frequently found in thickly wooded districts.

Found throughout the southern counties to Norfolk, Cambridgeshire, Oxfordshire and Herefordshire, though never very commonly; also, more rarely, in Lincolnshire, Derbyshire, Leicestershire, Warwickshire, Worcestershire, and even in Salop, where a single specimen has been obtained by Mr. Woodforde. Rather more frequent in the mosses and marshy districts of Cheshire, Lancashire, and Yorkshire; and scarce in Cumberland. In Scotland it is found, rarely, in the Edinburgh district, in Roxburghshire, and Clydesdale; more frequently in Perthshire, and onward through the northern districts to Moray and West Ross, becoming rather common in Strathspey. Also widely distributed in Ireland, and recorded from Westmeath, Cavan, Mayo, Donegal and Londonderry.

Abroad it is found throughout Northern Europe to Lapland, Central Europe, and the shores of the Adriatic, also in Northern Russia.

3. *C. bifida*, *Hüb.*—Expanse $1\frac{3}{4}$ inch. Fore wings broader than in the preceding species; markings similar, except that the outer edge of the dark transverse band is regularly hollowed, not indented.

Antennæ of the male rather short, regularly and strongly pectinated, the rows of teeth curving towards each other till they meet; black, shaft white. Head strongly tufted with soft white scales; collar broad, white; behind it a black bar crosses the broad thorax and is followed by alternate orange and black bars, the latter most distinct and the third curving back and embracing two white spots; sides of the thorax also white; abdomen stout, blackish, thinly covered with fluffy white scales; anal tuft rather long, flat, and squared, white; short tufts of white scales along the sides and base. Fore

wings long but broader than in the preceding species; costa very faintly rounded; apex full, almost angulated; hind margin curved, rather long and oblique, but very full at the anal angle; dorsal margin very slightly curved; white; markings almost exactly as in the preceding species (*C. furcula*), except that the transverse purple-grey band is edged outwardly by a regularly curved line, not indented; the band is also usually broader on the costal margin and less extended on the dorsal. The basal dotted line, the first line, the triple second line and following apical ovate blotch, the stigmatic streak and the marginal dots are all as in *C. furcula*, as also are the hind wings which, however, are a little longer and have a more distinct central lunule. Female with antennæ more shortly pectinated, and body stouter, sometimes with a conspicuous cloudy transverse grey shade on the hind wings, otherwise quite similar.

Underside of the fore wings clouded with pale smoky-grey, with whitish bands; margins white, with blotches and spots as in *C. furcula*; central black stigma conspicuous; central area of the wings thickly covered with upstanding whitish scales; hind wings white, with a long black central streak and the usual marginal spots.

Rather variable in depth of grey colour, but not so variable in the distinctness of the black lines as *C. furcula*, nor so much disposed to increased orange shading as that species. In the late Mr. F. Bond's collection is a large female specimen in which the dark band of the fore wings is extremely broad and much bent outward toward the anal angle. Mr. F. Norgate has one in which the black lines are bordered on both sides with pale orange, and another in which the dark central band is extremely perpendicular and entirely blackish-grey, the subapical oval spot being also very black and full. This is an extremely handsome example.

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

LARVA smooth, head retractile, second segment squared in

front and projecting laterally, third segment peaked; anal prolegs absent, replaced by two long horny tails covered with minute black spines. Head dull purple with a brown mark on each lobe, outwardly edged with yellowish; body bright pea-green dotted with red-brown; a triangular purple dorsal patch on the second and third segments, its base being the front edge of the second segment. From the fourth segment to the tail is a broad purple dorsal blotch, attaining its greatest breadth on the eighth, where it reaches below the spiracles, and narrowest on the twelfth, widening again on the thirteenth. Both these dorsal patches are edged with dark brown and broadly margined externally with yellow; spiracles reddish; legs and prolegs tinged with red; tail with a dark brown patch on the under surface. Dorsal line whitish on the second and third segments, subsequently grey, bisecting indistinct pale spots on the sixth to the ninth, which are clouded with ferruginous. (C. Fenn.)

July to September on poplars of all species, including aspen and Canadian poplar.

PUPA similar to that of *C. furcula*, but larger. In a hard cocoon of silk and scraped bark, placed under loose bark, or in a crevice, or chink, or on the smooth bark of a poplar tree, even sometimes on an excrescence, but always so constructed as precisely to resemble the adjacent surface, and render it exceedingly difficult of discovery. In pupa through the winter.

The moth flies at dusk and into the night, and may, now and then, be captured flying softly about the outer low branches of a spreading poplar. Later it is readily attracted by a strong light, and may sometimes be found sitting on a gas lamp. In the daytime it sits with very outstretched legs on the trunk or a branch of a poplar, or on neighbouring palings, and looks exactly like a ripe cottony catkin or an entangled feather. Rarely found in woods, but much more

frequently about poplars growing in gardens and hedgerows, and even to be found in the suburbs of London.

It is either more common, or more frequently noticed, than *C. furcula*, and seems to occur, where poplars are common, in all parts of the Southern and Eastern Counties of England, also in the Western to Leicestershire, Worcestershire and Herefordshire, and in Warwickshire, Staffordshire, Derbyshire, Cheshire, and Lancashire. Apparently not noticed in Scotland, and in Ireland only in the counties of Sligo and Londonderry. Abroad it has not the extensive northern distribution of its ally, but is found in Finland, Sweden, Livonia, most parts of Central Europe, the South of Spain, Piedmont, Greece, Dalmatia, and Siberia.

4. *C. vinula*, *L.*—Expanse $2\frac{1}{4}$ to 3 inches. White with a grey bar near the base of the fore wings, and beyond it numerous slender black arrow-head markings.

Antennæ of the male nearly one-half as long as the fore wings; densely pectinated with rather long, closely set teeth, the two rows of which are placed very close together, and incline to each other, the ends crossing so as to look entangled; pale brown; shaft white; the tips are also usually curled each into a twist like a ram's horn. Head white, strongly tufted with scales, the longest tufts being at the base of the antennæ; thorax densely covered with long, partially raised, and loose looking, pure white scales, mixed with pale grey; collar broadly greyish; shoulder lappets each with two round black spots; six similar spots, in pairs, down the middle of the back; abdomen dark grey and white, in regular alternate bars; lateral and anal tufts pure white, very soft and downy, the latter rather squared.

Fore wings very long, costa nearly straight, very gently curved toward the apex, which is bluntly angulated; hind margin regularly curved, oblique, and very long, causing the anal angle to be hardly indicated; dorsal margin rather straight; greyish-white, whiter at the base; nervures brownish

to the end of the discal cell, thence all black ; there is a black dot on the base of the median nervure, and beyond it a transverse row of about seven black spots ; parallel, and immediately following, is the first line, curved, and rather scalloped, interrupted at the nervures, black or dark grey ; a little beyond it, and *before* the middle of the wing, is the second line, dark grey, double, similarly curved and almost parallel, broadly interrupted at the nervures ; the space between the first and second line is filled in with smoky-grey, and forms a transverse band, divided by the nervures. Beyond the double second line, and outside the discal cell, the whole broad space to the hind margin is occupied by slender, dark grey, excessively angulated lines, forming arrow-heads between all the nervures, in series of three to each elongated space or cell ; hind margin with a black spot between each pair of nervures, from which, usually, a shorter or longer, black line runs inward toward the inside of the next arrow-head mark, so as in some cases to resemble a complete arrow. At the end of the discal cell is a long, slender, bent, black lunule, and on the costa near it several regular blackish blotches ; cilia white, spotted with smoky-black. Hind wings rather small and short, apex bluntly angulated, hind margin sinuous ; clear white with the nervures brown ; a faintly indicated dark grey central lunule ; cilia spotted with grey.

Antennæ of the female rather shorter and with shorter pectinations ; abdomen very stout and clumsy ; fore wings considerably broader, with the costal margin decidedly rounded, colour greyer, markings more distinct ; hind wings pale grey with a central lunule ; otherwise as in the male. The front or costal margin of the hind wings is strongly fringed with long outstanding white scales, and projects beyond the costal margin of the fore wings when the insect is at rest.

Underside of the wings of the male clear white, with the nervures brownish ; a grey cloud exists along the subcostal region of the fore wings. In the female the underside is much clouded with grey, the lunule of the hind wings is

distinct, and the marginal white spots are visible. In both sexes the body beneath is very downy, white; the legs black, barred with white, and very strongly tufted with masses of soft, downy, white scales.

There is constant variation in the positions of the arrow-head markings between the nervures; in some specimens these are crowded rather closely together, at a considerable distance from the hind margin, and in these instances there is a long black line from the marginal dot running toward them; in other cases the arrow-heads are widely separated, the last being near to the hind margin, and in these the black spot has but a short attached streak, or is entirely without it; every intermediate gradation occurs. In rare instances the dark band between the first and second line is intensified. Mr. S. Stevens has a specimen in which it is broad and blue-black, all the following markings being also intensified. One in Mr. S. J. Capper's collection has it grey, but very near the base of the wings, and the spaces before and beyond it pale yellowish; and Mr. J. Harrison has a female in which the fore and hind wings, thorax and abdomen, are all clouded with smoky-black.

On the wing in May and June.

LARVA stout, smooth, head flattened in front and much withdrawn into the second segment, which also is flattened in front and remarkably squared; fourth segment having a large upright angular dorsal hump, extremely conspicuous when the body is not stretched out; body tapering thence to the anal segment, which has no prolegs, but is provided with two long rough diverging points directed backward, each containing a long pink whiplike process or thread which is rapidly exerted, like a long lash, when the creature is irritated. Head pale brown, edged with black, but with the hind portion pink; general colour rich green; second segment deeper green edged with yellow, with a large black spot at each corner; from these corners, on each side, commences a white stripe

often edged inside by a purple stripe, which proceeds obliquely to the top of the hump on the fourth segment; where they diverge again obliquely to the seventh and eighth segments, upon which, in some specimens, they descend to near the spiracles, but in others, quite down to the prolegs; thence rapidly returning toward the dorsal region, and proceeding quite to the anal fork. The whole surface of the back above these two white stripes is purple, or brown dusted with purple, or with lilac, or even white; it forms a most striking dorsal blotch, and has been compared to a saddle, having a most conspicuous crupper. The apex of the hump of the fourth segment is dull crimson; the spiracles white edged with black; the legs brown ringed with yellow; anal tails whitish, greenish, or purplish, with brownish-black rough tips and roughnesses or incrustations; between them are two black points.

A formidable and alarming looking creature, as it sits with head drawn back, the black spots like two great eyes, the conspicuous hump, the contrasting purple, white, and green colour, and the two divergent tails, upraised and threatening. When young the angles of the second segment are sharper, almost like horns, the hump on the fourth segment even more conspicuous, the anal tails longer, and their contained whips long and much more easily excited to protrusion.

July, August, and sometimes September, more especially upon poplar, but also upon aspen, willow, and sallow; always sitting on the upper side of a leaf, most conspicuously, and feeding vigorously in the sunshine; also feeding much at night. The large leaves of the Canadian poplar (*Populus balsamifera*) in gardens in the outskirts of towns seem to be much favoured.

PUPA rather soft, stout, blunt, with prominent eyes and well-defined antenna-cases; incisions deeply cleft; anal extremity with numerous small warts; purplish-brown with darker wing-cases. Enclosed in a hard shell-like cocoon,

rough externally but highly polished inside, composed of a kind of gum secreted by the larva mixed with small fragments bitten from the surface where it is placed; on the trunk of a tree, usually rather near the ground in an angle of the bark, which it closely resembles. (C. Fenn.) The resemblance of the cocoon to the bark is so close that it is almost impossible to discover it with the eye. Not always placed upon the tree on which the larva has fed, but the cocoon (which is easily found when vacated by the moth) has been known to be placed on trunks of oak, birch, horsechestnut and other trees, and even on the mortar of a wall, or on a potato tuber. Colonel Partridge found a number of cocoons, one of which contained a living pupa, on stems of Tamarisk (*Tamarix gallica*) at the Isle of Portland, but as neither poplar, willow, nor any known food plant of the species grew near by, the inference appeared probable that the larvæ had fed on that unusual plant. Dr. T. A. Chapman has shown that the portion of the cocoon through which the moth has to break is thinner, more transparent and less strengthened with bits of bark than the remainder of the cocoon, that the pupa has a sort of edge, or keel, in front, for cutting its way, and that the moth, as it breaks the pupa skin, emits a fluid from an orifice close to the small filaments of the tongue, which fluid has the power of softening the cocoon, and is rubbed round inside by the moth before forcing its way out. This is of great interest, since the cocoon is of extraordinary hardness, and utterly impervious to so soft an insect without such aid. Professor Poulton states that the fluid in question is powerfully acid, affecting litmus paper in a most marked degree, and causing violent effervescence when allowed to fall upon sodium bicarbonate. He also states that it is formic acid, and that the freshly opened and moist cocoon is also acid to test paper. For his observations on eversible glands in this and other species, and the use of them for defence, for which I am unable to find room here, the student is referred to the Transac-

tions of the Entomological Society of London, 1886 and 1887.

The moth flies only at night and is readily attracted by a strong light. In the daytime it is most sluggish, sitting on a paling, or the trunk, or branch, of a tree, or on the low-growing dwarf sallows of a sandhill or fen. In such a situation a specimen, or more conspicuously a pair, of the moths, bears the most extraordinary resemblance to a bunch of bursting, cottony catkins of the willow. No one would imagine the accuracy of this mimicry without actually seeing it. The fluffy legs, the downy margin of the hind wings projecting outside the fore wings, the grey markings on the latter, and the spots on the thorax produce a most remarkable and unexpected harmony of appearance with the bunches of catkins all around.

Apparently to be found throughout the United Kingdom, except the Orkney and Shetland Isles; and in most districts moderately common, though hardly ever abundant; rare in the Hebrides, and some other parts of Scotland, but in Ireland extending to Malin Head, Donegal. Abroad it is found nearly all over the Continent of Europe, Western Asia, Siberia, and in some parts of Northern Africa. Specimens agreeing most accurately with our own, but named *felina* (a most felicitous synonym for our "Puss Moth"), are found in Japan, and a slightly more dusky variety from the North-West Himalayas, China, and Japan, has received the name of *Himalayana*.

Genus 2. STAUROPUS.

Antennæ one-third the length of the fore wings; in the male pectinated to three-fourths of their length, thence simple; in the female simple; abdomen crested with upright tufts of scales; dorsal margins of both fore and hind wings edged with long scales which are raised into a rather prominent tuft when the wings are closed.

Larvæ lobster-shaped, with very long anterior legs, no anal prolegs, anal segment with a pair of erect filaments.

PUPÆ of quite ordinary shape, in a silken cocoon.

1. *S. fagi*, *L.*—Expanse 2 to 2 $\frac{3}{4}$ inches. Fore wings long, grey-brown, with indented, whitish, cross lines; and blackish spots near the hind margin; hind wings short, grey-brown.

Antennæ of the male very short, strongly pectinated, and the teeth set well apart for three-fourths of their length, when they suddenly terminate, the shaft curved forward, and then straightened, with an angle, into a stiff simple spike: chestnut-brown. Head strongly tufted, yellowish-grey, with large whiter tufts at the bases of the antennæ. Thorax broad, densely covered with long fluffy scales, mixed, brownish-grey and whitish; abdomen stout, greyish-brown, often whitish-brown, with a dorsal row of upright tufts of black scales from the base to the middle, and a large flattened anal tuft of long whitish scales. Fore wings long, rather ovate: costal margin straight to the middle, then gently rounded; apex rather angulated; hind margin below it gently rounded, then bending suddenly, much more obliquely, and sweeping off to the dorsal margin, with little indication of an anal angle, continuing its curve along the dorsal margin, where is an edging of long grey scales. Colour brownish-grey mixed with ashy-grey; nervures faintly tinged with yellowish; base ashy-grey or whitish-grey; first line undulating and much indented, smoky-black, edged on its basal side with yellowish or whitish; second line placed just beyond the middle of the wing, also much undulated and indented, consisting indeed of crescents placed between nervures, yellowish-white, partially edged inside with black; the broad band between these two transverse lines much clouded with dark grey or blackish, darkest toward the costa, but tinged with dull purplish-red toward the dorsal margin. At the end of the discal cell is a perpendicular black streak

much obscured by dark scales. Beyond the second line is a row of ill-defined round black spots edged inside with whitish, lying parallel with the hind margin, except that the one nearest the apex is placed further back. Along the hind margin is a row of blackish dashes, the lower of them curiously bent and angulated; cilia rather long, dark grey dashed with whitish. Hind wings short, rounded, the costal margin clothed with long loosely projecting scales, and the dorsal half covered from the base with long fluffy scales; grey-brown, paler at the base, tinged with reddish towards the dorsal margin; the costal area darker brown, with large ashy-white marginal blotches; cilia white with dark grey dashes. Female larger, with very short, simple antennæ, hind wings darker, otherwise similar. When at rest the fore wings are folded closely together, so that the scales of the dorsal margin stand up in a ridge over the back; but the hind wings are laid flatly down, and extend outside the costal margin of the fore wings, so that there is a broad flap of hind wing, barred with white, visible on each side.

Underside of fore wings greyish-white with long grey shades between the nervures: that portion lying under the discal cell densely covered with long raised scales: hind wings and body greyish-white; legs grey above, whitish beneath, with large dense downy white tufts; anal tuft shining white. In the female the fore wings beneath are nearly unicolorous grey.

Variation is mainly in the depth of the grey-brown colouring and in the reddish tinge of the dorsal region. In some cases the latter is absent, in others it is extended halfway across the wings; usually it is strongest in the male. A large female taken near Reading by Mr. W. Holland is mainly of a very pale ashy-grey, with the costal half of the dark band also pale, but the submarginal row of spots very dark and conspicuous; others are smoky black, some quite smooth and shining, the usual lines and one or two spots whitish, and the cilia strongly dashed with white. This last

black form is a recurrent variety, and is met with in both sexes ; intermediate smoky-grey examples also occur. Wyre Forest specimens in the cabinet of Mr. and Mrs. Abbott have the thorax and base of the fore wings unusually hoary in colour.

On the wing in May, June, and the beginning of July, and in very exceptional seasons, as a partial second generation, in October and November, but the occurrence of this second emergence does not seem to have been recorded abroad, nor to have been noticed here until quite recently.

LARVA nearly three inches in length, shaped something like a lobster. Head large, narrow above and slightly cleft, broad below, flattened, outer edge ridged, and the lobes prominent ; second and third segments smaller, fifth to the tenth much larger, deeply divided and produced into double perpendicular tubercles on the back ; eleventh segment flattened a little at the sides, but less prominent above, twelfth and thirteenth also flattened at the sides, but swollen into a great ovate lobe, raised above the back and embellished with two curved-down tails or tentacles ; no anal prolegs. The true legs are very long, longer than those of the moth, sprawling, having regular tibiæ, tarsi, and outward bending knees, as conspicuous as those of a spider, but totally unlike those of other larvæ ; ventral prolegs very large and prominent. Head reddish-brown, streaked in front with light brown, or with purplish-crimson ; body and legs light brown or darker brown, with a faintly purplish tinge, always shaded on the segments with deeper brown ; dorsal line faintly yellowish, bordered with blackish ; dorsal humps edged on each side with blackish lines apparently representing subdorsal lines ; spiracles white, ringed with blackish-brown, surrounded with paler, and edged above by a deep brown spiracular line ; hinder segments rather darker and more crimson-brown, showing but little trace of the longitudinal lines. The very young larva looks almost like a long-legged ant and is dark brown, there being little alteration in appearance other than

in size throughout the larval existence. It eats nothing apparently, except its egg-shell, until after the first change of skin, when the cast skin is devoured. After this it feeds steadily on the leaves and is said to eat every morsel, even to the leaf-stalk, before going to another leaf. It has also been seen to drink drops of water sprinkled on its food.

July to September on beech, or more rarely on birch, oak, hazle, hawthorn, apple, and wild rose; abroad also on alder, lime, and fruit trees generally. So far as I am aware no second generation of the larva has been observed to feed up in this country, and there is reason to believe that the offspring of the second emergence of moths, if any, perish miserably from cold, or hunger, or both. This doubtless has helped to restrict the numbers of this species, which does not appear to be very subject to the attacks of Ichneumon parasites.

PUPA of ordinary shape, rounded, rather broad, abdominal segments almost as stout as the thorax, anal extremity very blunt; brown-black with a purplish bloom. In a thin but very tough cocoon of brown silk between two dead leaves upon the ground, Apparently never upon the tree. In this condition through the winter, during which season the pupæ must be greatly reduced in number by mice and other foes.

The moth flies only at night, usually from about 11 P.M., and after that hour the males may readily be assembled, in its restricted haunts, by means of a freshly reared female. It will also come to a strong light. In the daytime it sits on the trunks of trees, more especially small ones. Mr. W. Holland says in the *Entomologist's Monthly Magazine*, "They decidedly make a selection of the smaller trees and saplings to sit upon. It is unusual to find them—the males in particular—on anything larger than a small scaffold-pole, and the more favourite tree is from the size of a hop-pole to that of a walking-stick. The small tree need not be a beech, a young ash, thorn, nut-bush, dead stick, in fact anything

which stands upright in the beech wood will do, so that it is not too large. The females are not found quite so constantly on young trees, perhaps because they are less active than the males, but when once they have flown these also seem to prefer the smaller trees. This selection of trees may be a protection to the moth. The trunks of the large beech trees are very smooth and clean, and a large moth like this is conspicuous on them, but the little trees are rugged and covered with knobs, large in proportion to the size of the tree, where branches have been taken off to make it grow shapely; and the moth as it sits closely pressed to the tree, carefully balanced to the perpendicular, with its wings folded to a triangular shape, the hind wings projecting beyond the fore wings, after the fashion of *Gastropacha quercifolia*, looks wonderfully like one of these knobs. The blackish variety in particular is so like a knob on the tree that a close examination is needed to detect it." I feel particular pleasure in quoting Mr. Holland's remarks since his opportunities of observing the insect in the Reading district have been unequalled, and it is to his unbounded liberality that I am indebted for the magnificent series, including varieties and specimens set so as to show the position in repose, from which the above descriptions have been made. The manner in which the projecting portions of the hind wings, with their grey-brown and white shades, finish off the resemblance of the moth to a knot, is wonderful to see. The larva, too, has its curiosities of mimicry. When extremely young and at rest it looks exactly like one of the brown scales of the beech twig; when moving it resembles a large red ant; when larger it agrees most accurately in colour and outline with a twig of beech having unopened buds, such as it loves to sit upon; or is hardly to be distinguished from a dry brown curled leaf. When disturbed it takes a quivering trembling attitude, and if knocked off the spray "looks as though about to expire in a fit of palsy." When feeding it has a singular likeness to a great earwig or brown rove-beetle, and this last

similitude was so early noticed that Mouffet wrote more than two centuries and a half ago that the "*Staphylinus caterpillar*" was common in Norfolk. When irritated it has the power of ejecting an acid secretion from the gland under its head, causing much inconvenience to the eye of the too-close observer.

Most frequent in beech woods in chalk districts, more rarely found in open mixed woods, but almost confined to chalky or sandy localities. Certainly not *now* common in Norfolk, though early in the present century Curtis used to take it in the Cathedral Close at Norwich. Still found occasionally in the county and in Suffolk, and much more frequently in Essex, especially the Epping Forest district. In various localities in Kent, Sussex, Surrey, Wilts, Dorset, and even Devon and Cornwall. Not very scarce in the New Forest, Hants, and in some years comparatively common in the chalk districts of Berks, Bucks and Oxfordshire. Rare in Cambridgeshire, the Forest of Dean in Gloucestershire, Somerset, Middlesex, Northamptonshire, Herefordshire, Sherwood Forest, Nottinghamshire, in Wyre Forest on the borders of Worcestershire and Salop, and in Wales in the Swansea district. I have no record from further north in these islands, except that of a single specimen at Selby, Yorkshire, in 1864. Mr. Kane showed me a very pale specimen which I understood that he had taken in Ireland in 1892; it is since stated by him that it was captured near Kenmare by Miss Vernon, and that one or two more specimens have been found in Ireland.

Abroad it is widely distributed through Central Europe, and in Spain, Piedmont, Corsica, Livonia, Southern Sweden, and over extensive regions of Western and Southern Asia. Specimens from Japan have received the name of *persimilis*; and those from Ceylon, India, and Burmah, that of *alternans*.

Genus 3. **NOTODONTA.**

Antennæ in the male pectinated to near the apex, but in the upper portion the teeth diminish regularly in length, and in most species become much broader; all ciliated; fore wings of a long-ovate shape, rounded at the tip, and having on the dorsal margin a "prominent" or projecting tuft of scales which in repose forms a dorsal hump.

LARVÆ in some cases cylindrical, in others of most grotesque forms, always with sixteen legs, but usually carrying the anal pair elevated.

PUPÆ of normal form, in a thin silken cocoon, usually subterranean, occasionally between leaves.

1. **N. dictæa**, *L.*, **tremula**, *Staud. Cat.*—Expanse $1\frac{3}{4}$ to $2\frac{1}{4}$ inches. Fore wings long, narrow, rounded at the tip, whitish, with longitudinal black stripes and white nervures; dorsal margin with a small prominent tuft; hind wings white, with a dark spot at the anal angle.

Antennæ of the male strongly pectinated, the teeth stout, regular, rather spreading, closely fringed; light brown. Head small, purple-brown, tufts at the base of the antennæ darker; collar broad, brown or blackish-brown; thorax broad, loosely covered with downy dark brown scales mixed with silvery white; black lines at the back of the rather raised shoulder-lappets, and of the thorax; abdomen long, stout, cylindrical, yellowish brown, slightly tufted down the sides, and with a short, broad, golden-brown anal tuft. Fore wings long-ovate, costa straight to beyond the middle, then gently rounded, the curve passing smoothly round the apex and oblique hind margin to the anal angle; dorsal margin rather short, bending out from the base and slightly angulated in the middle, where is a protruding, angulated tuft of scales, forming a dorsal prominent, or hump, when the wings are closed; colour whitish; a broad, deep black,

longitudinal stripe, arising at the base of the costa, passes down the wing to near the anal angle, being sharply defined toward the dorsal area, but shaded off with light brown toward the middle of the wing, and divided by white lines which run up the nervures from the hind margin, that nearest the anal angle being slenderly and indistinctly wedge-shaped. A bright white line commences with a sharp angle above the dorsal prominent tuft and thence proceeds toward the anal angle. The space along the dorsal margin, cut off by the black stripe, is otherwise pale ochreous shading to grey. Great part of the costal region is occupied by a large grey shade which spreads, in longitudinal clouds, into the middle of the wing, and more darkly towards the apex, before which it narrows off to a point; in this darker portion are contained two or three black streaks lying between nervures. The nervures are clouded with brownish until past the middle, where they become white; and a white spot is formed by a cloudy ring at the end of the discal cell. Hind marginal space faintly clouded with grey and brownish from the black stripe; the margin edged with a white and a black line; cilia greyish, paler at the base. Hind wings elongated, rounded at the apex; nervures brownish; dorsal region clothed with very long brownish scales; at the anal angle is a purplish-black blotch divided by two brownish nervures and a submarginal white line; remainder of hind margin edged with a faintly brownish line; cilia white. Female a little larger and stouter, with antennæ very shortly pectinated, otherwise similar. Underside of the fore wings white in the middle, clouded toward all the margins with brownish grey, darkest toward the costa. Hind wings white, faintly edged at the anal angle with brown; body and legs glossy golden brown.

Variation appears to be mainly climatal, the brown shading gradually disappearing in the northern districts, so that specimens sent from Fifeshire by Mr. J. Ross have hardly a trace of brown colouring, the white ground colour forming

a broad stripe down the middle of the fore wings; while a long series in Mr. W. H. B. Fletcher's collection, obtained from Forres, are shaded with a very cold grey. Yet a male taken near Rugeley, Staffordshire, by Dr. R. Freer, has the ground colour dull pale brown with little trace of white.

On the wing at the end of May and in June, and as a complete or partial second generation at the end of July and in August. As a rule double-brooded in the South of England, single in the North and in Scotland, but this rule appears to admit of a somewhat wide range of exceptions, and there is a record of the rearing of a partial third generation in one season. In Nottinghamshire it has been shown to be fully double-brooded, while in the adjoining and more hilly county of Derby it is but very partially so.

LARVA elongated, with the skin highly polished and much wrinkled, especially at the sides; third segment swollen laterally; fifth to the tenth slightly so on the back; twelfth enlarged into a pointed dorsal hump. Head rounded, shining, whitish or greenish or pale brown, in the former cases the body is pale or deep green with faint darker green subdorsal lines, rather narrow and often indistinct; yellow spiracular lines, and the surface below them, with the legs and prolegs, either green or purplish-red; while in the other case the pale brown head is accompanied by a general pale brown or drab colour transversely banded with pale yellowish which encloses brown spots, and having on the second, third, fifth to eighth, and twelfth segments side blotches of rich dark brown; or sometimes clouded with pale lilac but having no distinct spiracular line. Spiracles black, in white rings; hump on the twelfth segment edged in front with whitish, behind with purplish; anal segment tinged with red. Under surface green, or rosy red, or lilac. These varieties are so different in appearance as commonly to be mistaken for distinct species.

At the end of June and beginning of July, and in a second

generation from the end of August to October or even November; on poplar, aspen, and sometimes on any species of sallow. Clinging so tightly to the leaves as to be very difficult to beat off, and liable to be injured in the operation. Not easy to rear in confinement, but fond of drinking drops of water. The brown variety of this larva is frequent in this country, but appears to have been unknown to Professor Zeller, in Germany.

PUPA cylindrical, blunt, rounded at both ends and tapering but little toward the tail; glossy, with roughened wing-cases; colour deep mahogany-brown with darker thorax and wing-cases. In a coarse ovate cocoon of grey silk and earth, buried often at the foot of a tree, sometimes at some depth below the surface of the ground. In this condition through the winter. Duponchel says that the larvæ of the summer brood spin up between leaves, the autumn brood in the earth.

The moth flies only at night, and is readily attracted by a strong light. I have often found the male settled quietly down on a gas-lamp in the environs of London. In the day-time it is perfectly quiescent, sitting occasionally on the trunk of a tree or a fence, but probably more generally on a branch; and, with extended legs, resembling an entangled and rain-washed feather, or a lump of bird's excrement. Apparently found throughout England, common in the Southern and Eastern Counties, except the Fens where it is scarce; not common in the extreme west of England or in Wales. Frequent in some parts of Scotland and found so far north as the district of Moray. Also widely distributed in Ireland, occurring even in Donegal, and commonly on the coast near Londonderry, but apparently much scarcer in the Southern districts. Abroad it is found throughout Central Europe, and in Northern Spain, Piedmont, Sweden, and Finland.

2. **N. dictæoides**, *Esp.*—Expanse $1\frac{3}{4}$ to 2 inches. Like

N. dictæa but with a long, distinct, wedge-shaped, pure white streak near the anal angle and continued to the cilia.

Resembling *N. dictæa* in structure, colour, and markings so closely that the description already furnished of that species applies to this, with the following exceptions:—the colour of the fore wings in the present species is usually of a clearer white with less brown or grey clouding; the nervures are not white except at their extreme tips; the ringed white discal spot is absent but replaced by one or two faint brownish flecks; and the long white streak which runs to the hind margin, above the anal angle, is of a clearer white, broader, much more distinctly wedge-shaped, and runs through to the cilia, obliterating the black marginal line. In the hind wings the colour is not so clearly white but tinged with grey, and the blotch at the anal angle is not divided by nervures nor by a white line but shades off in a dusky clouding above; cilia dappled with brownish. Underside, darker than in *N. dictæa*, the fore wings almost wholly grey-brown, except a sharply defined clear-white blotch just below the apex, and sometimes a white streak on the very dark costa; otherwise similar.

Variation very slight, but Scottish specimens are whiter than those from the South, and reared specimens are often paler than those captured at large. Dr. R. Freer has specimens, taken on Cannock Chase, in which the longitudinal black stripe is unusually broad, and its edging of brown shading also rather extended.

On the wing in April, May, and June, and as a partial second generation in July and August. Apparently single-brooded in the northern portion of its range, but irregular and uncertain, individuals fed up at the same time emerging at very different periods, from May to September.

LARVA elongated, skin highly polished, twelfth segment raised into a peaked hump which when young is very prominent; third segment swollen laterally; head rounded

and shining; a rough horny plate on the anal flap. Head lilac, delicately reticulated with black; back olive or purplish-brown shading into lilac on the sides; a broad and very conspicuous yellow spiracular stripe; spiracles prominent, black, edged with white; second and third segments transversely and indistinctly shaded with grey, twelfth segment transversely shaded with dark grey, the hump blackish; anal plate purplish-brown; legs reddish-brown; prolegs externally reddish-brown or purplish-brown, inside greenish. When young the spiracular stripe is often white, and the hump large, conical and prominent. (C. Fenn.)

In June and July, and, in a partial second generation, in September and October. On birch, feeding upon the leaves, but when not feeding fond of resting upon the underside of a leaf stalk; somewhat addicted, in captivity, to devouring its kindred, probably from want of water. Rather difficult to obtain by beating the trees, from the tenacity with which it clings to its resting-place.

PUPA elongate, rounded; anal extremity round, with two very minute and widely separated bristles; dark purple or blackish. Underground in a compact tough cocoon of silk and sand. (C. Fenn.)

The moth flies only at night, and is readily attracted by a strong light, though otherwise scarcely ever taken on the wing. In the daytime it sits upon a birch trunk or branch, or on one of the side twigs, or even on a spreading root, with its long tufted anterior legs stretched forward, and in the latter situation the resemblance of the moth, or more still of a pair of moths to the smooth dropping of a large bird is most startling and unexpected, far closer even than that to a swollen knot of birch bark. Dr. R. Freer of Rugeley points out another curious mimetic resemblance in this species. He says, "In the moth state it affects the edges of palings, and after pairing the female usually rests head downwards, and the male the other way up, the two heads being approxi-

mated. Their peculiar coloration then forms a very efficient protective resemblance to a brown and white fungus which grows in whorls up the sides of the palings and in similar situations, and the result is extremely bizarre, especially as I saw once, when six males and one female—evidently a case of assembling—were sitting close together on the edge of one paling; the resemblance to the fungus in question being then extraordinary.”

Very widely distributed, apparently occurring, though far from commonly, in all the counties of the southern half of England; still more rarely throughout the fen districts and most of the midland and western counties; becoming more frequent in Staffordshire, Lincolnshire, and Yorkshire, and in the mosses of Cheshire and Lancashire; and not rare in Herefordshire, Glamorganshire, Merionethshire and Cumberland. Far more common in Scotland, occurring throughout that country except the Isles, and especially attached to the hillsides and the valleys which run deeply into the hills, in which the birch is usually the most abundant tree. In Ireland it has been found near Dublin and in Wicklow, Mayo, Westmeath, Galway, Roscommon, Cavan, Tyrone, and Donegal, but apparently never commonly. Abroad its range extends throughout Central Europe, the temperate portions of Northern Europe, Piedmont, France and Lapland.

3. *N. ziczac*, *L.*—Expansion $1\frac{3}{4}$ to 2 inches. Fore wings pale brown, white toward the costa, with a very large oval purple-brown and grey blotch beyond the middle.

Antennæ of the male pectinated with rather strong teeth to near the apex, where they become broader, but so short as to be obscure; light brown. Head rough, purplish-brown; thorax broad, covered with dense, rather raised, long purple-brown scales; collar darker; shoulder lappets raised and edged with black; back of thorax almost crested with raised black and dark purple-brown scales; abdomen stout, greyish-brown, rather downy, with a very short, thick, anal tuft.

Fore wings somewhat ovate, with the costal margin straight to near the apex, where it curves, and takes a bold sweep round the tip, the hind margin, and the anal angle; dorsal margin also rather rounded, and furnished in the middle with a large projecting tooth of purple-black scales. General colour light fawn; middle portion of the costa to the median nervure white or hoary; at the base of the wing is a yellowish spot faintly bounded by a reddish line; first line perpendicular, purple-brown, but only visible from the costa to the median nervure; at the end of the discal cell is a long thick black streak or lunule, the apex of which unites with a cloudy deep black edging which runs along the costa to the apex, and also with several black lines along nervures. From this discal streak or lunule the whole outer portion of the wing is clouded with purple-grey interrupted with ripples or clouds of the ground colour, forming a large oval blotch like a pebble, in which the nervures are black and the portion in the hollow of the discal streak is dark grey, while a delicate line of pale crescents seems to indicate the normal second line; near the hind margin is a similarly formed pale line passing through reddish clouds; a thick black line from the costa passes round the apex and hind margin to the dorsal margin, along which, with interruptions, and a change to red-brown, it reaches the base of the wing; outside this the cilia, pale brown dashed with dark brown, are continued round the apex on to the costal margin; on the hind margin they are slightly scalloped and tipped with white. Hind wings white tinged with pale greyish-brown, paler at the base; nervures rather browner, as is a large cloudy central lunule; hind margin edged with black-brown, from which, at the anal angle, extends a light purple-brown cloud; often a whitish cloud lies across the middle of the wing; cilia pale brown dusted with darker and becoming very dark at the anal angle.

Female with the antennæ only dentate; slightly larger and rather stouter, hind wings browner; otherwise similar.

Underside of the fore wings smoky blackish with whitish margins, and the nervures and dorsal streak blackish; hind wings white with a large blackish lunule, brown nervures, and grey clouding, which, however, leaves a white transverse band in the middle; a dark brown line runs round the margins of all the wings, outside which the cilia are whitish dashed with grey; body grey-brown; legs reddish-brown. Female browner.

The ground colour varies from pale fawn colour to purplish-brown, and the large oval blotch is sometimes tinged in the clouded portion with red, while in other cases the clouding is almost obliterated. In some specimens the marginal black line is much thickened and intensified, forming quite a frame to the fore wings, and in such individuals the inner parallel ripples of colour are very strong. Mr. S. Stevens has a specimen in which the middle of the fore wings is dark brown, and is crossed by a longitudinal black bar which meets the discal lunule.

On the wing in May and June and in a complete or partial second generation in August. Mr. W. H. Tugwell reports having reared a third generation of moths in September. In the south of England, and so far northward as Nottinghamshire, a second generation is found to be constant and tolerably complete; but in the adjacent hilly districts, as Derbyshire, the second emergence is partial only, and this condition is observable in more northern English districts, while in Scotland but one brood is usually obtained. In this respect, however, the insect seems everywhere to be influenced by the seasons and by local conditions.

LARVA. Head broader than the following segments and slightly cleft at the top, four following segments moderately slender, sixth and seventh each with a large and conspicuous, broadly conical dorsal hump; another, more flattened, on the twelfth; ventral prolegs large and strong; anal prolegs small and but little used; anal segment tapering to a point

and usually elevated. Head greenish-grey or yellowish-grey; body whitish-grey, more or less tinged with pink or brown or yellowish; the two hinder segments more yellow-brown or pinkish; dorsal line broadly orange, edged with brown on some of the segments, but on others almost obliterated, well marked on the front of the dorsal humps; subdorsal line a mere darker shade of the ground colour; spiracular line similar but more distinct, broader, and edged below with yellow or white; spiracles ringed with black; undersurface and legs darker grey. Sometimes the raised hinder segments are richly clouded with orange, and have white lines on the upper portion of the hump.

June and July, and usually, in the southern districts, a second generation in August and September. On sallow and willow; more rarely on poplar and aspen; feeding on the leaves, clinging much to the twigs or leaf-stalks, holding on with considerable force, and from its singular form, which, with head and tail raised, and conspicuous humps, is quite a zigzag (hence its name), may easily be passed over as a dead and twisted leaf or catkin. When feeding on poplar it is sometimes of a bright pea-green. It is hardy and easily reared.

PUPA round, cylindrical, rather stumpy; red-brown; glossy on the abdomen and tail, dull on the wing-cases. Subterranean, in a cocoon of silk and earth, sometimes at the root of a tree, doubtless more frequently under a bush. In this condition through the winter.

The moth flies only at night, and comes readily to a light placed in its haunts, though not often to gas-lamps in the suburbs of towns. In fens and marshy places it is taken freely by this method. Otherwise it is rarely taken upon the wing, or indeed in any manner in the moth state, nearly all the specimens in collections being reared. Probably it sits in the daytime upon branches of trees rather than their trunks, and in the thick parts of bushes, where it is not easily seen.

Apparently found throughout the United Kingdom, wher-

ever sallow or poplar is plentiful, except in the Scottish Isles, from which I have no record of its appearance; yet never very common, and principally confined to fens, marshes, and damp woods. The records extend from Kent and South Devon to Moray and West Ross, and in Ireland from Wicklow to Londonderry and Donegal. Abroad it is found throughout central and northern Europe, Southern France, Spain, Italy, and Corsica.

4. **N. tritophus**, *Fab.*—Expanse 2 inches. Fore wings rusty-brown, with the base, and a very large ovate apical blotch, blackish; hind wings white.

Antennæ of the male rather shortly pectinated, light brown; head covered with raised grey-brown scales; thorax broad, not crested, dark brown, faintly dusted with ashy-grey, and in the middle tinged with reddish, shoulder lappets a little raised, blacker brown; abdomen rather long and stout, yellowish brown with a small blackish raised dorsal tuft of scales on the basal segment. Fore wings very ovate, costa slightly curved, more so toward the apex, which is very bluntly angulated; hind margin oblique, very slightly rounded except towards the anal angle; dorsal margin also rounded and slightly angulated in the middle, where is situated a triangular prominent tuft of blackish scales; general colour rusty-brown or reddish-brown; close to the base is a much angulated, thick, black line, followed by a broad, blackish transverse band nearly filling the space to the normal first transverse line, which is perpendicular, rippled and indented, blackish; beyond this, at the costal edge of the discal cell, is a triangular brown or blackish spot edged with whitish; beyond this the usual discal streak or lunule, long, reddish, edged with white, and clouded outside with smoky-black, this last being the commencement of a very large ovate smoky-black blotch which occupies most part of the apical space from the costa to below the middle of the wing, but is bounded toward the hind margin by a broad stripe of the ground colour. From the dorsal margin near the anal angle commences the second

line, indented, blackish, which on reaching the large blackish blotch sometimes continues across it as a white indented line, but in other cases becomes perceptible only by dots on the nervures; central portion of the costal margin tinged with whitish, sometimes broadly so; hind margin narrowly blackish-brown, edged with a black line; cilia dark grey dashed with black, and continued round the apex on to the costa. Hind wings short and rather small, rounded, white; the nervures faintly brownish; at the anal angle is a small triangular smoky-black patch, containing whitish and black dots; cilia white with grey dashes. Female with antennæ slightly dentated; hind wings faintly tinged with grey; otherwise similar.

Underside of the fore wings dark grey with the discal lunule reddish, and some whitish dusting near the margins; hind wings white, clouded with grey; body and legs grey, the latter dark-brown in front.

Said to be upon the wing at the end of April and in May, and in a second generation in July and August.

LARVA. Head rather large, following three segments more slender, the sixth seventh and eighth each with a large dorsal, curved-back, conical hump, and one on the twelfth of a pyramidal shape, hinder segments usually raised, with very small anal prolegs; the ventral prolegs being large and robust. The whole shape when at rest is most singular, the middle and hinder portions so elevated that the large humps point toward each other, and nearly meet. Head pale grey; body, with the humps, pale grey or brownish-grey, with numerous transverse wrinkles and darker shades; dorsal line rather narrow, darker grey or reddish-brown, and passing over the dorsal humps; sub-dorsal line slender, double, faintly grey or brown; spiracular line darker and broader, shading down to the feet, which are barred or ringed with whitish; raised hinder segments more distinctly lined and clouded than the rest; spiracles black. Before spinning up it changes to blackish-brown or purplish-brown.

June, July, August, September, on aspen. Abroad reported to feed also on poplar, willow, and birch.

PUPA shining dark-brown; in a silken cocoon, in the earth or between leaves. Passing the winter in this condition.

This is one of our rarest insects. The first recorded capture, of which I am aware, was in 1842 by Mr. J. W. Douglas. He says: "During the Essex excursion I took from an aspen a larva of a greenish-grey colour having three prominences on the back, and which, I thought, was *N. ziczac*, though differing somewhat from the usual appearance of that larva. It formed a slight covering between two leaves in the collecting-box, and appeared in its perfect state on the 10th of August. It has not, I believe, been taken in Britain before." This specimen, a very fine male, is now in the collection of Dr. P. B. Mason at Burton-on-Trent, with another taken by Mr. Garneys in Suffolk, and a third from the collection of the late Mr. Edwin Brown, of which the origin is unknown. The Rev. J. Hellins beat out a larva from an alder near Exeter in August 1870, which he was convinced belonged to this species, but it unfortunately died; and another recorded by the Rev. J. Greene as beaten out of hazel in Gloucestershire proved to be ichneumonid. Dr. F. B. W. White states in his "Lepidoptera of Scotland" that one was taken near Paisley by Mr. Morris Young, but no date is given, nor any indication whether this was a larva or an imago. A specimen "from Scotland," formerly in Mr. Buxton's collection, may be the same individual. It has been stated, but not, I believe, confirmed, that a larva has been found at the foot of an aspen on Clapham Common, London. I know of no other records in these Islands, and it is hard to believe these to be more than the produce of casual and desultory immigration, rapidly dying out under stress of climate. Abroad it does not seem to be a very common species. Godart says that he has taken it two or three times near Paris; but it seems to be found

throughout Central Europe, Southern Sweden, Piedmont, Livonia, and Southern Russia; also in North America, but called *plagiata*.

5. **N. trepida**, *Esp.*—Expanse 2 to $2\frac{1}{2}$ inches. Fore wings pale grey, with two black cross lines near the base, a row of reddish spots near the hind margin, and a large dark grey prominent tuft; hind wings whitish; costal region mottled with grey.

Antennæ of the male strongly pectinated for a considerable portion of their length, very shortly so toward the tip, the rows of teeth standing away from each other, on nearly opposite sides; pale reddish-brown. Head pale brown; thorax very robust, densely covered with slightly raised, dark brown scales having a yellowish gloss; and with blackish stripes at the back of the collar, the sides of the shoulder lappets and down the middle of the back; abdomen long and rather stout, glossy light brown, with two upright crests, or tufts of black scales, on the basal segment, a row of tufts of light brown scales down each side, and a similar broad, short anal tuft. Fore wings very long; costa straight to beyond the middle, then rounded gently, in a long arch, to the apex, which is blunt; hind margin much curved, very long and oblique; dorsal margin very short, bent outward, from near the base, into a broad obtuse angle, which is crowned by a considerable projection of grey scales tipped with black. Rather thinly scaled, whitish-grey, dusted all over with long dark grey, or blackish, scales, which are separately visible. Close to the base is a black bar from the costa joining a black loop at the separation of the larger nervures; outside it a blackish dash toward the dorsal margin; first line black, broadly and repeatedly angulated; second line indicated by a black streak beyond the middle of the costa, and a series of black dots on the nervures, joined together by almost imperceptible scalloped shades; before this is another blackish costal streak touching a discal lunule,

which is very slender, reddish, and surrounded by paler grey; nervures beyond the middle indicated by interrupted black lines; before the apex are two long reddish streaks, and below them a row of ovate reddish spots parallel with the hind margin; a dark grey line passing round the apex becomes, upon the hind margin, a series of flat lunules separated by the tips of the nervures; cilia pale grey, tipped with darker, and continued of a smoky-black and reddish colour, round the anal angle on to the dorsal margin, where it meets the prominent tuft, the dark line continuing across its base. Hind wings semi-transparent white, tinged at the base with yellowish, having the nervures yellowish, and the costal region broadly shaded with grey, which is broken by a commencement of an angulated cross line in accordance with that visible on the costa of the fore wings; hind margin dark grey interrupted by the nervures; cilia pale grey.

Female with the antennæ slightly toothed; body stouter; fore wings rather more clothed with scales and with the markings more distinct, the transverse lines being edged with reddish; otherwise similar.

Underside of all the wings whitish; fore wings grey at the base; costa and nervures pale brown; marginal line dark brown, interrupted; body and leg tufts shining pale drab; tarsi dark brown, barred with white.

Usually not variable. Mr. W. M. Christy has reared, from the egg, specimens of which the margins of the hind wings are deeply scalloped; this appears, however, to be somewhat of a malformation.

On the wing from the end of April to the beginning of June.

LARVA cylindrical, stout, smooth, slightly wrinkled at the sides; last segments tapering; head large, pale green, darker beneath; dorsal line double, yellow; on each side of the sixth to the twelfth segments is a row of conspicuous oblique yellow dashes edged with crimson; a broad yellowish lateral stripe, shaded with reddish cream-colour, passes diagonally from the

head to the edge of the fourth segment; subdorsal lines indicated by yellowish dots; anal flap broadly outlined with yellow; spiracles white, edged with black; head green with four conspicuous pale lines in front, those in the middle paler; outer edges of the lobes broadly margined with ferruginous, edged with yellow; legs and tips of prolegs reddish-brown. (C. Fenn.) The anal segment is not usually elevated, and the anal prolegs are of fair size; but the head and anterior segments are thrown up in a singular manner during repose, the reddish legs conspicuously visible in front. When younger the dorsal and subdorsal lines are visible—pale green or yellow—and the lines on the head yellow; the yellow oblique lateral lines being brighter and edged with brighter crimson. When quite full-fed the whole larva becomes of a dull purplish hue.

End of June, July, sometimes to the beginning of August, on oak, feeding exposed on the leaves, clinging to them, or to the twigs, with great tenacity. Somewhat difficult to rear unless allowed plenty of fresh air, and frequently sprinkled with water, which it likes to drink.

PUPA elongate, cylindrical, rounded at both extremities; the margins of the wing-cases hardly projecting; dark shining purplish-brown. Subterranean; enclosed in a large flat oval cocoon compactly made of silk, and covered externally with grains of sand. (C. Fenn.) Usually placed at the root of an oak-tree in a corner or under a sod of grass. In this condition through the winter, and sometimes over a second winter.

The moth flies only at night, probably not earlier than 10 P.M. It is readily attracted by a strong light, and has occasionally been found sitting on the frame of a gas lamp, looking from its grey colour, and extended downy legs, like one of the lumps of mud with which such lights are commonly embellished by idle boys. The male has also been captured toward midnight, though not in any numbers, by

the aid of a freshly reared female. In the daytime it sits on oak trunks and probably branches, also occasionally on palings near them, but is always scarce, the great majority of the specimens in collections being reared, either from the egg, from captured larvæ, or from pupæ dug from the foot of oak-trees. Although so uncommon it is widely distributed, and formerly might be taken, rarely, in the London suburbs; still found in Kent, Sussex, Surrey, Hants (more frequently in the New Forest), Dorset, more commonly in South Devon—rare in the north of the county—and in Cornwall. Not very rare in Berks, Bucks, Oxfordshire, Norfolk, Suffolk and Essex. Found rarely in Carmarthenshire, Gloucestershire, Worcestershire, Herefordshire, Sherwood Forest, Notts, North Staffordshire, and Yorkshire. There is a single record in 1851 at Delamere Forest, Cheshire, and one specimen, taken in Cumberland, is in the collection of Mr. G. Dawson at Carlisle. Excessively rare in Scotland, but Sir Thomas Moncrieff obtained a larva at Moncrieff Hill, Perthshire, in 1874, which he reared, and there are records in Clydesdale and Kirkcudbrightshire. In Ireland it was recorded by Mr. E. Birchall, but apparently without sufficient evidence. Abroad it is widely distributed through Central Europe, Eastern Spain, Italy, Corsica, South Sweden, Livonia, and Southern Russia.

6. *N. torva*, *Hüb.*—Expanse 2 inches. Fore wings rather broadly ovate, dark grey, with faintly yellowish cross-lines and black prominent tuft; hind wings grey.

Antennæ regularly pectinated to near the tips, where the teeth become extremely short; light brown. Head grey, and, with the thorax, densely covered with rather raised scales; thorax dark grey with a black stripe down the margin of each shoulder-lappet, and also edged behind with black; abdomen moderately long and stout, pale greyish brown, regularly tufted down the sides, and with a short broad anal tuft. Fore wings ovate; costa gently rounded, more so toward the apex, which is hardly angulated; hind

margin long, oblique and much rounded; dorsal margin slightly curved and having in the middle a small triangular black prominent tuft; grey, much dusted with pale yellowish; first line very faint, perpendicular, indented throughout, darker grey, edged inside with yellowish; second line oblique, but bending back to the costa, indented throughout, dark grey edged outwardly with yellowish; outside this is a straight row of about four obscure yellowish clouds toward the apex of the wing, and a row of dark grey cloudy dots, followed by a faintly yellowish line near the hind margin; the discal streak is short, black, enclosed in a large yellowish lunule. All these markings are most obscure, the effect being merely a mottled-grey. Hind marginal line black; cilia grey dashed with black. Hind wings pale grey or whitish-grey; nervures faintly darker; in the middle is a slight transverse whitish stripe followed by a darker shade of grey; at the anal angle is a darker grey cloud containing two or three black dots; cilia whitish dashed with grey, and having a dark grey line at the base. Female with rather shorter antennæ, which are slightly dentated; fore wings rather broader; hind wings darker; otherwise similar.

Underside of the male pale smoky-brown with browner costa and a faint smoky band crossing all the wings; cilia of the fore wings whitish, distinctly spotted with black; in the centre of the hind wings is a dusky lunule; body and legs light brown. Of the female dark grey, with a whitish transverse stripe, and blackish lunules on all the wings.

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

LARVA grey, pale or dark, mixed with yellow and lilac; head grey dotted with darker; on the fifth and sixth segments are dorsal, broad, elevated prominences, and on the eleventh a yellow-spotted conical hump. From the head to the sixth segment is a blackish dorsal stripe edged with white; spiracular line white; spiracles black bordered with white; under surface dark grey with lateral white dots. So

similar to the larva of *N. ziczac* as to be difficult to distinguish from it, but usually darker.

June and July, and again in the autumn, on poplar and aspen.

PUPA stout and cylindrical, rounded in front, and tapering off suddenly and very abruptly behind; indeed almost as much rounded off as in front, and with two or three short bent spines placed abruptly on the curved end. Dark brown, wing-cases longitudinally striated.

In a thin white silky cocoon, very tough and strong, between leaves or underground. In this condition through the winter.

The moth flies, like its allies, at night, but nothing is known of its habits in the perfect state in this country. Only one reliable British specimen is known. It was reared by Mr. Frank Norgate, formerly of Sparham, Norfolk, now of Bury St. Edmund's, from either an egg or larva found by him in North Norfolk in July or August 1882; but as the eggs there found produced what were supposed to be dark varieties of the larva of *N. ziczac*, they were not kept separate from other *N. ziczac* larvæ also found in the same division of Norfolk. Most unfortunately these larvæ did not receive sufficient attention, mainly because the captor was then travelling a good deal, and but one moth was reared, which Mr. Norgate placed, with doubt, in his series of *N. trepida*, to which it bears considerable resemblance. From that series I had the pleasure of separating it. No subsequent indication of the presence of the species with us has been obtained, and the larvæ may have been the result of a casual immigration. Yet the species seems a very probable denizen of the Eastern Counties.

Abroad it is rather local, and apparently never very common, but found in France, Belgium, Germany, Switzerland, Piedmont, Finland, Central and Eastern Russia, and Tartary.

7. *N. dromedarius*, L.—Expanse $1\frac{1}{2}$ to 2 inches. Fore

wings dark purple-brown clouded with yellow and rust-red ; a prominent tuft of purple-brown scales ; hind wings brown or grey.

Antennæ of the male rather short, pectinated with moderately long, solid, ciliated teeth ; becoming very short and broad toward the tip ; light brown. Head golden-brown ; thorax robust, densely covered with long recumbent scales, reddish-brown ; shoulder-lappets purple-brown ; abdomen stout, dull grey-brown, sometimes faintly banded with reddish-brown, tufted at the tail and down the sides. Fore wings elongated, rather narrow, broader beyond the middle ; costa nearly straight, or even a little hollowed in the middle, convex toward the apex, which is very suddenly rounded, almost pointed ; hind margin oblique, regularly curved, the curve passing smoothly round to the dorsal margin, on which, just before the middle, is a loose triangular tuft, or prominent, of projecting purple-brown scales. Colour dull purple-brown ; basal area clouded with rust-red, and having a large yellow spot toward the costa divided by the median nervure ; first transverse line perpendicular, regularly indented and rippled, whitish and yellowish, edged with red ; second line slightly curved and oblique, regularly scalloped between the nervures, whitish at the costa, becoming more yellowish, brightly so near the dorsal margin, edged inside throughout with dark brown ; at the anal angle is a large rust-red spot joined to the extremity of the yellow second line, and from it a row of red crescents parallel with the hind margin and bending inward at the apex ; hind margin edged with a dark brown line ; at the end of the discal cell is a perpendicular, long, rust-red streak in a yellowish edging ; cilia brown, darkest at the nervures, tipped between them with white. Hind wings pale brownish-grey, with a faint, whitish, transverse, cloudy stripe beyond the middle, outside which the ground colour is darker ; cilia whitish.

Female rather larger ; antennæ slightly toothed and abund-

antly ciliated; abdomen stouter; fore wings broader, with rounded costa; otherwise similar.

Underside pale brown; more yellowish round the hind margins, with a faintly reddish submarginal stripe; all the wings with a rust-red central lunule; body golden-brown; legs red-brown.

Variation in this species is distinctly local and climatal. The form described is that of the southern half of England. In the Midlands darker specimens, having less of the yellow and rusty colouring, occur in every shade of variation; while in Scotland and Ireland, and in the North and North-West of England, the form usually found is that named *perfusca*, in which the red and yellow colouring are much restricted or obliterated, the fore wings becoming in some instances entirely dark purple-brown except a faintly pale blotch at the base. Usually, however, some traces of the reddish or yellowish colour of the transverse lines is visible, with the rusty spot at the anal angle. This northern form has also a pale aberration in which the fore wings are of a pale semi-transparent purplish. Mr C. S. Gregson has one of a creamy-white with faintly yellowish markings. Aberrations also occur in the typical southern race, the rusty colouring being much developed. Mr. F. J. Hanbury has one, obtained in Norfolk, of which the fore wings are almost totally suffused with rust-red. A specimen from the New Forest, in Mr. W. H. B. Fletcher's collection, is of a pale chestnut-brown, without dark clouding except in the central space between the two lines; and another, of a fuller brown, has the central space bluish grey.

On the wing in May and June, and, as a partial second generation, in July or August. So far as I can ascertain only single-brooded in the North and West, occurring in June and July.

LARVA stout, but tapering anteriorly from the sixth segment, and sloping back from the apex of the twelfth.

Small, retractile, and slightly recurved humps on the fifth, sixth, seventh, and eighth segments, and another, rather conical and pointing forward, on the twelfth. Head larger than the second segment, notched, rounded, rather flattened in front; anal prolegs raised in repose. Yellowish-green shading into sulphur-yellow on the back; a broad lilac dorsal stripe from the second to the fifth segment; all the humps tipped and marked with reddish-lilac; spiracles purplish, edged and centred with white; a yellow spiracular shade is only distinct on the middle segments and terminates on the tenth, where it is continued down the prolegs, and edged with a conspicuous, oblique, purple dash. Below the spiracular shade is an ill-defined purplish stripe, often much waved, continued on the prolegs. Under surface rather shining grass-green, tinged with purplish, ferruginous, or orange-brown, with a purplish central line on the eleventh and twelfth segments. Head pinkish-brown dotted with black; legs and prolegs tipped with purplish. When young pale reddish-ochreous or light chocolate, the dorsal shade darker and the humps often tipped with ochreous. (C. Fenn.)

June, July, August, and, where double brooded, also in September and October. On birch, alder, and hazel.

PUPA stout, rounded, anal extremity very round, with three minute diverging spikes; glossy dark brown. In a rather large cocoon of silk mixed with loose earth, underground, often at the foot of a tree. In this condition through the winter, in rare instances through two winters.

The moth flies at night only, but is very rarely, if ever, captured during flight. An occasional specimen may be found in the daytime sitting on a fence or a tree trunk, but the vast majority of the specimens in collections are reared, the larva being, at times, not scarce on birch and alder. From the secluded habits of the moth, however, it seems more rare that it really is. Probably its favourite place of repose is on

a branch, indeed it is occasionally shaken out of a tree by beating for larvæ. Very widely distributed, the typical form being found in woods and wooded districts, throughout the Southern and South-Eastern Counties to Norfolk, where, in the fens, the darker variety begins to appear. Westward, however, the latter attains a far more southern distribution, since it is the dominant form in South Devon. On the other hand, specimens having the typical colouring have been found so far north as Cumberland; and in one of these forms, or both, with intermediates, the insect appears to occupy suitable districts throughout England, being almost common in the mosses of Lancashire and Cheshire. Apparently scarce in Wales, my only record being from near Swansea. Not rare in Scotland. Said by Mr. Wm. Evans to have been, thirty years ago, quite common in the Edinburgh district, now far scarcer; found also in Perthshire, Clydesdale, and in other districts to Moray and Argyle. In Ireland widely distributed—Wicklow, Sligo, Donegal and Londonderry. Abroad it is found throughout Central Europe, and in Sweden and Finland.

8. **N. bicolora**, *Hüb.*; **bicoloria**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ inch. Pure white; fore wings with an orange dorsal blotch edged with black.

Antennæ of the male regularly pectinated to near the tip, where the teeth become extremely short; light brown; shaft white. Head and thorax densely covered with raised, downy, white scales of considerable length; abdomen not very stout, white, with a yellowish band at the base, and a thick converging white anal tuft. Fore wings rather broad and short; costa gently arched; apex angulated; hind margin strongly but regularly curved; dorsal margin rounded, and having in the middle a rather long tuft of prominent scales—white tipped with brown. Colour pure glistening white; edge of costa from the base smoky-black; first line composed of three or four disconnected black streaks in a perpendicular direction,

but not attaining either margin, each black streak having attached outwardly a small blotch of rich orange, that nearest the dorsal margin extended along, between the nervures, almost to the anal angle, but interrupted by a short black line of dots which forms part of a normal second line, only indicated by two, three, or four, more indistinct dots; at the dorsal margin, between the orange blotch and the prominent tuft, is an aggregation of minute black-brown dots; cilia rather long, white. Hind wings rounded, pure shining white; cilia long and loose, white. Female with antennæ very faintly dentated; edge of costa white; otherwise similar. Underside of wings, body, and legs wholly pure white.

On the wing in May and June.

LARVA cylindrical, slightly thicker behind the middle, and with a slight swelling on the back of the twelfth segment; anal prolegs of normal appearance, but small and usually elevated during repose. Head green, the lobes olive-green, upper portion reticulated with whitish; body of a delicate green, shining, much suffused with whitish on the back; dorsal line darker green; subdorsal lines yellowish and having below them another slender yellowish longitudinal line, between which and the spiracular stripe is a darker green space; spiracular stripe broad, bright yellow; spiracles black in a white ring; under surface deep green; legs black; prolegs green, those of the body barred with black. When young greener, the subdorsal lines whitish. (Condensed from Buckler.)

End of June and July, on Birch; when very young gnawing the surface of the leaves, afterwards eating them in the usual manner.

PUPA very cylindrical, of almost uniform, moderate stoutness, the thorax slightly keeled, but rounded off at the head; tail rounded and but little tapering; a fine punctate roughness nearly all over; colour brownish-black and rather shining. In a thin cocoon of greenish-grey silk, but tolerably

compact ; between leaves which were closely united round it. (W. Buckler.) In this condition through the winter.

A very rare species in this country, and little is known of its habits. The first specimen known to have occurred in these islands was taken in the middle of June 1859, at Killarney, in the south-west of Ireland, by Mr. P. Bouchard, a professional collector. It was understood to have been beaten out of a birch, but he was naturally reticent as to its habits. Several more were taken by him in the same place—Mr. S. Stevens believes seven or eight—and the wings of one were found at the foot of a tree. Doubt was subsequently raised as to the genuineness of the captures, but Mr. S. J. Capper tells me that when he visited Killarney the residents showed him the very tree on which one of what they called “Micolora” was taken ; and I think that there is no reason to suspect fraud in this case. In June 1861, Mr. John Smith, an artisan from Manchester, had the good fortune to secure a specimen in an extensive wood, known as the Burnt Wood, in North Staffordshire. This was exhibited at Manchester, and led to an expedition by Mr. Joseph Chappell, a well-known Manchester collector, to the same place in June 1865, when he and a friend had the good fortune to obtain six examples, by beating birch trees and bushes. One of these laid a number of eggs, the larvæ from which were carefully tended, but they proved extremely delicate and most of them died, seven only producing the perfect insects. Operations in that wood appear to have been stopped by the gamekeepers, and I know of no more recent captures there. In 1866 another specimen seems to have been secured at Killarney, but here the favoured locality has been destroyed by the cutting down of the birch trees, and there are no further records from this spot. Mr. W. F. de Vismes Kane, however, states that two specimens have been obtained in the County of Kerry by Miss Vernon, and he exhibited one of these in London in 1892. Major J. N. Still possesses a single

specimen, the capture of which near Exeter, Devon, in 1880, appears to have been satisfactorily proved; and this I think completes the record of captures in the United Kingdom. Apparently no locality exists here in which its occurrence can be confidently reckoned upon.

Not a very common species abroad, but found in France, Belgium, Germany, Sweden, Livonia, Finland, and Russia. Mr. W. F. Kirby records the occurrence in the last-named country of specimens devoid both of the black and the orange markings, consequently pure white.

Genus 4. **DRYMONIA.**

Antennæ of the male pectinated throughout, the teeth shorter toward the tip, but not broadened; fore wings rather narrow with blunt apex, and having, on the dorsal margin, a very small prominent tuft.

LARVÆ cylindrical, smooth, without prominences.

PUPÆ in cocoons in the earth.

1. **D. chaonia**, *Hüb.*—Expanse, $1\frac{1}{2}$ inch. Fore wings rather narrow, purple-grey, with the central space, and a stripe on each side of it, white; a black lunule; hind wings greyish-white.

Antennæ of the male strongly pectinated, bright light brown; head and collar shining white; thorax stout, covered with long raised scales, purple-brown, more or less mixed with silvery-white; abdomen moderately stout; light brown with a short dense anal tuft, and slender, paler tufts down the sides. Fore wings rather narrow, with the costa straight to near the apex, thence very slightly rounded; apex bluntly angulated, hind margin rounded, not very oblique; dorsal margin but slightly curved and with an extremely small blackish prominent tuft. Colour paler or darker purplish-grey; base whitish barred with two black crescents, forming

a partial basal line ; first transverse line almost straight and perpendicular, thick, black, edged inwardly by a slender white stripe ; second line dark purple-grey, erect from the dorsal margin, then bent outward, closely indented throughout, and edged outwardly by a similarly indented white stripe ; space between these two transverse lines white, usually with a slender cloudy-grey transverse stripe or shade, either in the middle or near to the first line ; toward the hind margin is usually a faintly indicated whitish transverse line ; at the end of the discal cell, in the white central band, is a distinct elongated black spot or lunule ; cilia greyish-white, dashed with dark grey. Hind wings rounded ; whitish, with brown nervures ; a faintly grey shading from the base and a greyish cloud across the middle ; hind margin pale-brown ; cilia brown, partially tipped with white. Female with simple antennæ, the body stouter, fore wings usually of a deep purple-brown, hind wings pale grey ; otherwise similar.

Underside of the fore wings grey with the nervures darker, costal margin tinged with glossy yellow ; central lunule, and a band crossing it, dark grey ; hind wings white, with a partial irregular dark grey central stripe ; body glossy yellow-grey ; legs brown with extremely large fluffy tufts, which are pale silvery grey, or whitish.

Variation in this species is mainly in the depth of the ground colour, the purple-grey being in some instances varied with whitish clouding ; in other, more rare, cases the white central band is obscured with grey, but the dark lunule or stigma is always visible. A specimen in Mr. W. H. B. Fletcher's collection has merely a broad white central band, without transverse lines or markings, except the central lunule ; outside the white band the hind marginal area in this example is unicolorous grey.

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

LARVA cylindrical, fat, glossy, head flattened in front, rounded, shining pale green ; body green, dorsal region blue-

green, with two opaque yellow dorsal lines ; subdorsal lines yellow, or when full grown broken up into rows of irregular yellow spots ; spiracular lines distinct, yellow, edged above with dark green, but on segments two to four tinged with pink ; the yellow line is carried round the anal segment ; spiracles pinkish ringed with black, and each followed by a white spot ; undersurface wrinkled, glaucous green ; legs and prolegs similar. (Condensed from Buckler.)

June and July on oak, usually on detached trees in fields or parks or the more open woods. The larva lies along the midrib on the underside of an oak leaf, and clings very tightly. It is delicate and difficult to rear from the egg, requiring the closest attention, and occasional sprinkling with water.

PUPA stout and rounded at each end ; broad at the base of the abdomen ; smooth, deep mahogany brown. In a somewhat ovate cocoon of yellow-brown silk, mixed with earth ; in the ground, usually at the foot of an oak tree. In this state from August through the winter.

The moth emerges from the pupa in the middle of the afternoon and may then be found, occasionally, on oak trunks or palings. It is, however, restless, and probably ascends quickly to the trees. It flies at dusk with great swiftness ; indeed the Rev. Joseph Greene, who has dug up and reared very many of the pupæ, says that the male is "a furious and distracted flier, and speedily spoils itself." It will come to a strong light in its haunts, but does not seem to affect the suburbs of towns. Never common, but occurring in open oak districts in Kent, Surrey, Sussex, Hants, Berks, Bucks, Somerset, Gloucestershire, Herefordshire, sometimes almost common in South Devon ; rare in Norfolk, Suffolk, Derbyshire, and near Doncaster, Yorks ; very rare in Worcestershire, Cheshire, and Cumberland, and once taken, twenty-five years ago, in North Staffordshire. Apparently rare in Wales, but found near Swansea. Also rare in the South of Scotland

—one taken in the Torwood, Stirlingshire—and said to occur at Moncrieff Hill, Perthshire.

In Ireland scarce in Wicklow and Kerry, reported to be more frequent in Galway.

Abroad it is found over the greater part of Central Europe, in Piedmont, Livonia, and Southern Russia.

2. **D. Dodonœa**, *Schiff.*; **trimacula**, *Staud. Cat.*—
Expanse $1\frac{1}{2}$ inch. Fore wings rather narrow, purple-brown, with a broad central white band in which is no trace of a central lunule; hind margin marbled with white; hind wings pale brownish-grey.

Antennæ of the male strongly pectinated, light brown; head white; thorax stout, densely covered with long recumbent scales, white, or mixed grey and white, edged at the back and along the shoulder lappets with black; abdomen moderately stout, light brown, with a rather loose anal tuft, and long slender tufts down the sides. Fore wings somewhat narrow; costa faintly concave in the middle, very slightly rounded beyond; apex suddenly rounded, almost angulated; hind margin gently rounded; dorsal margin slightly, but gracefully curved and with a very small blackish prominent tuft. Colour purplish-brown, whitish at the extreme base, where are two black spots indicating a sort of basal line; first transverse line black, obscured by the ground colour, much curved, edged inside with white, and the latter in some instances partially again with black; second line indistinct, indented, not very oblique, duplicated and having a shining white intermediate stripe. The broad central band between these two lines is sharply divided, the anterior portion being of the ground colour and with its edge concave, the remaining portion white; but it never contains any central lunule or spot. Hind margin clouded with whitish, sometimes almost wholly white, the dark colour remaining as a broad triangular blotch on the costa near the apex, containing blacker streaks, and more or less connected along the outside of the second

line with another dark blotch at the anal angle; cilia white, interrupted by large purplish-black spots. Hind wings scarcely rounded, the hind margin being rather sinuous; very pale greyish-brown, with a straight whiter band across the middle; nervures darker; cilia pale-brownish, spotted with darker. Female with antennæ simple, otherwise similar.

Underside of all the wings whitish-grey, with the nervures rather darker, and crossed by two indistinct white transverse stripes; body and legs yellowish-brown, the latter with large white tufts.

Variable in colour and in the extent to which the dark portions are clouded with white or with brownish; or on the other hand the white central band is sometimes suffused with grey. In Mr. F. Bond's collection is one in which the fore wings are wholly of the dark colouring; in that of Mr. F. N. Pierce, a lovely male having the fore wings almost entirely white, the transverse lines alone being just visible. Mr. Sydney Webb has a beautiful male in which the white central band is extremely broad, and sharply edged with the two dark transverse lines, which are shaded off outwardly.

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

LARVA rather elongated, narrowed at each end; sides keeled; skin shining and transversely wrinkled; head large, rounded and highly polished, green. Colour bright green, with two parallel yellow dorsal lines, and less noticeable subdorsal lines composed of numerous yellow spots most distinct on the anterior segments. A conspicuous narrow yellow spiracular stripe, on which the white-ringed black spiracles are placed in pink blotches; a purple line margins the upper edge of this spiracular band, which is continuous from head to tail. (C. Fenn.)

July, August, and the beginning of September, on oak. Said also to feed occasionally on beech and birch; if so this is here very rarely the case. The Rev. Bernard Smith states that it nestles in chinks of the bark of trees in the day-time.

PUPA stout, rounded, anal extremity round, with very minute bristles. Dark purplish brown. In a compact, hard, oval cocoon of silk and earth. Underground, usually at the roots of oak trees. In this state through the winter. The Rev. Joseph Greene, who has dug up hundreds of the pupæ, says "search the friable sods collected in the corners of the roots, or the corners themselves without any sod. The cocoon is sometimes attached to the tree, but more usually among the grass-roots; in either case great caution is necessary. When you have pulled the sod out, put your hand in, and gently feel the trunk for any cocoons which may adhere to it. When the sod is loosely attached to the tree, and not between the roots, and the soil is dry and friable, this is a favoured locality with larvæ. By taking hold of the grass and pulling it gently the sod can easily be removed and the pupæ will fall down; or if spun up, will, not uncommonly, be found fixed to the trunk, or that part of the sod which lay against it." This excellent information is applicable to many species besides the present.

Like the previous species, this moth may, occasionally, be found in the afternoon sitting upon a tree-trunk, or paling, close to the place of its emergence. At night it flies with great vigour and swiftness, and the male may be readily secured by means of a strong light. I have even known it to fly into a house. Most attached to open parks, and scattered oak timber, but found also in woods. More frequent than *D. chaonia*, and though never very common, found throughout the Southern half of England, to Nottinghamshire, Derbyshire, Staffordshire, and Herefordshire, though very scarce in Norfolk and Suffolk. It has been taken in Warwickshire, is extremely local in Yorkshire, and in Cheshire very rare. In Wales only recorded from the Swansea district; in Scotland from Clydesdale and the Solway district. Mr. E. Birchall's record, "Not uncommon at Killarney," seems to have been a mistake. Abroad it is somewhat local, but

found in many parts of Central and Eastern Europe, and in Piedmont.

Genus 5. **LOPHOPTERYX.**

Antennæ of the male pectinated with very short, broad, almost squared teeth, which are ciliated, and lengthened by tufts of fine hairs. Fore wings rather broad behind, with the hind margin scalloped; a distinct prominent tuft on the dorsal margin.

LARVÆ cylindrical with small humps; having sixteen legs, the anal pair but little used.

PUPÆ in a silken cocoon.

1. **L. carmelita**, *Esp.*—Expanse, $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings soft red-brown, shaded off with pale grey; having a dark dorsal prominent tuft and two yellow costal spots; hind wings very little paler.

Antennæ of the male pectinated with extremely short broad teeth surmounted by long tufts of fine hairs which form the apparent pectinations, light brown; head densely scaled, dark red-brown. Thorax rather broad and squared, densely covered with raised red-brown scales, but not conspicuously tufted; shoulder-lappets raised and tipped with white; hinder portion edged with a yellowish line, followed by a blackish transverse bar on a slight crest, behind which is a short pale-grey triangular patch; abdomen rather long, thick, and very cylindrical, with a blunt apical tuft, and a slight ridge of reddish tufts down each side. Fore wings moderately broad; costa very gently curved throughout; apex angulated; hind margin slightly oblique to the middle, then bent and suddenly more oblique, scalloped throughout; dorsal margin straight almost to the base, and having a projecting tooth-like tuft of mixed brown and black scales, edged with white. Colour soft red-brown, darkest along the costa, shading off,

with a close dusting of whitish or bluish-grey scales between the nervures, gradually to the dorsal margin, at the base of which, and also at the anal angle, is a blotch of greyish-white devoid of the reddish colour; usual transverse lines very faint, the first indicated by a yellow spot on the costa, from which passes an irregular thread of dark colouring hardly visible except on the nervures, to before the prominent tuft; second line indicated by a larger, triangular, yellow spot, beyond the middle of the costa, from which a similar faint line of dots on the nervures and angulated, hardly visible, lines between them, passes obliquely back to the prominent tuft; nervures generally indicated by brownish lines and a few faint yellow dots; hind margin strongly scalloped with brown crescents, the tips of which interrupt the cilia at the nervures; cilia in the hollows of the crescents pale yellowish. Hind wings rather paler reddish brown, palest toward the base, shading to a purplish blotch at the anal angle; this blotch is divided by a whitish bar, which is continued as a faint pale line across the wing; hind margin with brown scallops, enclosing yellowish cilia, as in the fore wings. Female with antennæ merely dentated and fringed with very short bristles, very slightly larger and stouter, but extremely similar.

Underside of all the wings bright chestnut at the margins, shading to pale reddish-grey in the middle; beyond the middle of the fore wings is a bright yellow spot, from which a slender undulating pale line passes across the middle of all the wings; cilia scalloped, brown, edged with bright white in the hollows; body and legs dark foxy-red.

Not variable. This is perhaps the most softly coloured and shaded of all our native moths.

On the wing from the middle of April to the middle of May.

Larva stout, with polished surface, tapering considerably to each extremity; slightly projecting at the sides and having

deep transverse wrinkles. Head small, rounded, green, inside edges of the lobes marked with yellowish; body bright yellowish-green, undersurface flattened, darker green; dorsal line indistinctly darker green; spiracular stripe broad, conspicuous, yellow, containing a pink spot on each segment and edged above with darker green; spiracles black; legs and prolegs green. (C. Fenn.) When younger similar in colour and markings but more cylindrical.

May and June on birch, usually in shady places, rather avoiding the light. When young it keeps to the underside of the leaf sitting along the midrib.

PUPA elongate, incisions deeply cleft; anal segment round, smooth, without projections. Very dark purplish-brown. In a moderately strong compact cocoon, of silk and sand, under moss, or beneath the surface of the ground. (C. Fenn.)

In this condition through the winter.

The moth flies at night but very little is known of its habits, since it is scarcely ever observed on the wing. It emerges from pupa in the morning, and usually sits during the day not far from the ground on a birch trunk or on a neighbouring paling, generally in a shady sheltered place, but is always very scarce, even in its few favoured localities. The vast majority of specimens in cabinets have been reared from the egg. Formerly found at Birch Wood, Surrey, and Darent Wood, Kent; and more frequently at West Wickham Wood in the latter county, where it still lingers. I have taken it near Haslemere in the extreme south of Surrey, and other captures are on record in Sussex, the New Forest, Hants, and in Berks, as well as a single larva in Suffolk. But it may reasonably be expected to occur in any district of the South of England in which birch is abundant, as it is very easily overlooked, the moth being wonderfully like a broken slice of the birch bark. It appears to occur regularly, though rarely, at Keswick, Cumberland, but I know of no intermediate locality. In Scotland, Mr. P. Cameron has

recorded it at Ardentinny in Clydesdale, and Dr. F. Buchanan White in Argyleshire, Moray, and the Tay district.

Abroad it is widely distributed over the greater part of Central Europe, and in Sweden, Livonia, and Esthonia, but is always rather scarce.

2. **L. Camelina**, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings chestnut-brown with a large dark brown projecting tuft on the dorsal margin. Thorax crested, with a cocks'-comb-like tuft.

Antennæ of the male very shortly pectinated, with square flat teeth fringed at the tips with fine bristles; reddish brown. Head tufted, especially so at the base of the antennæ, red-brown; collar similar, upright; thorax crested with a very high tuft of upstanding scales forming quite a remarkable cock's-comb, red-brown or chestnut-brown in front, and tipped and lined with dark red-brown, pale drab, or yellowish-brown behind; shoulder lappets lifted, red-brown tipped with darker; abdomen moderately stout and cylindrical, pale drab or very pale brown, with a dense, stiff, squared and depressed, red-brown anal tuft. Fore wings moderately broad; costa slightly arched at the base, thence nearly straight to the apex, which is sharply but squarely angulated; hind margin regularly scalloped, perpendicular below the apex, then very full and rounded; dorsal margin curved and having in its centre a large, triangular, projecting, dark brown tuft of scales. Chestnut-brown with paler transverse shades; first line slender, indistinct, zig-zagged between all the nervures, dark red-brown; second line still less distinct, very oblique, excessively zig-zagged where visible, but often appearing only as a series of dark red-brown dashes on nervures, with a paler parallel stripe, but sometimes with a duplicate dark line, and often clouded with darker, forming an oblique stripe; nervures faintly indicated by dark dashes or dots; the prominent tuft has on each side a black streak; cilia red-brown, sharply scalloped,

agreeing with the margin. In some specimens a pale reniform cloudy spot indicates the usual discal spot, which in this group is so often suppressed, and in rare instances a second cloudy spot before it is visible in the discal cell. Hind wings rounded, reddish-white or very light reddish-brown, paler at the base; a rather broad darker submarginal band; at the anal angle a patch of bluish glistening scales edged with black, and above it two black spots; cilia at this portion chestnut, remainder pale red-brown. Female with antennæ slightly indented, a little stouter, otherwise quite similar.

Underside unicolorous pale reddish-brown, the hind wings rather the paler; cilia of both dark brown; body and legs chestnut-brown; anal tuft rather lobed, darker red.

Variation in this species appears to be somewhat climatal. The type, as described, is rather constant in all the southern and eastern districts of England; but specimens sent by Major J. N. Still from Dartmoor, Devon, have in some cases the reddish colour much clouded and hidden by deep umbreous, and the prominent tuft black; in others the general colour umbreous with the darker portions suffused with a bluish bloom. Durham specimens sent by Mr. J. Gardner are of a very smooth clear dark red, but with the prominent tuft black; from Pembrokeshire they are of a rich dark chestnut with strong umbreous markings. In Scotland variation seems to take three directions—paler reddish to pale buff, with the cilia darker; paler umbreous-brown without any tinge of red; and bright chestnut without darker markings, the prominent tuft being also red. One in Mr. W. H. B. Fletcher's collection is of a most delicate pale umbreous with darker nervures and a faint second line; in the late Mr. F. Bond's collection is one of a dull yellow-brown with a very dark distinct central transverse stripe; and every possible intermediate shade seems to exist.

On the wing in May and June, and as a second generation in July, August, or even the beginning of September. Almost completely double-brooded in the South; partially so

as it advances northward; probably having but one generation in the year in most parts of Scotland.

LARVA cylindrical, transversely wrinkled; head large, rounded, shining; twelfth segment with two projecting upright tubercles. Head pale green with a few dark hairs, similar hairs on the second and thirteenth segments and from the usual lateral spots; mouth yellow; body pale whitish-green on the back, shading into dark green on the sides and undersurface; dorsal line bluish, distinct; sub-dorsal lines yellow, margined above with a pale grey streak; spiracular lines distinct, greenish-yellow; tubercles on the back of the twelfth segment tipped with bright red; spiracles black, edged with white, each followed by a small red spot; a line of white dots above the spiracles and other white dots below; legs and prolegs red. (C. Fenn.)

Variable—Buckler figures one larva of a lilac colour with white spiracular line and purple head and undersurface; another with the general colour bright yellowish-brown, with the dorsal line dark purple edged with whitish-yellow, and the spiracular line yellow; and another with a light brown head, green dorsal region broadly barred with white, sides yellowish-pink, and undersurface purplish-green. It may, however, always be known by its curious pair of slender dorsal tubercles.

June, July, and in a second generation in September, October, and occasionally even November; on oak, birch, hazel, willow, beech, and hawthorn.

PUPA rounded, slightly elongated, anal segment with a spike; dull dark purplish-brown. In a silken cocoon mixed with earth, usually attached to a stone or to a root underground. (C. Fenn.) Often at the foot of an oak, elm, or beech tree. In this condition through the winter, and occasionally remaining over a second winter. In other cases pupa which have passed through the winter, and from which the moths have not emerged in the spring, produce them at the time of the usual second brood.

I have on one occasion captured the moth flying in the sunshine in the afternoon. This, however, was quite exceptional; its time of flight is at night from 10 P.M. till midnight, and it comes willingly to light, settling down very quickly on the frame of a lamp and at once looking exactly like a rolled-up leaf casually sticking there. The males also assemble readily to a freshly emerged female. In the daytime it may occasionally be found sitting upon a fence or a tree-trunk just after emergence, but it always prefers to sit among the leaves on a branch of a tree or in a bush, sometimes quite openly upon a leaf or a fern frond. It runs little risk from this exposed position, since its bright brown colour, its tall thoracic crest, and its large prominent tuft, combined, give it the most extraordinary likeness to a curled-up brown leaf, or a little bunch of fir-scales, a likeness so accurate that I am not ashamed to confess that I have picked up specimens in my fingers, puzzled by their appearance, yet not recognising them as moths. Not an abundant species, but to be found in moderate numbers in woods and open-wooded country, throughout the three kingdoms, except, apparently, the Scottish Isles. Abroad, it is common through Northern, Central, and parts of Eastern Europe, Siberia and Tartary. Probably also in India, since a black-brown form from that country, known as *saturata*, *Walker*, seems very probably to be no more than a variety of this species.

3. **L. cucullina**, *Schiff.*; **cuculla**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings yellowish, with chestnut clouds, a whitish hind-marginal blotch and a blackish dorsal prominent; hind wings with a divided dark spot at the anal angle.

Antennæ of the male pectinated with short broad teeth which are tipped and edged with fine bristles, light-brown; head pale yellowish-brown with four red-brown spots; collar pale yellowish-brown; thorax rather broad and roundish, densely tufted, the central portion with very long upright

scales, chestnut-red, barred with pale yellow-brown; shoulder lappets similar, rather raised; abdomen yellowish-brown, shading to red-brown behind, with an erect, divided, red-brown tuft on the back of the basal segment, and smaller, shorter tufts on the two following; anal segment with a short red-brown tuft. Fore wings moderately broad; costa very slightly curved to the apex, which also is rounded; hind margin rather curved, but very little oblique; slightly scalloped; dorsal margin nearly straight, with a tooth-shaped projecting tuft of blackish scales in the middle. Colour very pale yellowish-brown from the base, occupying the costal half to the middle, shading into light red-brown in the dorsal region, and also through the outer middle portion to the apex; hind marginal space mainly occupied by a large ovate whitish blotch containing faint clouds of pale brownish and a single black streak on a nervure; principal nervures dark brown, especially beyond the middle of the wing; usual transverse lines only faintly visible; the first as a light brown spot on the costa, and a couple of sharp angles just before the prominent tuft; the second as a series of scallops along the base of the white patch, but bending back to the costa; cilia white, clouded and dashed with brown, especially at the tips of the nervures. Hind wings rounded, light red-brown, paler at the base; at the anal angle is a blackish blotch, divided transversely by a yellowish line which continues faintly across the wing; cilia white, clouded and dashed with light brown. Female a little larger and stouter, antennæ merely dentated, otherwise quite similar.

Underside pale brownish-drab, the hind wings paler drab; both are crossed by two faint, indented, brownish lines or shades; cilia white, dashed with smoky-black; body golden-brown; legs light brown, barred in front with white, and having very dense tufts of pale yellow-brown scales.

Not variable except a little in the depth of reddish-brown colouring.

On the wing from the middle of May to the middle of June.

LARVA.—Head rounded, notched on the crown; face flat; second segment narrow, gradually widening to the sixth, remainder even, but the thirteenth sharply attenuated to the anal extremity. On the twelfth segment is a prominent dorsal hump, and a smaller double hump each on the fifth to the ninth, most conspicuous when the larva is at rest. Head pale yellowish-brown with a chocolate-brown streak on each side, and others on the mouth and sides of the lobes. General colour greyish-white tinged with green; dorsal line dull dark green broader from the second to the sixth segment; subdorsal lines paler green and bordered outside by a pale yellow stripe; no perceptible spiracular lines. The hump on the twelfth segment is dark purplish-brown; second segment with a collar of black horny spots; segmental divisions yellow; anterior part of the back dotted with black; spiracles large and distinct, pinkish surrounded with black; ventral surface yellowish-green, without markings; legs and prolegs pinkish-brown. Rests with the front and anal segments raised and thrown back, in the usual *Notodonta* attitude. (G. T. Porritt.)

Variable in colour—pale green, pale lilac, pinkish, or yellowish, in each case the broad dorsal stripe on the second to sixth segment is conspicuously darker, and the skin very glossy.

June and July on maple (*Acer campestre*), usually upon the small bushy maples which grow under trees in woods, always if possible choosing a shady spot. The Rev. Bernard Smith says that, if exposed to sunlight, the colour of the larva becomes brighter, but that it will not thrive; also that it always sits at the edge of the maple leaf. Although this is its favourite food, sycamore is not refused in confinement.

Pupa rather slender, rounded at both ends, with the anal segments smooth, and the whole surface glossy blackish-brown. In a thin silken cocoon on the ground under dead leaves, or moss, or among loose soft earth, or even under moss on a tree trunk, but apparently not at the roots of trees. In this state through the winter.

The moth certainly flies at night, and in one instance has been captured—by Dr. F. D. Wheeler—attracted by a light. Otherwise it seems never to be seen upon the wing. Moreover it does not appear ever to be captured when at rest in the daytime. From its colour, shading, and the prominent tufts on thorax, abdomen and wings, it must be admirably adapted for concealment, whether among dead leaves on the ground or sitting on the rough seamed bark of a maple, but where it does actually rest in the daytime is, I think, merely matter of conjecture. The larva is not difficult to find in its extremely restricted localities, and all the specimens in collections appear to have been reared. There is a record in a rather hot season (1857) of the emergence in confinement of a few specimens in the early part of August, but no other evidence of its double-broodedness appears to be obtainable either here or abroad. Always a scarce species and almost confined to woods in chalk districts. Most frequent in Bucks, where, more particularly near Marlow, the Rev. Bernard Smith has for many years collected and reared it, much to the advantage of our collections; found also in Kent, Sussex, Devon, Berks, Oxfordshire, Cambridgeshire, Essex, very rarely in Suffolk and Norfolk, and one larva in Gloucestershire. This appears to be the extent of its range in these islands. Abroad it is also scarce, but is found in France, Switzerland, Germany, Hungary, and Central Russia.

Genus 6. PTEROSTOMA.

Antennæ of the male very strongly pectinated; palpi very large, ascending; fore wings with two prominent tufts; abdomen with a long forked anal tuft. We have but one species.

1. **P. palpina**, L.—Expanse $1\frac{1}{2}$ to 2 inches. Pale brownish-drab with long thick palpi, forked anal tufts, and two large prominent tufts on the dorsal margin of the fore wings.

Antennæ moderately long, in the male strongly and regularly pectinated; pale brown, shaft white. Palpi very large, standing obliquely upwards in front of the head, broadly and densely clothed with scales and regularly crenulated along the front edge, whitish drab, almost hiding the rather darker head; thorax broad and squared, with large uplifted shoulder lappets, and the middle portion crested with long upright scales, brownish-drab; abdomen long and tapering, not stout, whitish-drab, having a very long forked anal tuft, and small tufts on the back of the basal segments. Fore wings rather long and narrow; costal margin very straight; apex angulated and rather pointed; hind margin extremely full and rounded, regularly scalloped throughout, but more deeply so at the anal angle; dorsal margin singularly formed, having a large projecting tooth a short distance from the anal angle, and a far larger one, edged with projecting scales, nearer the base. Colour pale buff with numerous blackish dashes on the nervures, and slender longitudinal brownish lines and shades between them; in the middle is an oblique straight cloudy brown stripe from the larger prominent tuft to the costa beyond the middle; before the larger prominent tuft a slender curved line indicates the usual first line and proceeds in dots across the wing; beyond the central stripe a sort of normal second line, commencing by a dark streak before the small prominent, is represented by pairs of dots on the nervures and short shades between them; edging of large prominent tuft blackish; along the hind margin is a row of brownish lunules fitting into the marginal scallops; cilia whitish-buff, interrupted at the ends of the lunules. Hind wings slightly rounded, acutely so at the apex, whitish-grey, whiter at the base, with a grey cloud along the hind margin, preceded by a pale line and a series of dark grey dashes on nervures; cilia white.

Female with antennæ shortly pectinated, palpi equally long but narrower; abdomen much stouter, but with only a short blunt anal tuft; fore wings longer and broader, more pointed,

with the hind margin more deeply scalloped; more uniformly brownish in colour; otherwise similar.

Underside of fore wings whity-brown clouded with grey; costa blackish at the base and spotted with black beyond the middle, where also is a pale transverse angulated stripe; hind wings whitish with a black central spot, dark lines on the nervures, and dark dashes along the hind margin; body and legs whity-brown.

Not very variable, slightly so in the intensity of the few dark markings, the oblique stripe being in some cases obsolete in both sexes. Mr. Harwood of Colchester, however, records a specimen nearly black.

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

LARVA rather stiff in appearance, nearly cylindrical and without prominences, tapering a very little from the eighth segment to the head, which is small, greenish or brownish-green, and edged with white. Skin rather granulated, especially on the usual dorsal and subdorsal lines; general colour pale bluish-green, or whitish-green, whitest on the back; dorsal line indicated by an edging of dull white on each side; subdorsal lines whiter, spiracular yellow, sometimes interrupted with white, slightly edged above with black, and enclosing small lilac or purple spots on the front segments; legs green; undersurface dark green irrorated with whitish. This larva has, very conspicuously developed, a remarkable gland beneath the head, from which it is able to protrude a forked projection. There is neither time nor space here to enlarge upon this curious organ; indeed it is not in my power to do justice to much that is wonderful in the structure of these creatures, but throat-glands of this nature, though not usually so strongly developed, exist in the larvæ of a large number of species of the present family, and in a very great majority of those of the *Noctuina*.

End of June, July, September, and October on all the

species of poplar, and less frequently on willow and sallow ; feeding on the leaves, often with great rapidity, the whole time from the egg to the pupa state sometimes occupying not more than three weeks.

PUPA stout, cylindrical, shining, a little produced in front; abdomen tapering, dilated at the end and furnished with a short curved spike; segments well divided. Colour glossy purple-brown. In a rather soft ovate cocoon of silk and earth, often at the roots of trees. The Rev. Joseph Green says : "Occasionally at poplars, but more frequently at willows, especially when on the bank of a ditch or stream. The side of the tree which faces a stream is often clothed with grassy sods of loose friable earth; this is the place for *palpina*; shake the sod well, and the cocoon will generally be found among the dry roots. End of September." It lies in this condition through the winter, but the pupa hunter is often forestalled by mouse, beetle, earwig, or *Oniscus*, if he does not search in good time.

The moth flies vigorously and in a wild and bewildering manner at late dusk—occasionally at early dusk—and well into the night. The male is readily attracted by a strong light, and was formerly by no means rare at gas-lamps in the London suburbs; sometimes even remaining all day on the lamp frame upon which it had settled on the previous night. In the daytime it is rarely found, though occasionally it may be seen sitting on a paling or tree trunk. But it may most easily be overlooked from its extraordinary resemblance to a pale twisted leaf, or even more accurately to a bit of broken, withered, bramble-stick, the prominences and tufts exactly like thorns, the projecting palpi and forked tail like loose bits of fibre, and the wings wrapped so closely round the body as perfectly to complete the mimicry.

Common in the South, East, and South-west of England and in South Wales; less common or even rare in some of the Midland counties, but probably existing, wherever poplars

and willows are common, throughout the country to Cumberland. In Scotland, in Roxburghshire, Clydesdale, and other parts of the south of that country, and, rarely, in suitable spots, in the Moray district. Very scarce in Ireland, but has been taken in Wicklow, Kerry, Galway, and Tyrone. Common in all the temperate parts of Europe, and in Asia Minor and Tartary. In China and Japan a form is found of double the size of our specimens, but otherwise agreeing most accurately, and apparently the same species. It is known as *P. Sinica*.

Genus 7. PTILOPHORA.

Antennæ of the male with such long slender pectinations as to be plumose; fore wings narrow, thinly scaled, dorsal margin very short. We have only one species.

1. *P. plumigera*, *Esp.*—Expanse $1\frac{1}{2}$ inch. Bright light chestnut, fore wings mottled with yellowish; antennæ of male plumose; thorax very fluffy.

Antennæ of moderate length, in the male furnished with very long slender filaments, not stiff or firm as in ordinary pectinations, but lying more loosely together, placed in two rows in the ordinary manner; black, shaft shining light brown. Head strongly tufted, rich chestnut; a small tuft of yellowish scales at the base of each antenna; thorax not very stout, covered with long, soft, loose, fluffy scales of a rich light or dark chestnut colour; abdomen rather slender, glossy, of the same colour, and with a loose spreading anal tuft. Fore wings narrow; costa nearly straight; apex suddenly rounded off; hind margin long, very oblique, and much curved so as to sweep round the anal angle and dorsal margin—which is very short, not more than one half the length of the costa, and curved to near the base; a short loose triangular marginal mass of scales forms a sort of prominent tuft, which lies much nearer the base of the dorsal margin than usual. Very thinly scaled and semi-transparent; pale chestnut with the

nervures dark red-brown ; first line rather curved and composed of a series of yellowish clouds ; second line similarly composed, arising on the middle of the dorsal margin, making a wide sweep outward and a bold curve back to the costa ; beyond this is a sub-marginal row of more obscure yellowish clouds ; cilia dark brown regularly interrupted with yellowish. Hind wings rather pointed, but smoothly rounded behind, semi-transparent, purplish-white or reddish-white ; cilia pale reddish dashed with brown at each nervure. Female with antennæ shorter and threadlike, yet finely toothed ; abdomen stouter ; thorax and fore wings alike darker red brown, almost purple brown, the latter much more uniform in colour and rather more thickly covered with scales ; first line hardly perceptible ; second indistinct except toward the costa, where is a yellow spot ; hinder area rather more tinged with purplish ; hind wings purplish-grey.

Underside of all the wings very thinly covered with purplish scales, except the margins, which are rufous dusted with whitish ; body and legs chestnut-red.

Slightly variable in depth of colour of the fore wings, some males having these much suffused with ochreous, others being rather dark or unicolorous, like the female ; on the other hand, some females are as pale as ordinary males.

On the wing in November, principally in the middle of the month, but occasionally emerging at the end of October.

LARVA plump, cylindrical, only slightly thicker in the middle ; head rounded, rather small, yellowish-green ; body polished and opaque, pale, delicate, whitish blue-green, with a very broad deep green dorsal stripe occupying all the space to the extremely narrow yellowish subdorsal lines ; spiracular line double, slender, wavy, white ; undersurface, legs and prolegs, glossy pale green. When about to spin up it changes to a uniform semi-transparent green, like the undersurface of a maple leaf. When newly hatched very pale greenish ochreous, with long silky curved whitish hairs ;

exactly resembling the enveloping sheath of the maple bud. As the buds open the larva casts a skin, loses most of its long hairs, and becomes yellowish-green, gradually approaching to the adult colouring. Varieties occur having two transverse bars of white on the twelfth segment, and one on the thirteenth. (Condensed from Buckler.)

May and the beginning of June, on maple ; but in confinement will also eat sycamore and Norway maple. It usually reposes in a curved posture on the underside of a leaf, and appears to be of a social disposition, since two will sometimes repose under the same leaf. The Rev. Bernard Smith, to whom we are indebted for much of our knowledge of this species, says that it prefers maple bushes in hedges which are open and not shaded by trees, and selects the sunny side. He says, moreover, that the eggs may be found, in the winter and spring, on the slender twigs, often two or three near together, and usually near a bud. The eggs when found must be kept in a cool place, and will probably hatch before the end of April, contrary to their habit out of doors. The young larva is very helpless and often fails to find its food—should be lifted on to it with a feather. It is always delicate, and of a quiet, sluggish habit. The curious throat gland already mentioned is well developed in this species.

PUPA rather slender, with the abdomen tapering; skin thin, polished; purplish-brown. In a thin brittle earthen cocoon, broadly ovate and placed upright, the pupa being fixed by the anal hooks and hanging free. Not at the foot of a tree, but doubtless under the bushes and often at a depth of two or three inches in soft sandy soil.

The moth flies at night, and the male is readily attracted to light in its very restricted localities. It has apparently a fondness for foggy, mild weather, but is very rarely obtained on the wing. Neither is it readily found when at rest in the daytime, and we know little of its habits in this respect—though it must surely sit upon the branches or twigs of

maple. The vast majority—indeed nearly all—the specimens in our collections are reared. Apparently almost wholly confined to chalk districts, and in them very local; found in the greatest numbers with us in Buckinghamshire, Berks, and Oxfordshire; more rarely in Kent, Hants, Gloucestershire, and South Devon; and is said to have occurred once or twice in Cambridgeshire. There is no apparent reason to believe that it inhabits any portion of these islands north or west of the localities named.

Abroad it is found over the greater portion of Central Europe, and in Livonia and Siberia; indeed, probably over a far wider range, since accurately typical specimens have been brought from Japan. It is a strongly marked and in structure rather singular species, and appears to have no close allies, so far as is known, in the world.

Genus 8. **GLUPHISIA.**

Antennæ strongly pectinated in the male, very shortly so in the female; fore wings short, ovate, rather broad, hind margin slightly crenulated. We have but one species.

1. **G. crenata**, *Esp.*—Expanse $1\frac{1}{4}$ inch. Fore wings short and broad, dark grey mixed with brown, with four whitish transverse stripes; hind wings grey, paler at the base.

Antennæ of the male short, rather broadly pectinated with solid ciliated teeth; blackish-brown. Head tufted, pale grey; thorax densely covered with partially erect scales, pale grey, darker grey in front and at the sides; abdomen stout, short, brown, with a short dense anal tuft. Fore wings very ovate; costa regularly curved; apex bluntly rounded; hind margin slightly crenulated, rather straight and but little oblique, rounded off at the anal angle; dorsal margin decidedly rounded but not tufted. Colour dark grey, with the hind marginal region whitish-grey; near the base is an

indistinct, broken, black, transverse line, edged outwardly with whitish; beyond this the usual first line is nearly straight and almost perpendicular, black, edged inside, rather broadly, with white; second line oblique, angulated above the dorsal margin, and sharply toothed close to the costa, otherwise rather curved, edged outside with whitish; beyond this, in the broad pale hind-marginal band is a slender much-indented black line parallel with the hind margin, this also is edged, internally, with whitish; between the first and second lines the nervures are sharply black, regularly dividing a faint yellowish transverse band which precedes the second line; discal spot white edged with black; cilia pale grey, dashed with darker. Hind wings short, rounded, slightly crenulated at the margin; pale grey, darker toward the hind margin, with a still darker cloud, from the anal angle, across the middle, and two white streaks at the anal angle. Antennæ of the female very shortly but distinctly pectinated; otherwise similar.

Underside of the fore wings smoky-brown, with the hind margin paler, and before it a darker smoky-brown band preceded on the costa by a whitish spot; hind wings paler smoky-brown, with a still paler indistinct cross stripe; cilia of all the wings whitish, regularly spotted with dark brown or black.

On the wing in June—that is to say, the British specimens appear to have occurred in this month. On the Continent the species is found in April and June or July in two generations.

LARVA cylindrical and very even in thickness; head pale green, body rather light green with a slender whitish dorsal line; pairs of dark-red or rusty-brown spots on the back of the third and fourth, seventh to the eleventh, and thirteenth segments; subdorsal lines pale yellow, rather broad and distinct; spiracular line yellowish, only visible on the anterior segments; spiracles blackish; legs and prolegs green, as also

is the undersurface. When younger, of a rather yellower green. (Condensed from Buckler.)

August and September on poplar. On the Continent, also in May and June.

PUPA rather short and thick, rounded, with the limb-cases well developed, undersurface a little flattened, tail blunt; shining brownish-black. In an ovate silken cocoon of a semi-transparent drab colour, between two poplar leaves. In this condition through the winter. (Buckler.)

Only three specimens of this species are known to have occurred in these islands. The first was taken on the trunk of a poplar in Ongar Park Wood, Essex, in June 1839, and the second in the same place in June 1841. Both are females, and are in the collection of the late Mr. H. Doubleday, now in Bethnal Green Museum. Of the remaining specimen, which is in his collection, the Rev. Joseph Greene writes: "In 1853 I was residing at Halton, Bucks. On the 18th August of that year, returning home past a large black poplar, I gave a branch a blow with my stick, and a caterpillar fell into the grass. It was of a dull green and with square brick-red dorsal spots. I placed it in a box with moss and it went down at once. In the same month I left Halton for Dublin. Before doing so I went to the rooms of the Entomological Society, and consulted Hübner. In one of his plates I found that my larva was *crenata*. I carried the box containing the pupa, and those of other rarities, in my lap, to Dublin, where I placed it in a greenhouse. One day in the following March I found in it a small dull-coloured moth just emerged. It was *crenata*. I sent it for exhibition to the Entomological Society in 1854." That casual specimens should thus appear at long intervals is most perplexing.

Abroad it is found in France, Belgium, Holland, Germany, Piedmont, and Central Russia. I do not see any sufficient

character to separate specimens from Canada and the Hudson's Bay Territory, which, however, are known as *septentrionalis*, Walker.

Genus 9. **PETASIA.**

Antennæ rather long, pectinated in the males, serrated in the females; fore wings elongated, having in the middle of the dorsal margin a slightly projecting tuft of scales; a distinct black horny spur is conspicuous on the front of the anterior legs.

LARVÆ cylindrical, very stout, holding both extremities thrown up when at rest.

PUPÆ subterranean.

1. **P. cassinea**, *Schiff.*; **Asteroscopus sphinx**, *Stand. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings greyish-white or pale drab, with numerous short black longitudinal streaks; hind wings white, with grey dashes.

Antennæ rather more than one half as long as the fore wings, in the male strongly pectinated throughout with solid curved teeth, reddish-brown, back of the shaft white. Head, with the palpi densely tufted with long projecting brownish and whitish scales; with white tufts at the bases of the antennæ. Thorax broad and squared, with extremely large and long shoulder-lappets, which are white in the middle, with a black streak on each side, and the front and hind margins tinged with brown; collar similarly brownish divided by a white patch, edged with black; remainder of the thorax brownish. Abdomen rather tapering, densely covered with pale brown scales; anal tuft divided, pale brown. Fore wings rather triangular; costa straight almost to the apex, which is blunt; hind margin gently rounded off to the dorsal margin, which is straight. White, faintly tinged with brown or grey, or both, in separate longitudinal shades; no trace of transverse lines, the only markings being longitudinal

black streaks, of which a long one from the base reaches one-third the length of the wing; other shorter ones are numerous, partially upon portions of the nervures; others, more irregular, are along the dorsal region; and one, more distinct, on the dorsal margin, having an edging of blackish projecting scales as a sort of prominent tuft; toward the hind margin is a series of black triangular dashes between nervures, pointing inward toward other more arrow-shaped streaks; along the costa is a succession of blackish clouds and streaks; cilia mixed grey and white. Hind wings white with a faint indication of a grey lunule, a series of grey dashes on nervures beyond the middle of the wings, and a marginal series of grey lunules; cilia whitish.

Antennæ of the female threadlike; body much stouter; fore wings longer, narrower, and rather browner; otherwise similar.

Underside of the forewings unicolorous light brown, or of that colour one half their length, the remainder whitish with brown nervures; hind wings white with brown nervures and a grey central lunule; body pale brownish; legs brown, densely tufted with long whitish scales; the first pair having in front a distinct shining black spur.

Usually not variable, but Dr. Mason has a male extremely white with the grey clouds and black streaks strongly marked; hind wings brilliantly white, and the margin dotted with black.

On the wing in November and the beginning of December.

LARVA stout, nearly cylindrical, head rather smaller, twelfth segment stout, having a slight appearance of a dorsal hump; anal segment sloped rapidly off; prolegs all well developed and in use; all the legs stretched out very widely apart, especially when beaten off its food (hence its common English name of the "Sprawler"). Head round, green or olive-green; body yellowish-green or whitish-green; dorsal line yellowish-white, with a deep green stripe on each side;

subdorsal or spiracular lines slender and threadlike, white or greenish-white; the latter double, or edged above with a dark brown line; second segment with a yellowish-white collar; spiracles whitish in black rings; legs pink; prolegs pale green tipped or spotted with pink.

May and June on oak, hazel, willow, ash, elm, lime, beech, poplar, and aspen. Probably the eggs, which are curiously shaped and have been compared to a butter-boat, and which have been laid through the winter, hatch by the end of April. The larvæ, when young especially, bear a shocking character as cannibals, and being, moreover, extremely delicate in constitution, are very difficult to rear; any degree of close confinement is fatal; they should have plenty of fresh air and be fed up singly. When, according to their strange habit, their extremities are thrown up, and all the legs extended, they are curious-looking creatures.

PUPA stout, dark brown, in a cocoon of earth and silk, usually deep in the ground, rarely at the roots of trees.

The moth flies only late at night, and the male may often be attracted by a strong light at about 11 p.m. It has been taken even at a carriage lamp. In the daytime it is said to sit upon old posts or railings, and is very hard to see, from its close resemblance to a bit of decayed wood, or to the greyish-brown lichens. Its extended and tufted feet, and rough scales at the edge of the fore wings, all help to complete the deception.

Formerly found in the London suburbs—as at Clapham Common; still to be found as near as Twickenham; also more or less frequently in Surrey, Sussex, Hants, Berks, Bucks (rather commonly), Dorset, Devon, Somerset, Gloucestershire, Oxfordshire, Hereford, Essex, and Suffolk, and widely distributed in Norfolk, Cambs, and Hunts; rare and local in Yorkshire and Cumberland, and recorded in single instances from Cheshire and Lancashire. I know of no other localities in these islands. Abroad it is not very widely distributed,

but is found throughout Central Europe, and in Piedmont and Sweden.

2. **P. nubeculosa**, *Esp.*; **Asteroscopus nubeculosus** *Staud. Cat.*—Expanse $1\frac{3}{4}$ to 2 inches. Thorax densely furry; fore wings dark grey or reddish-grey, with black streaks and nervures, and a large pale discal spot; hind wings pale grey with brown-dotted margin.

Antennæ rather long, pectinated in the male with short, stout, knobbed teeth, the rows placed widely apart and almost opposite; dark brown, back of shaft silvery white; face pale grey; head dark grey, scales erect; thorax broad and squared, densely covered with fur-like, long, raised scales, mixed black and grey; the shoulder lappets uplifted and very large. Abdomen rather tapering, covered with downy red-brown or grey scales, which form a broad ridge down each side, and a rather flat anal tuft. Fore wings long, with the costa very gently curved, apex rounded; hind margin oblique, very gently rounded; dorsal margin long, rather curved, fringed before the middle with long projecting scales. Ground colour reddish-white or greyish-white, greatly obscured with smoky black clouding and black markings; base cloudy, brown and blackish; first line black, but only as a succession of small clouds, blackest on the nervures; across this runs a long black streak from the base, which bends back and forms a long tooth-shaped marking below the median nervure; second line far beyond the middle, thick, curved, black, much indented and broken, edged with whitish; between these lines the nervures are black, there is also much black clouding, and on the outside edge of the discal cell a large rhomboidal or kidney-shaped whitish spot, encircled with black; a small rounder spot in a black ring lying just before it; beyond the second line is a deep black costal blotch before the apex, and from it a series of black cloudy blotches parallel with the hind margin and massing into a considerable blotch within the anal angle; along the hind margin is a series of black

triangular spots or arrow-heads pointing inward between the nervures; cilia white, very short. Hind wings pale grey, with the costal margin grey-brown; nervures dark brown; a large cloudy grey central lunule; and the hind margin spotted with dark brown; cilia white. Antennæ of the female threadlike; body stouter, less downy, fore wings usually more suffused with black; otherwise similar.

Underside of the fore wings dark reddish-grey, or smoky-grey to the second line; beyond this, whitish with dark grey clouds; central spot blackish; hind margin spotted with black. Hind wings whitish with dark grey nervures, the central spot large, ovate, black; marginal spots rather large and black; body dark golden brown densely covered with fur-like scales; legs grey with the large tufts brownish.

Variation is in intensity of dark colouring and extent of black clouding around the markings; and also, to some extent, in ground colour, from warm reddish-white to pale dull greyish-white. Dr. F. D. Wheeler states that larvæ fed up from the egg upon apple leaves in confinement are devoid of the rich reddish tinge which is so frequently seen in captured specimens. This almost seems to indicate an effect of colour produced by food, since the same result is certainly not ordinarily obtained by the use of other food-plants.

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

LARVA.—Head rounded, rather small; body plump, with the incisions strongly marked; cylindrical, except that the twelfth segment is raised into a blunt ridge or hump; behind this the thirteenth tapers off in a long curved slope; legs and prolegs stout and well developed, but much spread abroad, the anterior and posterior extremities both raised and thrown back toward each other in repose until the head almost touches the dorsal hump. Head pale bluish-green; body delicate green, whiter on the back, bright yellowish-green on the sides and beneath; the usual dots slightly prominent and large, pale yellow; spiracles white edged with black; on

each side of the fourth segment is a short, distinct, oblique, bright yellow stripe edged with reddish; one much more obscure on each side of the third; hinder edge of the dorsal hump sharply outlined with yellow; anal segment edged with yellow, and with a distinct yellow stripe along each side, meeting behind. Legs pink; prolegs green, with a black ring on the outer side; and brown hooks to the feet. When quite young the raised spots are very large and black, each furnished with a black bristle, but as the larva grows the tubercular spots do not increase proportionately in size, and the colour gradually changes. The young larva does not assume the extraordinary attitude of rest already described in the adult. (Condensed from Buckler.)

End of May and June on birch; but on the Continent found also on elm, hornbeam, blackthorn, and plum. In confinement it will eat apple, pear, Guelder-rose, buckthorn, honeysuckle, or sallow, if supplied with those plants from the time of hatching.

This larva with us is tender and rather difficult to rear, also liable to diarrhoea. Mr. W. H. Tugwell found that when in this state, and very dirty, with no apparent prospect of recovery, by washing them in cold water and thoroughly cleansing them with a camel's-hair brush, the disease was removed and he was able to rear them.

PUPA rounded, with short wing-covers, but the antennae-cases well developed; abdominal segments deeply divided and rather tapering; covered with a faint whitish bloom. In a cocoon of silk and earth, occasionally under moss on the surface of the ground, but usually at a depth of several inches. In this condition through the winter, but in confinement almost always found to remain in pupa two winters and occasionally more.

The moth doubtless flies at night, but has not, apparently with us been observed upon the wing. The only method of capture, so far as I am aware, is by searching the trunks of

the birch trees in the daytime in its extremely restricted locality, in the early spring, often before the snow is off the ground, and so securing it soon after emergence. It sits close in one of the open gashes with which all old birch trees are so plentifully ornamented, and is much protected by its great resemblance to the rough dark bark. If the weather is very cold it will hide in the deepest crannies close to the ground.

So far as I know its only locality in these Islands is the extensive range of birch woods around Loch Rannoch, Perthshire, but it is hard to understand why it should not be found in all open woods of moderately old birches in the Highlands of Scotland. The first British specimen seems to have been taken by Mr. Cooper in the year 1854. The next year another was found, and from that time to the present a good number of specimens have been taken, mainly by professional collectors, but by no means in regular numbers from year to year. Abroad it is found in Northern France, Germany, Galicia, Livonia, and the Ural Mountain district.

Genus 10. **PYGÆRA.**

Antennæ about one-half the length of the fore wings, pectinated in the male to at least three-fourths of their length, but not with solid teeth, only with, as in the Sphingidæ, horse-shoe shaped tufts of long curved bristles which closely imitate the usual teeth; thorax strongly crested; fore wings long and ample, with the hind margin regularly toothed.

We have only one species.

1. **P. bucephala.** *L.*—Expanse 2 to $2\frac{1}{2}$ inches. Fore wings silvery grey-brown, with a very large round creamy blotch toward the apex.

Antennæ of the male stout, pectinated, but only with tufts of strong curved bristles, placed in horse-shoe form,

and curving toward each other so that an appearance as of solid teeth is produced; the rows placed nearly on opposite sides and standing well apart; light chestnut-brown. Palpi covered with long curling red-brown scales; head strongly tufted with raised yellow scales, a longer tuft at the base of each antenna. Thorax broad, squared, densely covered with upright scales, and beautifully ornamented, the middle portion being of a rich creamy yellow, with a chocolate-red spot in the middle, and edged at the back by two chocolate-red bars which are divided with silvery-white, these two bars being so raised as to form a crest; behind them is a patch of silvery-grey; shoulder lappets large, each having at its base two chocolate-red cross bars divided by rich yellow; remainder of the lappets silvery-white. Abdomen long and stout, thickly covered with long creamy-yellow scales, and with a black interrupted stripe down each side; anal tuft broad and squared, creamy-yellow; lateral tufts of the same colour forming regular ridges. Fore wings long and ample, broad beyond the middle; costa almost straight to near the apex, then forming a smooth curve round the apex and hind margin, which last is not very oblique; dorsal margin almost straight. Ground colour apparently purplish-brown, most visible on the costal region; but much concealed, especially on the basal and dorsal regions, by silvery-white scales placed in transverse ripples; first line rather near the base, almost straight, perpendicular, double, purple-black; second line also double, purple-black, lying far beyond the middle, curved and scalloped,—the hollows outward,—bending suddenly back close to the costa. In a great concave formed by the upper half of this second line, and filling the whole space to the apex, is a very large, round, or ovate, creamy-yellow blotch containing two rows of darker yellow clouds or cloudy spots; at the end of the discal cell is usually a dark grey streak or cloudy spot, sometimes lying in a creamy-yellow spot or blotch, which, however, is not always perceptible; often there is also a triangular creamy, or whitish,

cloud at the anal angle, and a faint indication of a yellowish blotch at the base of the dorsal margin; hind margin edged with a thick black line, broken at the tip of each nervure, and often forming slight scallops, or lunules; cilia yellow, edged with bright red-brown and toothed by purple-brown projections at the nervure-tips. Hind wings rather ample, much rounded, furnished with very long silky scales at the base; pale yellow, usually with faint indications of two parallel greyish cloudy stripes half-way across the wings from above the anal angle; but in some specimens these are hardly perceptible, in others extended further across the middle of the wing and broadened into a smoky cloud; cilia yellow, faintly dotted with chocolate-red. Female larger and stouter, with the antennæ stout, and furnished with pairs of bristles in rows, otherwise similar.

: Underside of all the wings creamy yellowish-white, each with an undulating transverse narrow chocolate stripe, crossing the middle of the hind wings, bent beyond the middle and oblique in the fore wings; hind margin of the fore wings edged and rippled with chocolate, and having similar lines and spots in the yellow cilia; body pale yellow; legs purple-brown barred with yellow, and furnished with large tufts of scales, purple in front, yellow behind.

Variation in this species is usually in the degree and extent of the silvery-white shining scales over the fore wings and the degree of rippling over the darker under-colour. In some specimens this is almost confined to the base, in others it extends to all the dark portions of the wings, and every possible intermediate degree occurs; but the most extensively and beautifully rippled specimens seem to be obtained in Lancashire. In the collection of Mr. W. G. Blatch is a female specimen, reared in Warwickshire, in which the silvery-white colour is intensified to shining snowy-white, which extends over a large portion of the fore wings; while the first and second lines, in striking contrast, are strongly marked and of a rich red-brown. In Yorkshire a very different form is

occasionally found, which, though rare, appears to exist as a recurrent variety; it is devoid of the white scales, even the base of the fore wings being very dark; and having more than the basal half of the hind wings occupied by a smoky-brown cloud. Another phase of variation has incidentally been pointed out above, in the presence or absence of a yellow discal spot and a yellow or white blotch at the anal angle.

On the wing in June and July.

LARVA rather soft and limp; long, cylindrical, with the head larger, but no humps. Head round, black, with the lobes outlined in yellow; body downy, from a covering of small whitish hairs; yellow, clouded with grey on the back of each segment, or when quite full grown of a more greenish yellow; dorsal stripe rather broad, dull black, interrupted at each segmental division; subdorsal line grey, slender; beneath it two similar lines, all three interrupted in the same manner; spiracles black; legs black or greyish-black; prolegs blackish. Larger whitish hairs project over the head.

August and September on elm, lime, willow, sallow, oak, birch, beech, alder, sycamore. It has been found even on laurel and on *Tropaeolum majus*, and is far from particular in its choice of food, though in the suburbs of London, where it is abundant, lime appears to be chiefly selected. The eggs are deposited in clusters and the young larvæ remain together in companies, feeding side by side so as to clear leaf after leaf, and render their presence conspicuous by stripping the portion of a branch on which they reside. When, however, the higher portion of the branch is cleared the whole company suddenly leaves it and takes possession of another branch, usually high up the tree, stripping it in a similar manner. Each company seems to shift its position in this manner three times at least. When not feeding, the larvæ crowd together into a solid bunch on one of the twigs, their extremities protruding from the cluster and giving it a ragged look very like a leaf which has been eaten, leaving the

principal ribs, so that the bunch is not at all conspicuous. When about to cast their skins, a common silken carpet is constructed by them conjointly, and so little are they inconvenienced by close proximity that Mr. Stainton has seen one moulting while two others were lying across its back. When nearly full fed the companies break up and each larva takes its own course—and as this is, not uncommonly, across a frequented path, the result is often disastrous.

PUPA thickish in the middle, rounded in front, abdominal segments tapering, deeply divided, the last with two conspicuous black points in a sunken scutcheon; shining dark purplish-red. Placed just beneath the surface of any soft loose earth, often close to the roots of a tree, but not in any cocoon. In this condition through the winter.

A curious instance of vegetable parasitism upon this pupa has been met with by Mr. E. W. Lifton, near Gloucester. The pupa was at a depth of about two inches in the ground beneath some moss, and from it were growing three upright spikes of a fungus—*Cordiceps militaris*—just visible above the moss.

The moth flies tolerably swiftly at night but is rarely taken on the wing, probably from keeping about the higher branches of trees. In the daytime it sits about on the ground or on a stone or very frequently upon grass under trees, with wings folded closely down and almost rolled into a cylinder. In this state its resemblance to a broken bit of rotten wood is marvellous, both the yellow tufted thorax, and the large yellow blotch on the hinder part of the wing, looking exactly like the ends of a clean broken stick, or else a patch of yellow lichen, while the general colour of the wings singularly imitates smooth bark.

Very abundant in the London district, and in many other parts of the South of England, and, at rare intervals, increasing in numbers to such a degree that the larvæ strip the trees of their leaves. Fairly common in some seasons all over England and Wales except the hill districts of the Midlands

and the North, but very uncertain, and irregular. In Scotland it seems to be more local, yet found throughout the south; rather common in Clydesdale, and at one time abundant at Moncrieff Hill, Perth; elsewhere found occasionally, and locally, almost to Sutherlandshire. Found more commonly in most parts of Ireland. Abroad it is plentiful all over Europe except in the extreme North and South, also in the Balkan Provinces, Syria and other parts of Asia Minor, Southern Russia and Siberia. In the South of Europe a form is met with in which the yellow discal spot is enlarged to a conspicuous blotch; the pale spot at the anal angle also large and yellow, and the hind wings unusually white. It is called *bucephaloides*, but appears to have no sufficient distinguishing character.

Genus 11. CLOSTERA.

Antennæ of the males strongly pectinated with long solid ciliated teeth to the tips; rather curved inward. Head small and retracted, thorax strongly crested; abdomen suddenly narrowed at the tail and having a forked anal tuft; fore wings rather triangular, broad behind.

This is a compact genus of a few closely allied species, and apparently not nearly related to any other.

LARVA rather stout, living between united leaves on trees or shrubs.

PUPA in the larval habitation, or among dead leaves.

1. *C. curtula*, L.—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings reddish-grey with four slender white cross lines and a large chocolate red blotch at the tip; thorax strongly crested.

Antennæ regularly pectinated with rather short teeth which are delicately ciliated; head rich chocolate-red except a tuft of short whitish scales at the base of each antenna; thorax rather stout, pale reddish-grey, with a large central blotch, broadest in front, of long upright scales of a brilliant

chocolate-red, forming a conspicuous crest; abdomen long, pale reddish-brown, with a long, compact, narrow anal tuft of the same colour, forked, and tipped with chocolate. Fore wings narrow at the base, broad behind; costa at first arched, then straight almost to the tip; apex rounded, hind margin nearly straight to near the anal angle, and not very oblique; dorsal margin gracefully curved; pale reddish-grey, or very pale reddish-brown; at a short distance from the base is a slightly oblique, straight, white, transverse line, edged outside with light brown; before the middle of the wing is another, similar, and nearly parallel; beyond the middle a third, more broadly white on the costa and concave to the middle, thence straight to the dorsal margin; between the second and third are indications of another line in two separate similar streaks, almost end to end, but neither attaining the margin of the wing. From the concave of the third line the large apical space is wholly occupied by a brilliant chocolate-red blotch, shading into greyer toward the hind margin, and having within it a perpendicular row of cloudy-grey streaks or spots; the lower edge of the chocolate blotch curves outward, and nearly attains the anal angle; cilia light brown. Hind wings pale reddish-brown, paler at the base; cilia whitish. Antennæ of the female very shortly pectinated; abdomen much stouter; hind wings uniformly pale reddish-brown; otherwise similar.

Underside of the fore wings dull brown, with a whitish spot on the costa beyond the middle, and beyond it the apical chocolate blotch, paler and more dull than above; hind wings whitish with a faint brown central transverse line; body whitish-brown: first pair of legs tinged with chocolate-red in front, remainder greyish.

Variation in this species is mainly seasonal. There are two and sometimes three generations in the year, each usually of a different ground colour; the first is pale grey, or pale yellowish-grey, with the chocolate blotch dark, and tinged with purplish; the second reddish-drab, or reddish-

brown, with the blotch of deeper colour; the third pale drab dusted with darker atoms, and with the chocolate blotch paler toward the apex. A most beautiful variety in the collection of Mr. Sydney Webb is blackish-brown tinged with reddish, having the three transverse lines very distinctly yellowish-white, and the blotch of a deep mahogany colour. Mr. A. B. Farn has a gynandrous example—the right side male, the left female.

On the wing at the end of April and in May, July or August, and sometimes in a third generation in September or October.

LARVA.—Head rounded; body nearly cylindrical but a little flattened and the segments rather deeply divided; on the back of the fourth and twelfth segments is a slightly raised, round, blackish-brown knob, or tubercle; body covered with slender bristles or hairs, in loose open tufts arising from yellowish or orange spots on the sides. Head brown or blackish, body pale grey dotted with black, with a very broad wavy dorsal stripe composed of four narrow parallel lines: spiracular stripe also very broad, consisting of a row of large yellow spots in which are pairs of orange warts; legs black; under-surface and prolegs smoky-grey.

June, July, August, September, sometimes November, on aspen, poplar, willow, and sallow, drawing together two leaves with silk into a habitation in which it lives; coming out at night to feed, clearing off all the leaves close to its habitation before it will remove and form a fresh one; feeding up very rapidly, and appearing in two or three generations.

PUPA reddish-brown, said to resemble that of *Callimorpha dominula*, though smaller. In a silken cocoon in the larval habitation, the leaves spun very tightly together while upon the tree, and, in the late brood, falling with them to the ground. In this condition through the winter.

The moth flies at night, and is very rarely captured on the

wing. In the daytime it may occasionally be found sitting on the trunk of an aspen, and when captured feigns death, but very soon becomes violent if enclosed in a box, in which case its wings are quickly broken and the specimen spoiled. The vast majority of those in collections are reared, the method of feeding of the larva making it tolerably conspicuous and easy to find.

Formerly considered a rather common species, but now extremely local and far from plentiful. Probably more frequent in Kent than anywhere else; also found in several places in Sussex and in the Isle of Wight. Very local in Berks, Essex, Suffolk, Norfolk and Cambridgeshire; more rarely found in Gloucestershire, Worcestershire, Herefordshire, Leicestershire, Yorkshire, and even Cumberland, which seems to be its northern limit. I know of no records of its occurrence in Wales or the extreme West of England, and the late Mr. Birchall's record at Clonmel, Ireland, is not confirmed, and seems to have been a mistake. Abroad it is found throughout Central Europe, Northern Europe (except the coldest portions), in Piedmont, Corsica, Bulgaria, and Asia Minor.

2. *C. anachoreta*, *Fab.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings smoky-grey or reddish-grey, with a triangular smoky-red apical blotch and two black spots beneath it; thorax with a small crest.

Antennæ of the male strongly pectinated, teeth blackish, shaft brown; head densely tufted, pale grey-brown, with a large blackish-brown spot on the crown extending back over the collar, and sometimes quite back over the middle of the thorax, in a narrow bar of long upright scales; thorax on each side of this also covered with long grey scales, and having at the back an erect pointed crest; abdomen long, moderately stout but tapering, grey or grey-brown, with a large constricted but spreading and forked anal tuft, which is darker at the tips. Fore wings narrow at the base, broad

behind; costa arched at the base, then straight; apex suddenly rounded; hind margin rounded and very full at the anal angle, not very oblique; dorsal margin almost straight. Colour pale reddish-grey or smoky-grey, with two indistinct, nearly straight, parallel whitish lines, edged with dark grey before the middle, as in the last species; but rather oblique, leaning *inward* toward the costa. In the middle of the wing is one-half of a similar line from the median nervure to the dorsal margin. From the end of the discal cell the space to the apex is occupied by a large dark blotch of greyish-chocolate, changing to smoky-grey in its hinder area; the lower edge of this blotch hollowed, but curving downward as it approaches the hind margin. In this large blotch, cutting it near its origin, is a slender, interrupted, undulating white stripe, continued across the rest of the wing as the faintest possible whitish thread, and evidently recognisable as a normal second line. Outside the white stripe are two black spots on the apical blotch, and below it an elongated black spot placed transversely to the wing, followed by a smaller spot; hind margin edged with black dashes; cilia smoky-grey. Hind wings smoky-brown or smoky-grey; nervures slightly darker. Antennæ of the female very shortly pectinated; body stouter; otherwise similar.

Underside of the fore wings dull grey or brown, with a slightly indicated whitish transverse line beyond the middle; hind wings brownish-white or pale grey, with a slender brown transverse stripe and brownish nervures; body and legs dull brown or grey.

Only variable in depth of colour.

On the wing in May, in a second generation in July, and in confinement a third has been obtained in September.

LARVA.—Head rather narrow, with the lobes pointed in front; body even in thickness, flattened beneath. On the back of the fifth segment is a large and conspicuous knob or tubercle, rounded above, dull pink or red-brown, sur-

rounded with black, and having on each side of it a large bright white spot; on the twelfth segment another similar tubercle, also dull red, edged at the back with whitish. Head black, shining, rather hairy; body smoky grey or purplish-black; dorsal stripe very broad, pale buff or whitish-grey; immediately below it on each side is a row of large deep black spots, and intermediately below them a row of dull orange spots. Spiracular line orange-yellow; spiracles orange; legs black; prolegs smoky-pink.

May, June, July, August, and sometimes September and October on poplar and willow; when young living gregariously, but when older drawing together leaves of the food-plant with silk, and living alone in the chamber thus formed.

PUPA rather plump, blackish. In the larval chamber or spun up among leaves. In this state through the winter.

The moth flies only at night, but so far as I am aware has never been captured—as a moth—in these islands, except that two are said to have been picked up in the street at Deal. Yet it seems to have been known here from a very early date. Haworth, very early in the century, correctly described it, saying that it was most rare in England. Curtis (1838) says, “the only specimens I have seen are in the cabinet of the British Museum; they were taken near Salisbury by the late Mr. Spratt.” In the very old British Museum collection, now at South Kensington, still exist two specimens which are believed to have been obtained from Mr. Spratt by Dr. Leech, and presented by him to the National collection. These specimens appear to be referred to, also, by Stephens and Westwood. Apparently the species was lost for at least thirty years, but in 1858 two larvæ were obtained near Saltwood, Kent, in June, by Mr. Sidney Cooper, and reared, but were not at the time recognised. In the following year Dr. H. G. Knaggs found a larva near Folkestone upon poplar, and, recognising it, devoted himself to the search and secured ten more, which

with a pupa afterwards found, were reared. He found that the moths paired readily in confinement, and laid their eggs without delay. The same satisfactory result attended their progeny, and generation after generation—three in a year—were reared, and hundreds of moths distributed by him to other collections. Eggs were also given away and larvæ in such abundance procured from them that batches were turned out in various parts of the country, and even in Ireland, in the hope of fully acclimatising the species. This attempt was not successful, though in Norfolk the species continued to exist for several years, and ultimately all the colonies seem to have died out. Meanwhile there was no increase in numbers in the original habitat; a furious storm stripped the poplars of every leaf, and any larvæ that may have been upon them at the time doubtless perished. In 1861 the place was again tenanted, since a larva was found by Mr. Thomas H. Briggs, and others are recorded as having been found in the two or three following years—though rarely. In 1876 a pupa was said to have been found under willow bark at Deal, and about that time another on a wall at Dover. Both were reared. Two larvæ seem to have been found at Walmer, Kent, in 1878, but from this time I find no further records until 1893, when eggs were found near St. Leonards, Sussex, and the moths reared; from which source a large number has already been bred. These appear to be of a darker colour than the earlier specimens—which, however, have certainly faded, a little, towards brown. I know of no other locality for the species in these islands, yet in confinement no moth is more easy to rear and propagate.

Abroad it is found throughout Central Europe, in Eastern Spain, Italy, Livonia, Finland, Siberia, and in Asia Minor. Also in Japan, China, India and Ceylon—but called *fulgorita*, Walker,—and even in Java.

3. **C. reclusa**, *Fab.*, **pigra**, *Staud. Cat.*—Expanse 1 inch,

Fore wings purplish-brown with irregular white cross-lines and a small bright chocolate blotch before the apex; thorax strongly crested.

Antennæ of the male strongly pectinated, the teeth blackish, the shaft glossy brown; head pale grey; on its crown commences a blotch of deep black-brown which extends back over the middle of the thorax, rising into a high tuft of upright scales, the hinder portion of which shades into red-brown; sides of the thorax silvery-grey; abdomen grey, rather glossy, with a long, narrow, forked anal tuft, grey tipped with dark brown. Fore wings broad behind; costa very straight; apex blunt; hind margin very fully rounded, the curve sweeping round the anal angle; dorsal margin straight; colour purplish-grey; near the base is a short white line, edged with brown, extending from the costal margin to the median nervure; beyond this is another from the same nervure to the dorsal margin; before the middle is the normal first transverse line, slender, whitish, angulated in its upper half; beyond the middle the second transverse line, rather more oblique, whitish on the costa, passing through the commencement of a bright chocolate-red blotch of moderate size which reaches only half-way to the apex and hind margin; at the end of the discal cell is a black line, and beneath it another, placed more obliquely, edged with white, and meeting the second transverse line at the dorsal margin; before the hind margin is a line of blackish cloudy streaks or lunules; cilia grey-brown. Hind wings dark grey; cilia greyish white. Female with the antennæ very shortly pectinated; abdomen stout; otherwise similar.

Underside dull brownish, fore wings tinged with chocolate toward the apex, and with an oblique whitish streak on the costa.

Variable in colour, in some instances the fore wings are much tinged with chocolate-red, in shades and blotches, over the general surface even to near the base; in others almost

wholly dark grey with scarcely a trace of reddish. Some specimens from the South of Ireland in Mr. F. J. Hanbury's collection are very richly coloured and of unusual size.

On the wing in May and as a partial second generation in August. Only single-brooded in the North.

LARVA.—Stout, shining, slightly hairy; head rounded, dark brown. Dorsal region dull orange, with three ill-defined grey lines, and a conspicuous black spot, each, on the fifth and twelfth segments; sides very dark grey, almost black; spiracular stripe broad, orange, divided by a dark grey line; subdorsal spots raised into orange tubercles; under-surface and prolegs purplish-brown; legs blackish-brown. In its northern range the dorsal region is darker or greyish; sides slate-colour, and an interrupted black stripe edges the spiracular stripe above. (C. Fenn.)

June, and in a second generation in August, September, and sometimes October.

On sallow, specially on the low-growing species, such as *Salix fusca*, on sprays springing from the ground; occasionally also on low growing shoots of aspen and poplar. In a chamber formed of one or two leaves drawn together, in which it remains during the day, coming out at night to feed.

PUPA stout, rounded, anal segment also bluntly rounded, and having a small spike; bright mahogany-red. In a cocoon among fallen leaves or rubbish on the ground, or occasionally between leaves on the bush. In this condition through the winter.

The moth flies usually at night, or even towards morning. When collecting by means of light in a fen all that I have seen of this species have arrived just before dawn. In rare instances it flies also in the daytime. I have caught a male flying steadily over dwarf sallows in hot sunshine, but its activity in the net at that time was astounding. Occasionally it may be found in the daytime sitting on a sallow twig near

the ground, when with closely clasped, or almost rolled, wings, erect tufted thorax, and curled up, forked tail, it looks extremely ornamental, if not dignified.

Especially attached to boggy heaths, shallow marshes, and fens, where dwarf salallows are abundant; and in the larva state not scarce. Found in suitable places in all the southern and eastern counties, and, in the west, in Herefordshire, Worcestershire, and near Bristol; also in Glamorganshire. Occasionally in Lancashire, very rarely in Yorkshire, and in Cumberland, but in most of the intermediate counties records seem to be wanting. In some of these it may have been overlooked. In Scotland widely distributed, Clydesdale, Roxburgh, formerly near Edinburgh; Perthshire, near Ben Nevis; Inverness-shire; and other districts, to West Ross and Moray. Apparently in all suitable places in Ireland, recorded from Cork, Kerry, Galway, Westmeath, Mayo, Down, Tyrone and Donegal. Abroad it is found throughout Northern and Central Europe, and in Piedmont, Spain, Portugal, Southern Russia and Armenia.

Genus 12. **DILOBA.**

Antennæ long, pectinated, in the male, to the apex, simple in the female; fore wings very narrowly ovate, without projections; thorax slightly crested at the back.

We have but one species.

1. **D. cæruleocephala**, *L.*—Expanse $1\frac{1}{2}$ inch. Fore wings purple-brown, with black cross-lines, and two large greyish-white 8-marks; hind wings whitish with a black streak at the anal angle.

Antennæ of the male rather long, pectinated to the apex with long solid teeth; light brown. Head black-brown, tufts at the bases of the antennæ whitish; collar broad, bronzy-brown in front, then black and tipped with white; remainder of thorax dark purplish-brown, mixed with silvery-white;

the scales long, not erect, except a tuft which forms a distinct crest at the back; abdomen moderately stout, yellowish-brown with a more yellowish anal tuft and row of tufts down the sides. Fore wings rather narrow, slightly ovate; costa faintly curved; apex blunt; hind margin gently rounded; dorsal margin very gracefully curved; no prominent tuft, though this seems to be suggested by rather rough black scales along the extreme edge. Colour light purple-brown, more brown at the base; first transverse line black, rather perpendicular, but much angulated; second line scalloped obliquely above the dorsal margin, but from the middle of the wing passing as a straight black bar almost to the costa, and duplicated; between the first and second lines and partially in the discal cell, are two singular-looking, large, whitish, constricted, ovate spots, edged with black, and centred with pairs of grey clouds, giving them the appearance of two rough white figures of 8 connected obliquely together; beyond the outer of these the whitish colour is continued to the costa past the second line; outside this line is a transverse band of brownish clouds; hind margin pale purplish, slenderly edged with dark brown scallops; cilia brownish, dashed with darker. Hind wings whitish with grey nervures, a faint grey transverse cloud and a greyish central streak; at the anal angle is a wedge-shaped black streak passing through the cilia, and by it a curved black line; cilia white with brownish clouds. Antennæ of the female simple; costa of fore wings more rounded; anal tuft dense, and smoky black; otherwise similar.

Underside of the fore wings dark smoky-grey, with pale clouds toward the costa; hind wings whitish, abundantly dusted with dark grey, and with a blackish lunule and central transverse stripe; cilia edged and spotted with dark grey; female rather darker.

Usually not variable, but in the collection of Mr. S. Stevens are two specimens having a dark central band, and devoid of the two constricted 8 spots; and Dr. R. Freer has an example,

reared at Rugeley, Staffordshire, in which the two 8 marks are of a shining yellow. This unusual colour does not extend to the following blotch reaching the costa, and it is only visible by daylight.

On the wing in October and November.

LARVA of rather even thickness, short, plump, bristly; head round, bluish-grey, with a black spot on each lobe; body blue-grey with numerous round black spots from which bristles arise; dorsal stripe broad, composed of large yellow spots, one on the back of each segment from the fifth to the twelfth, in each case edged with four of the black spots; a row of similar black spots lies, in a yellow blotch, across each of the second to the fourth segments, and there is a large one on the thirteenth; spiracular stripe yellow, edged above with smoky-grey and a row of black spots, below with darker grey which becomes greenish-grey on the under surface; legs black; prolegs spotted with black. When younger darker slate-grey, the head more bluish, with the lobes blacker, and the dorsal stripe uninterrupted. When extremely young the black spots and black bristles, which are long, almost exclude all other markings.

March to June on hawthorn, blackthorn, plum, pear, apple, cherry, peach, apricot, almond, and even *Pyrus japonica*, feeding quite exposed upon the leaves. In the egg through the winter.

PUPA rather stout, blunt, the anal extremity with two projections, each furnished with small bristles; dull, rough reddish-brown, or blackish-brown, rather powdered with bluish. In a tough oval cocoon of strong silk mixed with morsels of leaf, moss, or earth, on or under the earth on hedgebanks, or at the bottom of a wall; more rarely under bark or even attached to a twig in a hedge. In pupa from June till October or November.

The moth flies at night, but is very rarely observed on the

wing, unless attracted to a light. This seems to occur only on very warm, close autumn nights, and the moths almost instantly settle down and remain inert for the rest of the night. On one occasion I saw nearly one hundred specimens in one night sitting quietly on the frames of gas-lamps at Norwich, yet I scarcely saw one flying. They were sitting closely pressed to the frame as though shrinking from observation. In the daytime it probably sits in hedges or on branches of trees, and is seldom noticed.

The larva has been aspersed as a ferocious cannibal, but apparently without sufficient grounds. It may occasionally devour a smaller relative when not allowed sufficient moisture, but in this respect it is certainly less culpable than very many other species. Miss Lilian Gould has shown by careful experiments, communicated to the Entomological Society of London, that it is extremely distasteful to birds; yet Kollar states that it is much relished by some birds on account of its rather smooth fleshy body. It is quite credible that different birds may have differing tastes!

In the South of England this species is usually very common, extremely so in the Eastern Counties and in some of the Western, though not so in Devon; extending in fair numbers through Cheshire, Lancashire and Cumberland; also widely distributed in Yorkshire, but apparently hardly noticed in some of the Midland Counties. In Scotland it has been found at Moncrieff Hill, Perthshire, and in Clydesdale, but seems to be very local. In Ireland widely distributed from Cork and Galway to Derry, yet scarce, and only recorded as abundant in one spot on the Londonderry coast. Abroad it is found throughout the Continent of Europe, except the extreme north and south, and is looked upon as a great pest from the devastation which its larva effects upon the fruit trees. It occurs also in Asia Minor and Armenia.

Group 3. *NOCTUINA*.

This is a group contrasting greatly with the last, in that its species, though very numerous, are so closely allied in structure and appearance that it is extremely difficult to separate them into well defined and readily recognisable families. Consequently almost every author has a different arrangement, and each classification presents difficulties.

That of Guenée, which was adopted by my late friend Mr. Stainton in his valuable Manual, is on the whole the most attractive, since by it the group is broken up into sections of moderate extent, and consisting of species which in many respects assort well with one another. Yet it hardly seems to bear a strict examination; the distinctive characters used to separate families are hardly stronger than those defining genera; and the so-called sections are very vague, while both seem to be cut to pieces by structural characters of equal importance to those adopted. Indeed, on close examination of the two main divisions, their separating characters as arranged by Guenée, do not appear to hold good. For instance, in the second large division—the *Quadrifidæ*—we find that more than one-half of the species allotted to that group actually possess the trifold arrangement of the median nervure of the hind wings from which the other large division—the *Trifidæ*—takes its name. Perhaps a slight explanation upon this subject may be useful. The neuration of the fore wings in this group presents no sufficient variation to be of service, but that of the hind wings is more diversified. These organs require in the majority of cases to be folded—once or twice—in order that they may be concealed under the narrower fore wings when the insect is quiescent. The expansion of the wing, as well as its folding, is accomplished, as every one knows, by means of nervures, or veins as they are often called—ribs in fact, like those of an umbrella. These ribs are three in number at the base of the wings, but in the middle area they branch into a number of separate

nervures. A fashion has arisen of counting them backwards—not from the front, or costal margin, but from the back, or dorsal margin of the wing. On the whole this is the easier method, though it is by no means universally approved or adopted. By it the nervure nearest the dorsal margin is called vein 1. It is very commonly single and undivided, and so forms a convenient starting-point. The next nervure from the base is the median, and it is always divided into three, sometimes into four branches (trifid or quadrid), and as these divisions become, for practical purposes of expansion of the wings, main ribs, they are called nervures or veins 2, 3, 4 and 5, veins 2, 3 and 4 being permanent, and vein 5 the great variable character on which the classification has been made to depend. The remaining main nervure from the base, the subcostal, is also divided into three strong branches, veins 6, 7 and 8, and these nervures, or veins 1 to 8, at moderately even distances—following out the comparison to an umbrella—stretch the wing into shape, the margin being produced a little at the termination of each *strong* nervure in a faint likeness to the tips of the umbrella, so that the actual margin of the membrane is usually a little crenulated or scalloped, although this formation is not usually communicated to the cilia. But vein 5 is, in this group, usually *not* a strong nervure, but in numerous species extremely thin and weak, and in many of such tenuity that it can only be seen, under a good magnifier, by a faint line of reflected light, being otherwise totally lost in the deep fold which takes place down its line. Wherever this vein 5 is strong and stout, the margin takes the usual extension at its tip, and this is diminished or lost in accordance with the tenuity of the nervure. In all such cases it takes its origin from a short, slender, sometimes angulated or oblique, horizontal nervure, which crosses the space from the median to the subcostal nervure, uniting them at about the angle of veins 3 and 4 and of veins 7 and 8. This is known as the discocellular nervule, but may for convenience be called the cross-bar. It forms the

outer edge of the discal cell. In the vast majority of cases in which vein 5 is moderately or extremely thin and weak, and produces little impression upon the margin; it arises from the *middle* of this cross-bar. When it arises upon or near the median nervure it is usually strong and produces the marginal extension. As before remarked, the main fold of the wing by which it is laid together and packed under the narrow fore wing is down this vein 5, and very often the fold is so strong and obvious that the nervure *seems* to arise from the base of the wing and pass down the middle of the discal cell. The other fold, when in use, is between veins 1 and 2. A curious peculiarity of many species which seem to have the median nervure quadrifid is that it is actually only bifid, vein 5 arising at a very short distance from the median, and vein 3 crossing that nervure to meet it. This, however, is not very noticeable until the wing is denuded of scales.

The structural character, however, which seems to work most havoc in the arrangement in question is furnished by the eyes. In the majority of species the surface of the eyes is, as in the *Bombyces*, smooth and naked, though often the corneous surface is so shrunken after death as to present a more or less irregular pattern of black blotches. But in a less number of species the whole large convex surface of the eyes is protected by short and minute, but perfectly even and regular, upstanding hairs or bristles. These are so exquisitely fine that they only become visible under a good lens, and even then cannot be seen from above; but when looked at across the surface of the eye present a most delicate and regular cloud of tiny short points, perfectly erect and usually of a bright brown colour. In this respect no intermediate gradations seem to occur; all are either completely hairy—or naked—eyed. Yet to adopt this character alone for separation of the *Noctuina* into two families would land the systematist into greater difficulties, since this curious character cuts right across some genera which in other respects appear to be tolerably homogeneous. Thus, the genus *Cymatophora*, as

described in Stainton's Manual, becomes divided into two parts, since *C. flavicornis* and *C. ridens* have eyes densely hairy, the rest naked. (But oddly enough, those writers who have separated these two species into a separate genus—*Asphalia*—have placed with them *C. diluta*, the eyes of which are perfectly naked.) By this peculiarity of structure Stainton's genera *Mamestra*, *Tœniocampa*, *Aplecta*, and *Hadena* are similarly bisected. A division consisting only of hairy-eyed species would embrace the genera *Asphalia*, *Leucania*, part of *Mamestra*, part of *Tœniocampa*, *Dianthecia*, *Hecatera*, *Aplecta* (part), *Hadena* (part) and *Anarta*, with a few scattered single species, leaving the rest of the *Noctuina* in the other division, and would be about as intelligible as a division of the Butterflies which would place the genera *Vanessa*, *Pararge*, *Thecla* and *Polyommatus* on one side, with all the rest on the other! Nevertheless, it seems undesirable to leave species separated by so striking a structural peculiarity as this in the same *genus*. In view of these considerations, I find myself unable to follow the arrangement of Mr. Stainton, convenient and attractive as it otherwise appears.

Other structural characters which may be used for classification are the presence, position, or absence of eyelashes or rows of bristles, usually black, in front or at the back of the eyes; large tufts of elongated scales in curved crests on the top or at the back of the thorax; and smaller tufts or crests, various in form and in number, on the dorsal ridge of the abdominal segments. The fine bristles or hairs, denominated for convenience eyelashes, are placed, in a few species, in a row in front of the large convex eye, and in another row at its back, either stiffly erect or curiously curved over the eye as though to afford it additional protection, and closely resemble similar appendages in the *Hepialidæ* and some of the *Sphingidæ*. In a larger number of species they appear only at the back of the eye, and in a still larger number, where they seem to be absent, they may be found in a prostrate position among the surrounding long head-scales; but in

certain groups they are quite absent, and in these the eyes are prominent and the head-scales usually not so long or dense. The thorax, in many species, is beautifully decorated, the collar in front being raised, broad, and often banded; the shoulder-lappets frequently uplifted and striped or edged with dark colour, and the middle and back portions crowned with crests of erect scales, in large curved tufts, in front and back, often with a dividing hollow or channel down the middle, separating the top and back crests into pairs. In other species these crests exist only at the back, the scales on the front portion being much less erected and smoother, and this crested character is modified gradually and almost imperceptibly through numerous species down to a mere central knob at the back of the thorax formed by the converging tips of rather long scales. In many genera even this is absent. The number of species having crests or tufts of scales on the back of the abdomen is very large, and their variation extreme. In some species the tufts are erect, stiff, and horseshoe-shaped, and occur on from one only, to all the abdominal segments except the last. In others the tufts are broad and blunt, or those on the basal segments are thick and distinct, those on following segments dwindling away and hardly noticeable; or all are oblique, and more and more oblique, until there is really no tuft at all, or it is quite prostrate and only indicated by its darker colour. In certain groups, on the other hand, the basal tufts are small, and that on the third abdominal segment, or on the third and fifth, tall, slender and graceful, being curved over at the tips. In many species long horizontal tufts or fascicles of pale hair-scales, projecting from the hinder part of the thorax, converge over the basal segments of the abdomen and partially conceal the short abdominal tufts; while in some species the latter are so fugitive that they are shaken off and lost in specimens which have flown or become in any degree worn, and the species, although really decorated with one or two tufts, becomes credited with none at all—whereby

closely allied species have, by mere accident, been placed far apart. The number of species really devoid of any such crests is large, but even of these a few have colour-imitations on the back of the abdominal segments.

All these structural appendages seem to be useful in characterising genera, yet neither of them appears to be so far dominant as to assist in the division of the whole group into sections. The arrangement of genera worked out by Lederer, and adopted in Drs. Staudinger and Wocke's Catalogue, is based on many of these characters, and in many respects is an admirable classification, but some of its genera are ponderous, and I think unnecessarily mixed. The structural characters furnished by Mr. Hampson in his fine work on the "Moths of India" are extremely clear and valuable, and have been of very great help to me; but both arrangements seem, in my opinion, to be damaged by the inclusion of the *Cymatophoridae* among the *Notodontidae* and their exclusion from the present group. The structure and usefulness of the tongue in the *Cymatophoridae*, their love of sweet substances as food, and their crepuscular flight, are characters so diametrically opposite to those of the *Notodontidae*, and so entirely in accord with those of the *Noctuae*, that I feel it necessary to follow Stainton in including them in the latter, and in placing them at the head of the family, as a stepping-stone from the *Bombycina*, to which they, undoubtedly, are in some respects allied.

Having indulged in a somewhat prolix apology for my attempt to produce an arrangement of this group differing in some details from those at present in use, it only remains to point out that the *specific* distinctions—although the species are so closely allied, and in some cases very variable—are usually easy of recognition and quite reliable, and that they depend largely upon modifications of a certain plan or pattern of markings in the fore wings; also, that by the use of a definite nomenclature for these markings much of the confusion and difficulty of description, and discrimination, of

the species is avoided. The terms normal *first* and *second lines* have already been constantly used in this work and will be at once recognised as lines which really seem to have some connection with the *structure* of the wings, so constantly do they appear, one before, the other beyond, the middle of the fore wings. Nearer the base is usually—or frequently—a more or less incomplete line, which in other groups becomes the outside margin of a basal blotch, and which is known as the basal line; nearer the hind margin than the second line is the subterminal line, usually a mere pale division of the clouded apical and hind marginal colouring, but which often assumes sharp and very definite form. Between the first and second lines, and placed in the discal cell, are usually two spots large enough to extend completely across the cell and divide it into sections. That nearer the first line is usually somewhat round, and is known as the Orbicular stigma; the other, nearer to the second line, is generally larger and somewhat broadly kidney-shaped, and is known as the Reniform stigma. Below the Orbicular stigma, on the other side of the median nervure, and commonly placed with its base touching the first line, is a third spot, very frequently present though not so reliable as the other two, and of a wedge-shape, known as the Claviform stigma. If the reader will look back to the genus *Sesia*, he will find in nearly every species a bar or blotch at the apex of the discal cell analogous to the Reniform stigma, as indeed is the central spot in so many other species; and in *Euthemonia russula* and *Dasychira pudibunda* he will find it more decidedly indicated. In some exotic *Bombycina* allied to *Euthemonia*—notably some South African species—both the Reniform and Orbicular stigmata are strongly marked. To go even further back, the markings in the discal cell of the butterflies of the genera *Argynnis* and *Melitæa* are of a somewhat analogous character, and a resemblance can readily be traced. It is desirable that these four lines and three stigmata, with their names, should be fixed upon the mind, or the descriptions of

most of the species of *Noctua* may, instead of being simple and easy, appear meaningless, if not incomprehensible.

The vast majority of the species are strongly built, the thorax stout and often squared, abdomen usually moderately stout and tapering off small at the tail, rather pointed in the females; fore wings strong and stiff, not very blunt, either narrow or triangular; hind wings broad and ample and much slighter in texture; wings complete in both sexes in all our species; and as a general rule the sexes very similar, sometimes difficult to distinguish.

Antennæ in the male most variable, pectinated, half-pectinated, serrated, tufted, ciliated, or simple and quite naked; always threadlike in the female.

Family 1. CYMATOPHORIDÆ.

Antennæ threadlike; palpi rather short; thorax rounded, with scales usually in dense raised tufts; fore wings rather broad; hind wings thin and delicate.

LARVÆ usually naked, feeding on trees or shrubs, in most species concealing themselves under, or between, the leaves.

PUPÆ rounded; abdominal segments tapering in a conical form somewhat as in the *Geometridæ*; texture dull; anal armature consists of hooked bristles placed on a spine.

Genus 1. GONOPHORA.

Antennæ rather short, ciliated; eyes naked, with lashes at the back; back of thorax strongly crested; abdomen without crests; fore wings broad; hind wings ample, vein 5 very near to vein 4.

1. *G. derasa*, L.—Expanse, $1\frac{5}{8}$ inch. Fore wings light buff, with two broad diverging white stripes and numerous zigzag lines; hind wings grey-brown.

Antennæ simple, faintly ciliated, light brown; head tufted pale brown; thorax rather squared, with a broad erect

whitish-brown collar, which is prominently raised at the shoulders, and edged with yellow-brown at the back; shoulder-lappets short, raised, yellowish-white, tipped with yellow-brown; upper surface covered with erect whitish-drab scales, tipped with yellow-brown, and formed at the back into a large expanding double crest; abdomen less stout, rather tapering, covered with long buff scales, which are in large masses toward the base; a row of long tufts down each side, and a rather conical anal tuft, all of the same colour. Fore wings broad, triangular, with the costa arched at the base and apex, straight between; apex bluntly rounded, almost angulated; hind margin gently rounded; dorsal margin hollowed before the anal angle. Colour, pale soft greyish-buff; a curved white stripe, edged with brown, from the middle of the base, reaches the first transverse line, which is broad and white, arises on the costa near the base, and passes obliquely across the wing to beyond the middle of the dorsal margin, almost extending itself to join another broad white stripe, which extends from within the anal angle to the apex. The middle portion of the wing between these stripes is clouded with rich orange-brown, which shades off to white along the costa, to yellow along the first stripe, and to grey-buff along the second, before which are four parallel, slender, zigzagged white lines, and a wedge-shaped white streak from the costa; orbicular and reniform stigmata outlined with white, the latter having a central white upright line; hind margin with a row of delicate white crescents, of which the points run into the cilia and enclose elongate orange-brown marginal streaks; cilia buff, tinged with orange-brown. Hind wings ample, rather long, rounded behind; pale greyish-brown, with a faintly indicated whitish central transverse cloud; cilia yellowish-white. Female similar; abdomen more pointed.

Underside of the fore wings pale yellowish-grey, paler along the costa and spotted with pale fawn colour; apex with a pale orange-brown cloud, edged inwardly by a whitish

crescent, before which is a faint transverse grey shade; hind wings yellowish-white with a broad grey shade before the hind margin. Body and legs densely tufted with long yellowish-white scales, except the second pair of legs, which are adorned with large grey tufts.

Not variable with us.

On the wing in June and July. Very rarely casual specimens of a second generation occur in September or October.

LARVA smooth, plump, velvety, rather cylindrical, but each segment rounded, third and fourth segments a little stouter; head dark brown or yellow-brown; body red-brown, slightly translucent; whole under surface and lower portion of the sides yellowish-brown; on each side of the fifth segment is a conspicuous rounded white spot edged with black; in some specimens a second similar spot on each side of the sixth segment, and occasionally a third on the seventh; dorsal line slender, blackish; spiracles black; above them is an obscure slender blackish line or shade edging the darker colouring; legs and prolegs yellowish.

August to November, on bramble (*Rubus*), but has been known to eat hazel and even hawthorn. Feeding only at night; concealed in the daytime under moss or dead leaves, and sometimes in a chamber of leaves, joined together, on the ground.

PUPA short; thoracic portion very cylindrical, squared in front; abdominal segments tapering regularly to a sharp anal point; mahogany-brown, darker in front; tip of wing-cases produced. In a cocoon of earth under the surface of the ground.

In this state through the winter.

This beautiful moth is very rarely found in the daytime; doubtless it hides among brambles and other herbage, or among dead leaves on the ground in woods. It flies at dusk, sometimes at earliest twilight, and is extremely fond of

sweets, such as honeydew, and is readily attracted by the sweet compound of treacle or boiled sugar mixed with beer and rum, and technically known as "sugar," to the attractions of which so many species of the present group fall victims. It does not, however, settle quietly down to feed, but sits with wings half erected and quivering; and on the approach of the collector will often dart off and fly round him in a tantalising way, but from its light colour is easily captured in the net. If not caught, it does not always return very readily to the sugar.

Common in wooded districts all over the South of England, except in Cornwall, where it seems to be scarce. Widely distributed, though not plentiful, in the Fen districts and throughout the Eastern Counties to Lincolnshire and Yorkshire; also in the West, in Herefordshire, Worcestershire, Cheshire and Lancashire; scarce in the Midlands, though found in Warwickshire and North Staffordshire. In Wales I have found it in Pembrokeshire, and it doubtless occurs in other suitable localities. In Scotland there seems to be but a single record—at Gourock, by Mr. P. Cameron. In Ireland apparently in every wooded district from Dublin to Sligo, and from Kerry to Londonderry, and sometimes very common.

Abroad it has a wide distribution: all Central Europe, Northern Italy, Livonia, Armenia, Tartary, Himalayas, Burma, Bengal, Japan. Specimens from some of these Eastern countries are known under the names of *Indica*, *fraterna* and *derasoides*. From North America a form known as *scripta* is more of an olive-brown, and very lovely, but apparently not distinct.

Genus 2. **THYATIRA.**

Antennæ rather short, curved, ciliated; eyes naked, having lashes at the back; thorax rounded, strongly crested at the back; shoulder-lappets raised; abdomen crested; fore wings

rather broad, having large gaily-coloured spots; hind wings ample; vein 5 from the middle of the cross-bar.

1. **T. batis**, *L.*—Expanse, $1\frac{1}{2}$ inch. Fore wings dark olive-brown, with large, rounded, roseate spots; hind wings dull grey.

Antennæ short, slender, curved, faintly ciliated, light brown; head pale smoky-brown; collar broad, densely scaled, rather erect, smoky-brown; remainder of thorax covered with raised pale olive scales, strongly barred or shot with purplish-pink, and expanded at the back into a broad crest, behind which is a tuft of pale reddish or bright pink scales; abdomen rather slender, tapering, glossy whitish-grey, with three or four light or dark brown dorsal crests or erected tufts, the third the most conspicuous; but these are fugitive and only to be seen in perfection in very fine specimens, and in them sometimes almost prostrate or concealed by long fascicles of whitish hair-scales, which arise at the back of the thorax; lateral tufts of the abdomen small; anal tuft rather long. Fore wings somewhat ovate; costa arched at the base, then gently curved to the apex, which is rather suddenly rounded; hind margin gently rounded; dorsal margin tolerably straight; colour very opaque, dark olive-brown or blackish-olive, with large, rounded, sharply defined, bright pinkish spots, (like peach petals, whence its common name of the “peach-blossom”). Of these spots one, occupying the basal area, is pinkish-white, and contains delicate fulvous clouds and dots; one, equally large, is at the anal angle, bright pink, with an olive-fulvous central cloud; a very small one beyond it on the hind margin; two of full size and of a lovely pink on the costal margin toward the apex; and an elongated blotch along the middle of the dorsal margin, pinkish, with a long fulvous cloud; cilia dark olive-brown, with a paler line at the base, and before it, along the hind margin, a series of faint pale crescents. Hind wings ample, rounded, but with

a slight hollow in the hind margin before the anal angle; greyish-white at the base, gradually shading off to dark grey behind, but with an indistinct whitish central transverse band; nervures dark grey; cilia light brown, tipped with whitish. Female similar, but with the abdomen rather stouter and more pointed; tufts smaller.

Underside of fore wings whitish-grey, shading to smoky-grey toward the costa; a dark grey central shade; and from the costa two black bars, followed by whitish patches, the large spots of the upper side faintly visible. Hind wings whitish; nervures grey; and with pale grey transverse clouds. Body and legs tufted with greyish-white, but first pair of legs blackish in front and tufted with white.

Usually not variable, but specimens from western districts, as South Wales and the North of Ireland, frequently have the pink colouring of the back of the thorax and of the large spots paler or replaced by pale buff.

On the wing in June and July; occasionally as a second generation in August, September, or even October.

LARVA naked, rather velvety; head large, divided, the divisions rounded; on the back of the second segment is a divided tubercle or hump, and one still larger on the third, the points of which rather curve forward; on the fifth to the tenth are raised, undivided humps or ridges, and on the fifth and sixth are also lateral swellings; on the twelfth is a rather conical raised hump or ridge; all these humps are dark olive-brown, but pale brown at the back; the remainder of the upper surface is pale olive-brown or reddish-brown; under surface and legs pale brown; along the spiracular region is an irregular brown line.

July to September on bramble, and occasionally raspberry; feeding at night, and concealed under dead leaves during the day. It usually rests with its anal segment slightly elevated.

PUPA short and thick, rather angulated or almost bluntly pointed in front; thorax very thick and short; abdomen even

thicker, tapering rapidly to a rather short, thick bent spike at the tail. Mahogany-red, with several blackish spots on the back of the thorax, and in a double row down the abdomen. In a cocoon of silk and earth underground. In this state through the winter.

This exquisitely beautiful moth is very rarely observed in the daytime, or at rest. Doubtless it conceals itself among dead leaves on the ground or among bramble bushes, but is partial to woods and open wooded districts. It flies at dusk and may be captured flying at hedge sides; but much more frequently at sugar, to which it is very partial, resting upon it as it feeds, with quivering, upraised wings, and often, but by no means always, flying off at the approach of a light. If disturbed it readily returns to the feast, and is easily captured. On warm favourable nights specimens will continue to arrive all night long, and sometimes it is much more common towards morning.

Common in and near woods in all the Southern and South-Eastern Counties, though less so in the Fen districts; also in South Wales to Pembrokeshire, and in the West to Worcestershire and Herefordshire. Not common in the Midlands, though found in North Staffordshire and Warwickshire; farther north it is widely distributed in Cheshire, Lancashire, Yorkshire, Lincolnshire, and even Cumberland. Local in Scotland, though rather common in Perthshire. Elsewhere found in Roxburghshire, at Dunoon, Renfrew and Bute; but in the Eastern districts much farther north—rather scarce in the Edinburgh district, at Cramond, Corstorphine Hall, and Dunbar, but extending as far as Moray.

Apparently in all wooded districts in Ireland, and sometimes in great abundance. Mr. Kane says that he has seen it in clouds, and most persistent at sugar.

Very widely distributed abroad, throughout Central and Northern Europe, except the Polar regions, Northern Italy, Corsica, Armenia, Asiatic Turkey generally, Tartary, and

Northern India; specimens from the North-West Himalayas, having the ground colour more dull and leaden and the spots less bright, being known as *var. cognata*. Also obtained from Java, but called *victrix*, and from North America, very similar to our western variety, but under the name of *Mexicana*. A browner form from Java, known as *vicina*, appears to be very doubtfully distinct.

Genus 3. CYMATOPHORA.

Antennæ rather short, ciliated; eyes naked; lashes present at the back, but usually prostrate; thorax very slightly crested at the back; fore wings broad, with transverse stripes or bands; hind wings ample, but very thin and delicate; vein 5 variable.

LARVÆ naked, concealed between spun-together leaves on trees.

PUPÆ rather conical with tapering abdominal segments and minutely punctured dull surface; anal bristles placed on a spine and forming curious hooks.

A table of the four species may be useful.

A. Thorax and abdomen slender, fore wings broad, with broad central band.

B. Two black dots outside central band and a grey apical streak. *C. duplaris*.

B². Black dots absent, apical streak black. *C. fluctuosa*.

A². Thorax and abdomen rather stout, fore wings less broad.

C. Fore wings grey or purplish-grey; first and second lines quadrupled; stigmata indistinct; whitish.

C. or.

C². Fore wings purple-brown, first and second lines double, stigmata ashy-white. *C. ocularis*.

1. **C. duplaris**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Body slender; fore wings very broad, whitish or pale grey, with a very broad central transverse purplish-grey band, outside which are two black dots; hind wings greyish-white.

Antennæ rather short, minutely ciliated, pale purplish-brown; palpi short but thinly scaled and visible, dark brown; head grey-brown; thorax rounded, but narrow; collar light brown, tipped with darker; rest of thorax silvery-grey, shading to brown behind; shoulder lappets uplifted; abdomen slender, smooth, brownish-white, with small lateral and anal tufts. Fore wings very broad; costa much arched at the base, and regularly rounded to the apex, which is squared off; hind margin long, curved; dorsal margin rather straight; ground colour greyish-white, much rippled with brown; basal line faintly indicated, purplish-brown; beyond it is a very broad purple-brown central band completely crossing the wing, broadest on the costal margin and a little hollowed obliquely in front and behind; in this are indications of two slender darker lines, which probably represent the normal first and second lines; immediately beyond it, at the end of the discal cell, are two distinct black dots; hind marginal region broadly banded or rippled with purplish-brown, through which runs the subterminal line, white and much indented, and before it a similar but fainter line. An oblique dark brown streak runs into the extreme apex; hind margin edged with short black streaks; cilia purplish-grey. Hind wings broad, rounded, greyish-white, with a slender transverse grey shade before the middle, and a broad pale grey band along the hind margin; cilia whitish. Female extremely similar, body a little stouter, with a blunt anal tuft.

Underside yellowish-white, with two faint grey bands across all the wings; body and legs yellowish-white.

Variation in this species appears to be climatal. In the North of England and in Scotland the ground colour is more smoky or purplish-grey, the markings becoming very obscure, or, with the exception of the two black dots, the whole surface of the fore wings assuming a smoky-purplish colour. I have found this variety with typical specimens even so far south as Norfolk. In hill districts a much darker colour is sometimes assumed, the fore wings becoming of a blackish-purple and

the outer portion of the hind wings nearly as dark ; such specimens have been taken at Cannock Chase, Staffordshire. From the Perthshire hills similar dark examples are relieved by one or two slender delicate white lines. Those from the Shetland Isles are larger than ordinary, less black, but mottled with dark colour. Irish specimens are also large, and are of unusually pale forms ;—some of those exhibited to the South London Entomological Society, by Mr. de Vismes Kane, were of a beautiful white colour, the transverse purplish-brown bands very variable in width and in depth of colour, in some cases being hardly more than a shading of silvery-grey.

On the wing in June and July.

LARVA flattened, smooth, attenuated at each extremity, particularly behind ; head large, rounded, and slightly bifid ; a horny plate on the second segment. Whitish or yellowish on the sides and undersurface, with a broad, dark grass-green dorsal stripe occupying the whole space between the sub-dorsal lines ; dorsal line grey ; spiracular line very indistinct, yellowish ; dorsal spots slightly pale, lateral spots and spiracles black ; head reddish-brown ; mouth and a spot on each side of it black ; second segment with the plate black, and a black lateral spot on each side in a line with the spiracles. When young the green dorsal stripe is much paler. (C. Fenn.)

August, September, and October, on birch, and sometimes on hazel, alder, and oak. During the day it conceals itself in a habitation formed of green leaves united by silken threads, upon the tree. At night it comes forth to feed, and may then readily be shaken or beaten off, though very hard to dislodge in the daytime.

PUPA rather stout, deep dull red or reddish-black, with the incisions of the abdominal segments paler. Spun up in a loose silken cocoon between two or three leaves on the tree. (C. Fenn). In this state, among the fallen leaves, through the winter.

The moth sits in the daytime on the branches of trees, and has even been observed, before its wings were fully spread, running up the tree trunks to attain the branches. When shaken out it falls straight to the ground and lies among the dead leaves. At dusk it flies, and is exceedingly fond of sweets, settling down to the sugar placed on a tree trunk, and allowing itself to be captured by the hand, though on first arrival at the sugar it flutters a little and will fly off if disturbed.

In woods and open wooded districts; common in most of the Southern and Eastern counties, but scarce in the Cambridge fen district, and in Somerset and Devon. In Wales it must occur, though I find no record; but it is found in Herefordshire and Worcestershire, very locally in Warwickshire, Staffordshire, and Lancashire, and widely distributed in Yorkshire. In Scotland it is recorded from Perthshire, Lanark, Ayr, Arran and other parts of Argyleshire, and in other localities to Ross-shire and Moray, in hill districts reaching an altitude 1200 feet; also in Shetland.

In Ireland it had been taken at Garinish Island, Kerry, by the Hon. Emily Lawless, also at Killarney, in Wicklow, Down, Lough Swilly, Donegal, and other wooded districts.

Abroad it extends through Central and Northern Europe, North Italy, Southern and Eastern Russia, and Siberia.

2. **C. fluctuosa**, *Hüb.*—Expanse $1\frac{1}{4}$ to $1\frac{3}{4}$ inch. Body slender; fore wings very broad, silvery-white, rippled and banded with purplish-grey; no black dots beyond the band; hind wings whitish.

Antennæ short and rather thick, curved, ciliated, light-brown; face blackish-brown, back of the head pale brown; thorax slightly crested at the back, pale brown, collar and shoulder-lappets white, edged with purple-grey; abdomen smooth, whitey-brown, with minute lateral tufts, but rather long compressed anal tuft. Fore wings very broad, shining; costa arched at the base and rounded to the apex, which is

bluntly squared; hind margin straight below the apex but curving off to the anal angle, which is rather fully rounded; dorsal margin gracefully curved; colour silvery-white, very much rippled with purple-grey; basal line purple-grey, curved and indented; immediately beyond it commences a very broad purple-grey transverse band, which occupies the whole middle portion of the wing, being broadest on the costa, having its inner edge rather curved, and its outer very bluntly angulated; within it are darker transverse lines or stripes and a blackish streak at the end of the discal cell. Beyond it is a much indented and rippled slender transverse purple-grey line, followed by a series of clouds of the same colour edged by a beautiful rippled line of the silvery-white ground colour, from which to the hind margin is a band of purple-grey; before the apex is a thick distinct oblique black streak; cilia very glistening, purplish-grey with a black line at the base and a grey one through the middle. Hind wings very ample, rounded and rather waved at the margin; white, faintly clouded with grey from the base, rather more strongly so along the hind margin; a brownish line at the base of the cilia, which are faintly yellowish with the tips white. Female with the body stouter and the costa of the fore wings straighter; otherwise similar.

Underside of the fore wings white, clouded with grey to the middle and along the costa, and having two greyish transverse stripes near the hind margin; hind wings also white, with similar hind-marginal bands; body whitish-brown; legs brownish.

Rather variable in size, and in the distinctness of the rippled lines beyond the broad central band. Specimens from Ireland are sometimes large and pale in colour.

On the wing in June.

LARVA rather flattened, wrinkled; head broad, lobes rather divided, orange-brown, mouth black, and a large black ring, centred with white, on each lobe; second segment with a

greenish-white dorsal plate dotted with black; remainder of the dorsal surface dull pale purplish-grey, with deeper purple dorsal and subdorsal lines, and a row of black spots at the upper edge of the latter; undersurface pale yellowish-white, spiracular lines pale purple, spiracles black, legs and prolegs tipped with purplish-grey. Sometimes the whole surface is whitish.

August, September, and October on birch, passing the daytime between united leaves and feeding exposed at night, when it is easily beaten off. Holds tenaciously to its habitation in the daytime, and is difficult to dislodge.

PUPA rather stout, conical, reddish-brown, of delicate texture; spine rather short.

Spun up between birch leaves or among rubbish on the ground. In this state through the winter.

The moth hides in bushes and trees in the daytime, and when suddenly disturbed will sometimes fly a short distance. It flies naturally at dusk, rather swiftly, and from the whiteness of its hind wings is conspicuous, but its time of flight is very short and it is by no means so readily attracted by sugar as its congeners. Very local and almost confined to woods. Found in various parts of Kent, Sussex, Surrey, Hants, Essex, and Suffolk; also in Herefordshire, and Wyre Forest, Worcester-shire. In Yorkshire in several localities, the neighbourhood of Sheffield especially, and I have seen two specimens which were taken by Mr. George Dawson, in Cumberland; but am not aware of any certain record in Scotland. In Ireland it has been taken, though rarely, at Killarney, Kenmare, and Lough Gill, Co. Sligo. Not so widely distributed abroad as the previous species, but found throughout the greater portion of Central Europe, and in Southern and Eastern Russia.

3. **C. or**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Stout, fore wings pale purplish-grey with two cross bands composed of three or four black lines each; stigmata indistinct, whitish; hind wings pale brownish-grey.

Antennæ simple, faintly ciliated, pale yellowish-brown; eyes naked; palpi tufted, rather projecting; head mottled with grey and black; thorax stout; collar sharply defined, mixed black and pale grey; shoulders very prominent, and the lappets uplifted and covered with long grey, greenish-grey, or purplish-grey scales; rest of thorax similar, the scales forming a very obscure tuft or crest at the back; fascicles broad, whitish, meeting over the abdomen, which is stout, greyish-white, with minute whiter lateral tufts, and a contracted anal tuft, also with a central dorsal ridge, on which are sometimes visible minute tufts of half-raised scales. Fore wings moderately broad; costa nearly straight; apex bluntly angulated; hind margin very slightly curved, but more so toward the anal angle; dorsal margin also gently rounded; colour pale pinkish-grey or purplish-grey, with a distinct, black, interrupted and angulated basal line, followed at a short distance by a broad transverse band, composed of four rippled black lines, which rather diverge at the dorsal margin; of these the first is thick and deep black, the fourth equally conspicuous and more notched; beyond the middle is a second transverse band, more oblique and formed of three or four repeatedly-angled black lines; halfway from this to the hind margin is a rippled whitish line, edged outwardly with blackish points, from one of which a black line runs to the apex of the wing; between the two broad bands are the two stigmata, the orbicular round and indistinct, the reniform rather squared and divided, both whitish or ashy-white; hind margin edged with faint black dashes; cilia brownish. Hind wings rather elongated, with the hind margin sinuous; colour pale greyish-brown, with a faint paler transverse stripe in the middle. Female with the abdomen very stout and short, almost devoid of tufts, anal segment shortly pointed, otherwise similar.

Underside pale smoky-grey, with faint indications of a darker central spot, and two darker transverse stripes beyond the middle; body and legs smoky-grey.

Variation in this species seems to be mainly climatal. In

the South of England the prevailing ground colour is grey with but a faint tinge of pinkish; in Scotland it is decidedly purplish, and this colour is intensified in examples from the Scottish Isles; but in Perthshire there is a tendency to slate colour, with the stigmata more yellowish. In Sutherlandshire and the Hebrides the stigmata are in some specimens quite yellow or even orange. Such specimens are in Mr. W. H. B. Fletcher's collection. In Ireland there is but little indication of either the pinkish or purplish tint of ground colour, which is pale grey, but with very strongly accentuated dark stripes. In Mr. H. Goss's collection is a specimen from Sussex with the broad central space very strikingly paler than ordinary. Mr. S. Stevens has two in which the stigmata are absent.

On the wing in June and July.

LARVA soft, smooth, flattened, attenuated behind; head large, shining, much flattened; on the second segment is a narrow horny plate. Dull yellowish-green, dorsal line darker, spiracular line whitish, interrupted; head dull deep yellow or yellowish-brown, mouth blackish; undersurface, legs and prolegs rather paler than the ground colour; on the front edge of the second segment are two black spots. Though not shining, it has a semi-transparent appearance from the thin texture of the skin. (C. Fenn.)

July, August, and September, sometimes even in October, on poplar and aspen, drawing together two leaves, uniting them with silk, and living within in the daytime, but coming out at night to feed.

PUPA short, stout, much rounded and thickest in the middle; anal extremity with a long pointed spike, bulbous at the base. Red-brown, minutely punctured all over. In a thin but strong silken cocoon of a brown colour, placed between two spun-together leaves. The Rev. J. Hellins says that the pupæ of Scotch specimens are reddish-brown, those from the South of England usually black. They

remain in cocoon among the fallen leaves through the winter, and, in Scotland, occasionally even through two winters.

The moth is rarely observed in the daytime. It flies at dusk and comes willingly to sugar on tree trunks, but feeds with its wings half erect and quivering, and is extremely skittish, and rather difficult to secure. It continues to fly until late at night.

Rather common among poplars in the Southern English counties, less so in the Eastern counties, and apparently absent from the Midlands, except the fen district of Cambridgeshire and Huntingdonshire, where it is not scarce. Found also in Gloucestershire, Herefordshire, Worcestershire, and very locally in Lancashire, Yorkshire, Lincolnshire, and Cumberland. In Scotland much more frequently found, being very common in the Clyde district and extending freely to Argyre, Moray, Ross, and Sutherland; also to the Hebrides and even the Shetland Isles. Rare in Ireland, but found in Wicklow, Cavan, Galway, Sligo, Londonderry, and at Lough Swilly, Donegal.

Abroad it is found throughout Central and Northern Europe, except the coldest portions of the latter, Northern Italy, Livonia, Central and Southern Russia, Finland and Tartary.

4. *C. ocularis*, *L.* (?); *octogesima*, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Stout, fore wings light brown, with two pairs of transverse black lines; stigmata whitish and resembling the figures 80.

Antennæ of the male very faintly ciliated, simple, light brown; eyes naked; head densely tufted with smoky-black scales, mixed with paler; collar broad, pale grey mixed with blackish; thorax stout, densely covered with slightly raised brown scales, very faintly crested at the back, but the shoulders prominently raised; abdomen stout, very pale brown, with small lateral and anal tufts. Fore wings moderately

broad, costa rather arched at the base, thence gently curved; apex bluntly angulated; hind margin very slightly rounded; colour pale purplish fulvous, paler in the central area, with very faint indications of a transverse line at the extreme base, and of another, rather angulated, beyond it; first line near the middle of the wing, deep black and duplicated; somewhat bent below its centre; second line also black, double, elbowed outwardly, but unusually perpendicular; beyond it is another blackish line, not quite parallel, and outside this a broad space tinged with smoky-grey, in which is a rippled shade of the pale ground colour, terminating in a black oblique line, which runs into the apex. Orbicular stigma greyish-white, oval, with a distinct black streak in the middle; reniform stigma also white, and black centred, but so constricted in the middle as to form a very distinct figure 8, while the other stands for a very tolerable 0. Hind margin edged with a black line; cilia purple-brown, divided by a darker line. Hind wings pale smoky-grey, with a central transverse whitish stripe; nervures, and a long slender discal lunule, dark brown; cilia rather long, whitish. Female very similar, abdomen stouter and almost devoid of tufts.

Underside very pretty, pearly white, broadly clouded with smoky-brown along the costa, and having, on all the wings, two broad smoky-brown transverse bands, of which the first is divided by whitish clouds, most distinct in the female, the outer one being often very faint in the other sex; body pale-brownish; legs whitish, dark brown in front.

Hardly variable, except that some specimens have a faint central dusky shade, and some smoky clouding before the first line.

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

LARVA moderately stout, rather clumsy; slightly tapering at each end; head broad, glossy, a little rough, orange-ochreous, barred on each side the mouth with black, which extends to the ocelli; round the pale antennal papillæ are

square black marks; skin of the body soft and smooth, not glossy; dorsal region faintly yellow, tinged with greyish and changing almost imperceptibly to primrose-yellow along the spiracular region, and then again to the delicate tint of the back; a very faint glaucous pulsating vessel shows partially through the dorsal line. On the second segment is a narrow shining pale-greyish dorsal plate, and another is on the anal segment; on each side of the second segment are three black spots; on each side of the third, two, and of the fourth and twelfth one each; spiracles pale pink; tubercular dots minute, whitey-brown, each with a single hardly perceptible hair; legs and prolegs shining yellowish-white. When very young pale straw-colour, inclining to greenish. When half grown the body is pale buff, very velvety in appearance; head pale honey-yellow, with black ocelli, and black on each side of the mouth; the dots on the body as already described. As it grows it becomes greyish-green, with orange-brown head, and gradually assumes the adult colouring. (W. Buckler.)

End of June to September, on poplar. When very young it commences to unite the leaves together with short thick silken threads, and then feeds on one surface only of the leaf. When half an inch long it begins to eat quite through the leaf, and from this time feeds in the ordinary manner, continuing to hide in its domicile of leaves during the day, and to leave it at night for the purpose of obtaining food without injuring its home. The short threads, ending in broad studs or pads of white silk, with which the leaves are fastened together, are very curious. They are strong, and the larva is not readily dislodged. Sometimes it selects a curled dead leaf on the tree as its habitation.

PUPA thick and short, the surface covered, except at the abdominal incisions, with minute pits, or on the thorax and wing covers by minute ridges; at the anal extremity are two converging spines, of which the recurved tips meet and cross each other. Colour black, divisions of segments dull

purplish-red ; surface rather glistening. In a delicate cocoon of open network, either between leaves, in moss on the surface of the ground, among grass at the foot of a poplar, or under loose bark on that tree. In this stage through the winter.

So far as I know, the moth is never taken in the daytime. It doubtless hides in the poplar trees. It flies at rather late dusk and into the night, and comes to sugared trees, but is very timid, sipping with raised wings, and flying wildly round if disturbed ; but if allowed to feed a while is not quite so restless. To obtain it *poplar* trunks should be sugared. A very local and far from common species. Most frequent in Norfolk, Suffolk, Essex, and the Cambridgeshire and Huntingdonshire fen and chalk districts ; also found in Somerset, Gloucestershire, Worcestershire, and Herefordshire, but very locally ; and there is a record of its occurrence in Sussex. This appears to be the extent of its range in these islands ; abroad it is found throughout Central, and great part of Northern Europe, Northern Italy, Portugal, Armenia, and Tartary.

A very beautiful series of hybrids between the last two species has been reared by Mr. W. H. B. Fletcher. All are much alike and yield nothing in ornamental appearance to either parent, being rosy-grey, with the black quadruple bands of *C. or* and the 80-marks of *C. ocularis*, which last are pure white.

Genus 4. **ASPHALIA.**

Antennæ short, thick, ciliated ; eyes hairy, with thick backlashes, hardly erect, but mixed with the head scales, which project and give the head a hairy aspect ; thorax stout, usually crested at the back ; abdomen moderately stout, usually not crested ; fore wings not broad, banded ; hind wings with vein 5 arising close to the median nervure.

LARVÆ naked, concealed under drawn together leaves of trees or bushes.

1. **A. diluta**, *Schiff.*—Expanse $1\frac{3}{8}$ inch. Body moderately

stout, fore wings narrow, whitish, with two straight purplish-brown transverse stripes ; hind wings whitish.

Antennæ notched, ciliated, brownish, head and palpi strongly tufted, grey ; eyes naked, with a few blackish lashes at the back ; thorax moderately broad, covered with uplifted grey scales ; shoulder lappets raised and prominently tufted at the corners ; the long scales of the middle of the back drawn together behind into a slight tuft or crest ; following this, from the back of the thorax, long tufts or fascicles of white hair-scales spread over the base of the abdomen, which is shining greyish-white, and has on its third segment a conspicuous oblique blackish dorsal crest, or tuft, of semi-erect scales. This crest is in some specimens absent, while in others there is a small additional tuft on the previous segment ; lateral tufts distinct, whitish ; anal tuft narrow. Fore wings rather narrow, costa very slightly rounded throughout ; apex sharply angulated, and hind margin below it slightly hollowed, then gracefully curved off to the dorsal margin, which is very straight ; colour greyish-white, faintly tinged with brown ; two broad, almost straight, purple-brown stripes cross the wing and are very conspicuous, the first, before the middle, is edged outwardly by the normal first line, which is black and rather undulating ; just beyond the middle is the second line, also black and much waved, forming the inner edge of the second stripe ; beyond this the hind marginal space is very pale purplish-grey, with two rippled paler transverse lines, and the nervures slenderly streaked with black, as also are the costal and hind margins ; cilia greyish-white. Hind wings rather short, rounded, white, with two broad greyish transverse stripes, one in the middle, the other along the margin ; cilia whitish. Female with abdomen rather stouter and more pointed, otherwise quite similar.

Underside of all the wings white, shining, each with an indistinct central cloudy transverse stripe or band, followed by a fainter and more slender cloudy stripe ; body and legs whitish.

Rather variable in the ground colour, from whitish to pale brownish-grey or pale slate-colour; and also in the depth of colour of the transverse stripes. Mr. S. J. Capper has an exquisite specimen, taken in Yorkshire, in which they are of a very rich dark purple-brown, the base equally dark, having also two additional purplish stripes, and two of an orange-yellow, the remaining surface being clouded with grey; another, from the New Forest, in the same collection, is pinkish-white with one broad and one narrow stripe; in that of the late Mr. H. Doubleday is one of an almost unicolorous slate-grey; Dr. Mason has similar specimens, and others with the middle of the wings suffused with grey; but all these extreme forms are rare.

On the wing in September, sometimes at the end of August.

LARVA plump, almost fat, but flattened above and below, smaller at the extremities, naked; head narrow, rounded above, blackish-brown; body pale purplish-grey or greenish-grey, tinged with yellowish above, and with a slender dark grey dorsal line, and more slender grey spiracular lines dotted on each segment with black; spiracles black; feet greyish-white.

April to June on oak, concealed in the daytime between spun-together leaves; coming out at night to feed. Difficult to disturb from its hiding-place during the day, and, for so common a species, very seldom observed.

PUPA rather slender, abdomen conical, spine very slender and delicate; surface rather dull; reddish-brown; in a slight cocoon among leaves.

The moth is said to sit, sometimes, on tree trunks, but is not often so observed; probably it usually hides during the day in oak trees among the leaves. It flies at dusk and comes very freely to sugar spread on the oak trunks, sitting down quietly with closed wings to feed, and allowing itself to be captured with the greatest ease. Sometimes it may be thus secured before dark and without the aid of a lantern.

Principally confined to oak woods, and common in most of

the Southern counties; less so in Devon and apparently not recorded from Cornwall, yet locally common in Pembrokeshire, and probably in suitable places throughout South Wales. Scarce in the Cambridgeshire fen district and not very common in Norfolk and Suffolk, nor in Somersetshire, Gloucestershire, and Leicestershire. Locally it seems to be much more frequent in Warwickshire, North Staffordshire, Lincolnshire, Lancashire, and Cumberland, and rather widely distributed in Yorkshire. In Scotland it is only known to extend a short distance into the districts of the Solway and Clyde; and in Ireland the only record is that of the late Mr. E. Birchall, at Killarney, which has not been confirmed, and may have been a mistake.

Rather local abroad, but found in Southern, Central and Eastern Germany, Northern and Central France, Switzerland, Belgium and Hungary.

(Since the last "part" went to press, it has been brought to my notice that this species has hairy eyes, though the hairs are singularly minute and difficult to distinguish.)

2. **A. flavicornis**, *L.*—Expansure $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Antennæ yellow; fore wings long and pointed, slate-grey, with slender black transverse lines; hind wings pale grey.

Antennæ in the male short, thick, ridged, slightly ciliated, brownish-yellow; eyes very densely set with erect brown minute hairs or bristles, and thickly encompassed by upright projecting scales, mingling with which are the black lashes at the back; head very hairy, a dense dark grey-brown tuft of erect scales between the antennæ; thorax stout, rather squared, with the shoulders accentuated by raised tufts, wholly covered with long slate-grey or yellowish-grey scales; fascicles broad, converging, whitish; abdomen rather stout, hairy-looking, blackish-grey, with small yellowish-grey lateral tufts, and grey-brown anal tuft. Fore wings elongated and rather narrow, with very slightly curved costa; apex sharply angulated; hind margin oblique, first straight, then smoothly

rounded off quite to the dorsal margin, which is rather hollowed and gracefully curved. Colour soft slate-grey, paler or darker, usually with a greenish or yellowish gloss, and the costal margin paler; basal line rather distinct, black, twice curved and sloping obliquely outward from the costal to the dorsal margin; first line immediately beyond and parallel with it, double, black, sometimes partially triple; second line also black, duplicated, undulating, but oblique in the opposite direction, placed so that these two lines are more than double as far apart on the costal as on the dorsal margin; the costal space between them is very often sharply paler, sometimes almost ashy-grey; below this, in the discal cell, is a large round or rather squared yellow-grey spot faintly outlined with blackish, representing the orbicular stigma, and by it a very faint suggestion of another spot, smaller, mottled with grey, representing the reniform stigma. Below these the central space is usually darker. Beyond the double second line is a nearly parallel blackish transverse shade, and beyond this a rippled dark grey subterminal line; also a slender black line at the hind margin; cilia whitish-grey, dashed with dark grey at the nervures. Hind wings short but elongated, and rather pointed at the apex; rest of the hind margin slightly sinuous; dark grey, paler or whitish at the base, with a central whitish transverse stripe; cilia white. Female with the abdomen decidedly stouter, and the hind wings more uniformly smoky-grey; otherwise similar.

Underside pale smoky-grey, with two narrow whitish transverse bands on the fore and hind wings, followed in each case by a darker grey parallel band, darkest on the costa; cilia whitish, spotted in the fore wings with dark grey; body and legs whitish-brown.

Variable in the ground colour, and in the depth of colour of the markings. In the South of England the ground colour is usually greenish-grey; pale slate-grey in the Eastern counties; in Scotland more shaggy in appearance, with dark greenish-grey or blackish-grey ground colour, and the mark-

ings greatly intensified, so that the whole fore-wings are almost completely occupied by the broadly clouded blackish transverse lines, except that the orbicular stigma becomes paler and much more distinct. In the Midlands, and especially at Cannock Chase, Staffordshire, all these characters become mixed together, except that of the distinct orbicular stigma; indeed it, in many specimens, coalesces with the reniform, forming a long greenish blotch in the discal cell. Such specimens are in Dr. Freer's collection, and others combining the very dark cross-lines with pale greenish or slate ground colour, or suffused with dark slate-grey, or even faintly tinged with a sort of peach-bloom. Mr. S. J. Capper has dark northern specimens with the orbicular stigma white; Mr. S. Stevens pale grey examples curiously tinged with buff; and in the cabinet of the late Mr. Bond is a specimen of a pale greenish-grey almost devoid of markings.

On the wing in March and sometimes in April.

LARVA plump, slightly flattened, head rather small, with the lobes rounded and distinct, light brown; body dark green, greenish-black, or yellowish-green, rather translucent; second segment with two conspicuous black dorsal spots, and smaller ones at the sides; along the subdorsal region is a row of black spots, one on each segment, on each side; and a row of smaller black spots below them, marking the spiracles; the usual tubercular dots distinctly white; undersurface and legs pale greenish or yellowish.

June and July on birch, sometimes on birch trees, but more partial to the bushes which are so plentiful on sandy commons and on hills. In the daytime remaining in a habitation formed by spinning together leaves, often into a rather conical shape, or into a nest; coming out at night to feed.

PUPA moderately stout, but abdominal segments rapidly tapering; thorax and wing-covers abundantly pitted and ridged with minute and delicate sculpture; colour red-brown;

anal segment black, much thickened, with a distinct rim cut into sections along its anterior edge; anal spike thick at the base, tapering, long, and curved. In a slight cocoon under moss, or at the roots of grass at the foot of a tree, or under the surface of the ground. In this stage through the latter part of the summer, the autumn and winter; sometimes lying over a second winter—this is said to be very frequently the case in Scotland.

The moth rests in the daytime, occasionally, on trunks, more frequently on branches or even twigs of birch trees, but far more usually upon stunted birch bushes, the more stunted the better, and half a dozen specimens may sometimes be picked off a little bush not more than a foot high, where they stick about anywhere on the small branches. On the larger birch bushes the favourite spot is on the main stem, where it throws off a branch or two, and here appears a very curious instance of natural mimicry. The birch bushes have upon their stems small patches of grey lichen, and to one of these patches of lichen the greenish-grey moth with its dark lines and its curiously crested shoulders and thorax bears an extraordinary resemblance.

It has been occasionally taken flying in bright sunshine, but this is not its usual habit. It flies at dusk, and later in the night, and has been taken at sugar, but is said to prefer the sap exuding from a wound in a birch tree.

Usually found on open hill sides and commons where birch grows freely, but not absent from birch woods, and common in such suitable places, in Kent, Sussex, Surrey, Hants, Dorset and Berks; rather scarce in most parts of the Eastern Counties, but common near King's Lynn and in Lincolnshire; plentiful at Cannock Chase, Staffordshire, and in other parts of that county and Derbyshire; rare in Devon; scarce in Somerset, Gloucestershire, Warwickshire and Leicestershire; much more frequent in Worcestershire, Herefordshire, Cheshire, Lancashire and Yorkshire, indeed common on the

mosses. Further north in England I find no record. In Scotland it is common, and very dark in Perthshire; very much scarcer in the Eastern districts, and only recently noticed, by Mr. Wm. Evans of Edinburgh, at Wemyss and elsewhere in Fife; further north it has been met with even to Moray, but in the western districts only to Dunoon and Renfrew. In Ireland the late Mr. E. Birchall recorded it as common, but this has not been confirmed. It is, however, found occasionally, by Mr. D. C. Campbell, at Londonderry, and Colonel Partridge has met with it at Enniskillen; it is difficult therefore to believe it absent from other suitable localities. Abroad it is found throughout Northern Europe, and much of Central Europe, also in Northern Italy and Southern and Eastern Russia.

3. **Asphalia ridens**, *Fab.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Antennæ yellow; thorax stout; fore wings narrow, blunt, pale green or greenish-white, mottled with black and with a broad dark central band.

Antennæ thick, almost broad, strongly ridged, naked, brownish-yellow; eyes densely set with minute hairs; lashes at the back, but obscured by erect head-scales; head grey, barred and spotted with black; thorax blackish; shoulder lappets edged with white on the inner side; crest distinct and barred with white and black; fascicles broad and very spreading, yellowish in the middle, outwardly white; abdomen light brown barred with whitish, lateral tufts white, anal tuft brown. Fore wings narrow; costa straight to near the apex, where it is slightly curved; apex bluntly angulated; hind margin rounded, very little oblique; dorsal margin gracefully curved. Ground colour white, silvery white, greenish-white, pale green, or bright green, much mottled with black; basal line black, angulated, sharply defined, and outside it a large black or brownish cloud occupying the space near the base of the dorsal margin; remaining basal space occupied with angulated black streaks

or an extension of the dark cloud; first line black, curved, duplicated; second line also double, black, oblique; the whole space between the first and second lines occupied by a very broad, mottled, black and green, black and grey, or dull blackish, central band, in which are placed a small, oblique orbicular stigma, and a minute oval reniform stigma, both whitish edged with black. Beyond the second line is a similar, more distinct, and much indented, black line, followed by a row of black wedges, and a long, black, indented, curved streak which runs to the apex. Along the hind margin is a very pretty row of deep black crescents, of which the united extremities project into the cilia, which are whitish; there forming black wedges. Hind wings rather short, with rounded apex, and sinuous hind margin; whitish; nervures and hind margin brown; cilia white. Female with stouter body, and hind wings a little browner toward the hind margin, otherwise accurately similar.

Underside white and shining, with the nervures of all the wings grey, and a broad grey cloud across the central area of the fore wings; cilia spotted with black; body and legs brown.

Always variable, as already described, in ground colour and markings, but especially the latter, which changing from their general sharpness and distinctness, become, in some specimens, altogether softened and obscured, even so far as to make the whole fore wings of a dull blackish-green; yet it is always an exceedingly pretty insect. This variation appears to be normal and constant, and by no means local or climatal, the same extreme or medium forms being found in the most widely distant localities. Mr. W. H. B. Fletcher has a specimen wholly black, except some very faint greenish markings toward the base and hind margin.

On the wing in April and sometimes in the beginning of May.

LARVA elongate, cylindrical, skin rather dull and wrinkled, spots raised; head bifid, the lobes rounded, red-brown, the

lower portions of the lobes and face ochreous ; mouth black and with a black spot on each side ; body yellow, shading into greenish-yellow on the sides ; two ill-defined deeper dull greenish sub-dorsal stripes ; usual spots dull white, large and prominent ; spiracles very pale brown ; a black lateral dot above those on the second segment. (C. Fenn.)

May, June, July, on oak, drawing together a leaf or a lobe of a leaf, partially, with silk, and sheltering through the day on the underside, but coming out at night to feed. The habitation is not so closely drawn together as in previous species, and the larva is readily shaken out of it by beating, but it is also quite easily discovered by looking upward at the outside leaves of the high oak bushes, when the larva may be seen half-curved under the concave leaf.

PUPA stout, wrinkled, tapering considerably ; anal extremity furnished with a long double-hooked spike ; incisions deeply cleft. Dull red, not highly polished ; in a compact silken cocoon among moss or rubbish adhering to the trunk of a tree or under the surface of the ground. (C. Fenn.) In this state through the winter and not unfrequently during more than one year.

The moth may occasionally be found sitting on the trunk of an oak tree in the daytime, but its colour and markings mimic so closely the lichen and moss on the trunks that it may probably be often overlooked. It appears to be rarely if ever taken at sugar, or at exuding sap, and its habits are very obscure, though it is known to fly at night. The vast majority of specimens in collections are reared from the larva or pupa.

Apparently confined to woods and wooded districts, and found, though not commonly, in Surrey, Sussex, Hants, Berks, Dorset, Devon, Cornwall, Somerset, Gloucestershire, Herefordshire and Worcestershire. Probably more frequent in South Wales, since I have found the larva rather commonly in a large wood in Pembrokeshire. Very scarce in the Eastern Counties and almost absent from the Midlands,

though found rarely in North Staffordshire; also rare or extremely local in Yorkshire, Lancashire and Cumberland. I have no knowledge of its occurrence in Scotland or Ireland. Abroad it is not very widely distributed, but is found in most parts of Central Europe and in Southern France, Denmark and Portugal.

Family 2. **TRIFIDÆ.**

Fore wings usually of fairly even width, often narrow, hind wings rounded behind, vein 5 arising alone from the cross-bar, slender and often hardly distinguishable, causing little or no protrusion at the hind margin.

An extensive and rather vaguely defined family, comprising the vast majority of the British Noctua, various in the structure of antennæ, of eyes, and of larvæ, so much so as to forbid exact definition in these respects.

PUPÆ usually rather cylindrical; abdominal segments not rapidly tapering; surface glossy.

Genus 1. **DIPHThERA.**

Antennæ simple, ciliated; eyes naked, without lashes; thorax strongly crested; abdomen rather slender, crested on almost every segment; fore wings rather short and broad. We have but one species.

1. **D. Orion**, *Esp.*—Expanse $1\frac{1}{2}$ inch. Collar black; fore wings bright green, with white clouds and black cross-stripes; hind wings dark grey with white marginal spots; abdomen rather slender.

Antennæ rather short, flattened, minutely ciliated, light brown in front, back of shaft white; eyes naked, without lashes; palpi black, with dense tufts of white scales in front; head also densely tufted in front, green; tufts at bases of antennæ whitish; thorax only moderately stout, rounded,

distinctly crested on the top and at the back, and the shoulder lappets raised; collar deep black; a broad deep black bar across each section of the upper crest, the upper edge of the back crest, and the edges of the shoulder lappets; remaining surface of the thorax bright green, shaded with white; fascicles very short, as though cut off, white; abdomen light grey, with a black bar across the basal portion of each segment except the last, a portion of the black scales obliquely raised on each into a tuft, those on the third and fourth forming conspicuous crests, the rest only raised in some specimens; all the crests minutely tipped with white, and behind them the lower part of each segment is edged with white; lateral tufts spreading, grey and black; anal tuft narrow, mixed black and white. Fore wings rather broad; costa nearly straight; apex and hind margin decidedly rounded; anal angle well marked; dorsal margin gently undulated; colour bright green with bright white spots, or small clouds, along the costa and the subcostal and median nervures; near the base is a deep black angulated and indented transverse stripe; a second in the middle of the wing, oblique, disconnected, and consisting of a series of bent black streaks and lines, a broadly hooked black streak near the costa being conspicuous; a third deep black transverse stripe, repeatedly angulated and thickened in the outer angles, lies near the hind margin, still nearer to which is a central black spot and then a series of black dots edged inside with white; cilia green, broadly barred or chequered with black. (When freshly emerged the white spots on the median nervure are decidedly tinged with rosy.)

Hind wings dark grey, with a clouded whitish partial transverse band beyond the middle, which becomes slender and rather silvery-white near the anal angle, where it touches a black blotch divided by two white bars; cilia white, with double black dashes.

Female quite similar, but with abdomen a little shorter.

Underside of the fore wings smoky-blackish, shading off

paler toward the dorsal margin, and having the costal margin white, barred with black; cilia white, spotted with black; hind wings very pretty, clear shining white, with a transverse bar half-way across the middle, enclosing a black central spot; beyond this a slender, much curved and scalloped black line, followed by a much broader black curved transverse stripe, scalloped at its edges; hind margin and cilia white spotted with black; body and legs blackish, the latter tufted and barred in front with white.

A singularly beautiful species and very constant in colour and markings, except that in some specimens the black sections of the central stripe of the fore wings are more slender and rather more widely separated from each other, and the black blotches on the third stripe are shaded with purplish brown; while in others small additional black streaks present themselves in series, representing two more transverse lines, in the green spaces; these also have the white spots more than usually tinged with pink. In Mr. W. H. B. Fletcher's collection is a very large specimen having all the black markings very strongly accentuated, the transverse stripe nearest the hind margin unusually broad and intensely black. This species has an extraordinary resemblance in colour and markings to an autumnal species, *Charip-tera aprilina*, but may be known by its black collar—that of the latter being green—and by its more slender body.

On the wing in June.

LARVA moderately stout, of nearly uniform width, but tapering a little toward the anal segment, which is rounded off at the back; head broad, a little flattened in front, lobes broadly rounded; second and third segments rather short. Head shining, black at the top of each lobe, light yellow, thickly spotted with black below; dorsal region blackish-olive on the second and third segments, blue-black on the fourth, fifth to twelfth deep velvety black, anal segment drab. A large broad bright light yellow transverse blotch lies on the

back of the fifth, seventh and tenth segments, and strikingly relieves the velvety black ground colour. The subdorsal stripe is a broken series of pale yellow spots, and is followed by two other broken series of similar spots; sides olive-drab, with three longitudinal yellowish or greyish-yellow stripes, the middle one containing the spiracles, which are oval, blackish, and ringed with yellow. On each body-segment is a transverse row of ten bright red raised spots, bearing fascicles of rather long light brown hairs; but in the yellow blotches these spots are also yellow, with brown hairs. The subdorsal spots on the twelfth segment are greatly enlarged; on the back of the fourth they form transverse streaks at the back of the red spots. On the second segment is a narrow transverse bar of shining blackish, bearing a series of four red warts. The pattern on the anterior segments is rather obscured by the long hairs, of which those in front project over the head. Undersurface drab, more dusky in front; legs and prolegs drab. (Condensed from Buckler.)

Dr. Chapman says that the very young larva presents a character in the small size, and weakness of the eleventh segment, and its less conspicuous hairs, which agrees closely with that found in the genus *Acronycta*. It is "a very delicate whitish scrap, whose first duty is to eat up as much as its neighbours permit of its egg-shell." It seems to linger about, waiting for the last of the batch to hatch out before beginning to attack its regular diet, but very soon shows a greenish colour after commencing to eat. Feeding is begun gregariously, all the larvæ from the batch of eggs ranging themselves side by side and marching forward exactly in line, eating only the parenchyma or flesh of the leaf and leaving the upper surface and even the smallest ribs. Its raised spots or tubercles are large and conspicuous, each bearing a single hair, except those above the spiracles, which have three each. As the larva grows it gradually assumes colour, becoming after the first moult creamy yellow, with red-brown dorsal and subdorsal lines; the raised spots now carry more

hairs. Up to this time the head is almost colourless, but after the second moult it becomes black with green radial markings; and is deeply cleft and rather angular; the body now begins to assume the adult colouring. After the third moult it is a red larva with black and yellow markings, a black hump on the sixth segment, with two yellow dots behind, a yellow raised patch on the fifth, seventh and tenth, and a small black hump on the twelfth, on each side of which is a conspicuous yellowish-white patch; the sides are marked with several alternate lines of yellow and fuscous, and the lower parts are still very pale, delicate, and transparent. The hairs are more numerous and whitish, but as it advances toward full growth they sometimes become more rufous, and are still more plentiful and conspicuous, especially toward the head, over which they hang abundantly, "Skye-terrier fashion." At all stages the head is large, but towards full growth the second segment becomes much contracted, being reduced on the back to an exceedingly narrow black collar with two white transverse lines, hard to see under the thick mass of hairs projecting forward. (Condensed from Dr. Chapman's memoir "Acronycta and its allies.")

July to September, on oak; feeding exposed by day, and loving the hottest sunshine. This beautiful larva strikingly reminds one of that of *Liparis salicis*.

PUPA stout, shining, very round, thickest in the middle; wing-cases full; limb-cases less conspicuous; abdomen tapering rather rapidly; anal extremity flat at the apex, with six short thick recurved hooks; incisions of segments toothed. Colour deep shining mahogany brown. In an oval compact silken cocoon, the upper end left almost open; placed immediately below the surface of the ground. Sometimes the cocoon is formed partly of gnawed bark or rotten wood. In this state through the winter, and sometimes through another year.

The moth may occasionally be found, in its very restricted

localities, sitting on the trunk or a branch of an oak in the day time, though protected from a casual glance by the wonderful similarity of its green and black colouring to a patch of green lichen. It flies at dusk, and comes willingly to sugar on the trunks of oak trees, especially on windy nights; yet is very shy and restless, and easily disturbed. Its time of flight is known to last till midnight. Found only in oak woods, and exceedingly local; probably more frequent in the New Forest, Hants, than in any other place in these islands, and there, in some seasons, almost common. Also in woods near Hailsham, Brighton, and Hastings, Sussex; Isle of Wight and Forest of Bere, Hants; in wooded valleys under Dartmoor, towards Plymouth, Devon; formerly at East Looe, Cornwall; and in the Eastern Counties near Ipswich and Colchester; also recorded by Mr. W. M. Crowfoot, of Beccles, in South Norfolk. I know of no other certain localities for it in the United Kingdom; but abroad its distribution is very wide—all over Central Europe, Northern Italy, Northern Europe (except the coldest portions), India, China, Japan, Northern Asia. It is the only European representative of a small group of most beautiful species, most of them of a brilliant green with black markings, and inhabiting Asia and North America.

Genus 2. **ACRONYCTA.**

Antennæ simple or nearly so, ciliated; eyes naked, with lashes at the back, but nearly prostrate among the long scales; head tufted; thorax thickly covered with somewhat raised long scales, obscurely crested at the back, and with the shoulder lappets rather uplifted; abdomen crested, sometimes obscurely, the crests varying in number from one to five, and in some species very fugitive. Fore wings elongated, in most cases rather pointed, usually of some shade of grey, and with black transverse lines and deep black longitudinal streaks; hind wings nearly unicolorous; vein 5 variable but usually weak, always arising from the cross-bar.

LARVÆ hairy, but differing in appearance in an extraordinary manner—cylindrical, or humped, or with a long tubercle; hairs placed singly or in dense tufts, or silken and plentiful all over the body, or short and downy. Feeding on leaves of trees, shrubs, or low plants.

PUPÆ presenting several types, in strong tough cocoons or in holes in woody substances.

The extraordinary divergence in form and in the arrangement and extent of hairy covering among the larvæ of the species of this genus has led to the bestowal of a quite unusual amount of attention upon it, and even to proposals for its dispersal into various families—Arctiidae, Liparidae, Notodontidae, as well as among the Noctuidæ. But the researches of Dr. T. A. Chapman have shown that these extraordinary distinctions, visible in the well-grown, or full-grown, larvæ, are by no means observable in them in their earlier stages, and that in the infant larvæ, as in the perfect insects, there is a very close relation between the species. His minutely structural examination of the pupæ of the various species has resulted in a proposal to divide the British species of the genus into three groups, or sub-genera, for which he has proposed the names of "*Viminia*," to include *auricoma*, *myrica* (*euphorbia*), *menyanthedis*, *rumicis*, and *Arsilonche venosa*; "*Cuspidia*," to consist of *psi*, *tridens*, *strigosa*, *alni*, *megacephala*, *leporina* and *aceris*; and "*Bisulcia*," for the somewhat aberrant *ligustri*.

The details of structure given by him are of extreme interest, and in any classification founded upon pupal characters, his divisions would necessarily be adopted. I think no excuse necessary for devoting a little space to these details.

In the first group—*Viminia*—named from the structure of the pupal segments, which appear hooped like the willow-hoops of a barrel, the pupa is of very even thickness to the middle of the abdominal segments, whence it tapers off

extremely suddenly, the three segments 8, 9 and 10 having, very distinctly, the raised hoop-like ridges in question. Dr. Chapman says: "The pupæ are black, or nearly so, of a rough, wrinkled, and warty surface; the free abdominal segments—9 and 10—are as wide, or even wider, than those in front of them, the tapering to the tail being done in the remaining fixed segments—11 to 13—giving a peculiar squareness to the pupa. There is a double nodule between the eyes; the posterior margin of each segment, most marked in 9 and 10, has a raised band just like those barrel hoops that are made of a branch split and with the bark left on, whose smooth surface contrasts with the roughness of the rest of the segments. The anal armature is a projection with somewhat quadrangular termination, having the points or spines nearly or quite obsolete, but clothed with a brush of stiff brown bristles." The pupa is enclosed in a cocoon of tough whitish silk, fairly copious in amount, but in one simple layer, usually clothed with fragments of grass, twigs, leaves, &c., and often placed against a stump, stone, or post. "The young larva is of typical *Acronycta* form and colour, in all the five British species being very nearly alike, and very close to the newly hatched larva of *psi* and *tridens*, but differing from other groups in having three or more hairs on the anterior trapezoidal tubercles" (raised spots). The eggs are laid in groups, usually in a very regular manner, imbricated, that is, in regular rows overlapping each other, an arrangement which their flatness permits.

In the second group—*Cuspidia*—(*cuspis*, a spine) the pupæ are characterised by a peculiar arrangement of long terminal spines. "The pupa is again the most distinctive stage of the group; it is of the ordinary *Noctua*, smooth, brown, brittle-looking, semi-transparent, chitinous material; it tapers regularly from the thickest part of the thorax to the terminal segment, which is somewhat rounded to finish with; and the sculpturing, instead of being raised points, consists of the ordinary minute pits. The anal armature con-

sists of a system of spines, of which there are a dorsal and a ventral series. I presume, strictly, all are dorsal, as being dorsal to the cloacal aperture, but in relation to each other these groups may be most simply so described. The dorsal set consists of two spines, one on either side, but not far from the middle line; only in *aceris* do these tend to be multiplied, apparently by being split up, rather than by others being developed. The ventral set is more variable, and consists of three or more spines on either side. These pupæ are not contained in a silken cocoon, but in cavities formed by the larvæ in rotten wood, bark, &c. Some, as *psi* and *tridens*, use rather more silk and will spin up in *débris*, or even go down into earth if no other resource is available, whilst *aceris*, though loving some dead loose bark or such material, spins an elaborate cocoon almost anywhere." "The newly hatched larvæ always have the eleventh segment pale." "In nearly all the species the *anterior* trapezoidal tubercles have only one bristle, but two occur in one or two species." "The full-grown larva is in each species a law to itself, but where the larva is hairy, as in *leporina* and *aceris*, the hairs arise chiefly from the general surface, and the tubercles, as bases for bundles of hairs, are not easily distinguished, whilst in the non-hairy species, such as *alvi*, each tubercle has one bristle." "In this section the eggs are always laid separately, and, so far as I know, in the wild state, are always laid solitarily. They are not quite so flat as those of *Viminia*."

In the third group—*Bisulcia*—"(*bis*, twice; *sulcus*, a furrow) from the double depression that crosses the back of each segment of the pupa." "The pupa is thick and squat, and has two transverse depressions on the dorsum of each segment; the anal armature consists of short points. The cocoon is of a hard, tough, but somewhat brittle silk, nearly black in colour, and with always some indication of an opening at one end, and sometimes an almost distinct line of division forming a valve for the emergence of the moth." "The young larva

is pale throughout, with only one bristle on each tubercle." "The egg is laid solitarily and is indeed very much like that of *psi*."

In curious contrast to this division into three groups mainly by the structure of the pupa, is the result of examination of the "anal appendices," "anal armature," or "appendices ancillary to generation," as the curious structure of claspers in the anal segment of the male moth is variously entitled. Mr. F. N. Pierce, who has examined this structure in most of the species, with great care and minuteness, informs me that by it the genus is divisible into three distinct groups: 1st, *tridens*, *psi*, *strigosa*, *alni*, *menyanthedis*, *rumicis* and *myrica* (*euphorbiae*), all of which show very similar structure; 2nd, *leporina*, *accris*, and *ligustri*, which again are very similar; and 3rd, *megacephala*, which is very distinct from all the rest, "and would probably belong to another genus." Another division of the genus has reference to a point to which I have already adverted—the presence or absence of dorsal crests on the abdominal segments; but in it sufficient allowance does not seem to have been made for the fugitive nature of these crests or tufts, in certain species. On the whole, it appears best to include all the grey species, as was done by Mr. Stainton, in the genus *Acronycta*.

A table of the species may be useful.

- A. Forewings whitish or pale grey.
- B. A black < before the anal angle. *leporina*.
- B². A sharp black dagger before the anal angle.
psi, *tridens*.
- B³. An obscure black dagger before the anal angle.
- C. Second line distinct; orb. stig. minute; ren. stig. short. *menyanthedis*.
- C². Second line clouded and obscure; ren. stig. elongated.
auricoma.
- B⁴. A simple black streak running into the anal angle.
- D. Dorsal half of wing black. *alni*.

- E. The black streak continued in sections to base of wing. *strigosa.*
- A². Forewings much mottled or marbled with grey or black.
- F. Mottled light grey; second line white, edged with black. *aceris.*
- F². Mottled dark grey; a pale blotch beyond ren. stig. *megacephala.*
- F³. Mottled and clouded with black; two white spots before anal angle. *rumicis.*
- F⁴. Mottled olive and black, a large pale cloud beyond ren. stig. *ligustri.*
- F⁵. Mottled dark slate-grey. *cuphorbia.*

1. **A. leporina**, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings white or grey with a black bar in the middle of the costa, a black \blacktriangleleft near the anal angle, and broken indications of black transverse lines.

Antennæ of the male rather stout, simple, naked, blackish, with the back of the shaft white; head white; thorax covered with long, loose, white, or light grey scales; shoulder-lappets rather raised; at the back is a slight crest of raised scales, tipped with dark grey; a sharply defined black streak runs from the side of the head to the base of the fore wing; fascicles long, white; abdomen dark grey, thinly covered with white scales, those on the dorsal ridge raised into one or more oblique tufts or crests; lateral and anal tufts white. Fore wings elongated and rather triangular; costa straight to near the apex, where it becomes arched; apex rather pointed; hind margin very oblique, but very slightly curved; anal angle distinct; dorsal margin straight to near the base; colour white, greyish-white, or creamy white; a small black streak lies along the base of the costa; another, longer, from the middle of the base lies horizontally below the median nervure; the first line is only indicated by a black spot in the costa, and another opposite to it in the middle of the wing; the

second line, rather far beyond the middle of the wing, is very oblique, almost parallel with the hind margin, and composed of a series of indistinct blackish curves, but near the anal angle forms a broad black V-like marking; in the middle of the costa is a nearly perpendicular thick black streak, continued down the anterior edge of the reniform stigma, which otherwise is hardly perceptible; beyond this streak is a small black costal spot; along the hind margin a row of black spots or dots between the nervures; cilia white. Hind wings clear snowy-white; nervures faintly tinged with brown; cilia white. Female slightly larger, with the body stouter; otherwise similar.

Underside white, the nervures of all the wings faintly brownish, and each wing with a more or less distinct central black spot; hind margin of the fore wings spotted with black; body and legs white.

Variable, the variations being somewhat local or climatal. The typical form described above is that usually found in the southern counties of England, though accompanied occasionally by specimens much dusted with dark grey or slate-grey and with the apical portions of the nervures grey, a band outside the second transverse line being sometimes especially dark; along with this darkening of the ground colour, the transverse lines are usually blacker, more distinct and more complete; the black central streak from the costa is also thicker, and that portion of it at the back of the reniform stigma often accompanied by a black mark at the other side of the stigma. In the Eastern Counties these darker forms appear almost to exclude the type, and assume still stronger variations. Mr. F. J. Hanbury has a specimen taken in Norfolk, in which the thorax and fore wings are suffused with very coarse dark grey atoms, not of a slate tinge, but singularly dark; and specimens which I took in a marsh near Norwich have the basal area much dusted with black, and the whole hinder area beyond the second line suffused with slate-grey. These grey forms were at one time

looked upon as a distinct species, under the name of *brady-porina*. They seem to prevail in the Western and Midland districts and also in the North, but so far as I am aware are not anywhere much darker in general colour than those from Norfolk. In Mr. C. J. Wainwright's collection is a Warwickshire specimen, wholly dark grey without distinct markings. In the mosses of Lancashire and Yorkshire, where the ground colour is of a smoky-grey or slate-grey, the usual black markings are more obscure. The most curious specimen known to me is whitish on one fore wing, dark grey on the other. It is in the collection of the late Mr. Bond. Irish specimens are reported to be usually white or pale grey. One in the collection of the Rev. W. W. Flemyng of Portlaw is uniformly greyish-white, except the black perpendicular streak in the middle of the costa, which is sharply marked. In some parts of Scotland, as around Loch Laggan, it has been found beautifully white, with dark markings.

On the wing in May and June, in more northern districts sometimes in July. There is but a single generation in the year.

LARVA nearly cylindrical, thickest at the seventh to ninth segments, rather truncate at the tail. Colour pale apple-green with no markings, spiracles white, with a fine black line, head and legs paler green, labrum and palpi nearly white, darker beneath. The surface is uniformly clothed with long, perfectly white hairs, which stand erect for about one-twelfth of an inch of their length and then bend down parallel to the larval surface for a length of about one-fifth of an inch; thus forming a continuous coat or surface at the distance of one-twelfth of an inch from the larva. Very inconspicuous are some black hairs, two to three on each anterior trapezoidal raised spot, one to each posterior, a little longer on the anal segment, where they mix with the white hairs. This form is that usually found in the South. In the North the dominant form appears to be that which has a yellow skin and yellow

hairs; it has distinct chocolate bands down the back and side, indistinct as to outline, but pronounced as to tint; it is also olive-brown beneath; the head has much black; and on the back, especially on segments five, seven, eight, nine, and twelve, are black tufts rising above the level of the yellow hairs. The long hairs after being bent down parallel to the larval surface are arranged exactly as if they had been brushed smoothly, but they are always brushed forward on the right side, backward on the left—an instance of bilateral asymmetry which is extremely rare among insects.

The infant larva is white and brown alternately, segments four and five, seven, eight, nine, and the two last being dark, head black; second segment with a distinct black plate; the raised spots, which are conspicuous and mostly black or blackish, have each but one or two hairs; these are long, black, and longest on the front segments. When half grown the alternation of pale and dark colouring has disappeared, the back of most of the segments has become very dark, almost black, and there are broad purplish and yellow stripes down the sides, but these colours are much hidden by the hairs, which are longer, far more abundant, and of a yellow colour; head still black, under-surface fuscous. It is not until the fourth moult that the adult colouring is assumed. (Condensed from the elaborate memoir of Dr. Chapman).

The southern form of the larva—green with white hairs—is found very frequently upon alder, but most certainly also upon birch; the yellow and more northern form appears to be more attached to birch; but this may arise from the far greater abundance and wider distribution of birch than of alder. Dr. Freer finds both forms on birch at Cannock Chase, the yellow usually the later in the year—that is in the more slow-feeding larvæ probably. Other observers have supposed the yellowness to be a change occurring before the larva spins up, but probably without sufficient reason—the change at this season being to a dirty greenish, with the hairs smoky black.

The protection afforded by the curious form of the hairs in this larva is most interesting. When on the trunk of a tree it looks like a twisted downy feather, and on a leaf the same resemblance is kept up to some extent. Dr. Chapman, however, points out a quite different protective resemblance. He says: "My observations were made and repeated many times on the green, white-haired larva occurring on alder; this larva sits somewhat curled round, near the middle of the underside of a leaf. Looking down from above, it is absolutely hidden; looking up from beneath, it ought to be very evident; but this is far from being the case. In looking up from below through the foliage of an alder tree, most of the lower leaves are in the shade of the upper ones, but here and there a gleam of light falls through on to a portion of a leaf, and gives it quite a different tone and appearance as seen from beneath. A larva of *leporina* seated beneath an unilluminated leaf precisely resembles one of these patches. I have several times missed a larva till I have looked three or four times, and have also fancied I saw a larva, when none was there."

July to September or even October; on alder and birch, but occasionally on oak, aspen, black poplar, and Canadian poplar.

PUPA of ordinary form, broadest from the fifth to ninth segments, then tapering off; spiracles distinctly marked; blackish-brown, paler beneath; wing cases with raised dark green nervures. In a deep burrow bored by the larva into rotten wood, dead bark, or the pith of bramble or elder; the entrance closed by a covering of tough silk, with which the larval hairs are interwoven. In this state through the winter, and not unfrequently through two or more years.

The moth sits in the daytime on the trunk or branch of a tree—usually alder or birch—and often at a height of fifteen or twenty feet; in other cases close to the ground or on a fern frond or other plant under the tree. It flies at early dusk, and comes willingly to sugar, sometimes so early that

it may be captured without the aid of a lantern. It settles down with closed wings to feed, and is captured with perfect ease in this manner, but is rarely taken on the wing. Never an abundant species, but very widely distributed, apparently occurring in woodland districts, marshes, and heaths on which birch grows, throughout the Southern and Eastern counties of England, and in some of the Western and Midland counties, since I have records from Devon, Somerset, Gloucestershire, Herefordshire, Worcestershire Warwickshire, Leicestershire, Staffordshire, Derbyshire, Cheshire, Lancashire, most parts of Yorkshire, Lincolnshire, and Cumberland. In Wales it is found in Glamorganshire and Carmarthenshire, and can hardly be absent from the birch woods of North Wales. Widely distributed, but scarce, in Scotland; found in Ayrshire, at Kilmun and Dunoon in the Clyde District; in Argyleshire, Perthshire; in Eastern districts to Ross and Moray; and even more commonly in Sutherlandshire. Confined apparently to the southern half of Ireland, Dublin, Wicklow, Waterford, Kerry, and Galway. Abroad it extends throughout Central Europe, Northern Europe except the coldest portions, Northern Italy, Southern Russia, and Siberia.

2. *A. aceris*, L.—Expanse $1\frac{1}{2}$ to $1\frac{7}{8}$ inch. Fore wings pale grey, much mottled with darker grey; second line white; hind wings white with blackish nervures.

Antennæ of the male stout, ribbed, naked, greyish-brown; head pale grey; thorax robust, pale grey dusted with dark grey; shoulder lappets rather raised; at the back of the thorax is an indistinct crest; fascicles of scales from the back, dense, white; abdomen white, faintly dusted with dark grey; the first three segments covered with loose hair-scales, the central dorsal portion of which is raised into obscure crests and tipped with dark grey. Fore wings stoutly built, broadly triangular, conspicuously broader and more ample than in the other species of the genus; costal margin very slightly curved, apex bluntly angulated; hind margin long,

oblique, gently rounded, and slightly excavated before the anal angle; dorsal margin straight and rather short; greyish-white, almost wholly covered with mottled markings composed of dark grey or blackish atoms; from the middle of the base is a slender, rather long black line throwing off three rather small curved branches, two of them into the first transverse line, which is double, blackish, indistinct, and much indented; the second line lies far beyond the middle and is deeply toothed, notched, and scalloped, white, edged on both sides with dark grey; nervures in the middle area, and also some oblique costal streaks, dark grey; orbicular stigma nearly round, pale grey, ringed with black; reniform stigma grey, indistinct, edged and clouded with black; hind margin spotted with black; cilia white, scalloped and indented. Hind wings clear white; the nervures dusted with blackish and forming black lines beyond the middle; margin rather crenulated; cilia sinuous, white. Female similar except that the nervures of the hind wings are blacker, there is usually some grey clouding between them, toward the margin, and in most instances a cloudy grey transverse line or stripe beyond the middle.

Underside white; fore wings with grey nervures beyond the middle, and with three blackish lines from the costa; cilia streaked with black. Hind wings tinged with grey along the front margin; a row of black dashes on the nervures indicates a faint transverse stripe; central spot minute, dark grey. Body and legs greyish-white.

Usually rather constant in colour and markings, varying only a little in tint of the grey mottling; the hind marginal space is, however, often darker or paler than the rest, and a dark grey band outside the second line is not unfrequent. A rare variety is nearly unicolorous blackish grey or dark brown-grey, and in this the white second line is sometimes obscured. This form was described by Haworth as a (probably) distinct species under the name of *infuscata*.

On the wing in June and July.

LARVA very hairy, the hairs arranged in long dense tufts parted down the centre of the back, which is thus left exposed; sides covered with long hairs; head large, quadrate, polished, edges rounded; bluish-grey, the body entirely covered, except a parting down the middle of the back, with long yellowish, bright yellow, orange, or brick-red hairs; a lozenge or roughly diamond-shaped silvery-white dorsal spot on each body segment, very conspicuously edged with black; these spots sometimes confluent on the second to fourth, and eleventh to thirteenth segments; head hazel-brown, mottled with dark brown and with a broad distinct yellowish frontal **V**; under-surface rather light chocolate brown; legs dark brown. The dorsal tufts are often yellow tipped with red, or alternately yellow and red. (C. Fenn.)

The infant larva as figured and described by Dr. Chapman presents no resemblance to the adult; its head is very broad and black, there is a black plate on the second segment; the hairs, though long, arise singly from the raised spots, and there is no dorsal division nor any indication of tufts; the body is, as is the rule in these species, curiously parti-coloured, segments 2 to 5 being greyish-brown, segment 6 whitish, 7 to 9, brown 10 and 11 whitish, and the remaining two brown, giving it a curious banded aspect, which continues till it has attained one-third of its growth; when half-grown tufts of hairs commence to arise from some of the raised spots, and white markings to appear on the back, the full adult appearance being assumed at the fifth moult. The aspect of the full-grown larva, when coiled in its favourite position under a leaf, or tightly drawn into a ring when alarmed, the white spots forming a circle, and the large strong straight tufts of hairs standing out all round, is exceedingly curious and pretty.

August and September on horse-chestnut, sycamore, maple, and occasionally oak and birch. When full fed it may sometimes be seen on the trunks of trees, palings, and

even on the ground, doubtless seeking a convenient place in which to spin up. No larva is more conspicuous.

PUPA of the ordinary form, of even thickness to the ninth segment, then tapering to the extremity, but with decided angular ribbing at the spiracular lines. Rich brown, with darker lines at the margins of the segments, and a dark dorsal line widened in places as if it were the black line which in the larva encircles the lozenges. The ninth and tenth segments often have projections representing the prolegs; in some these are so conspicuous as to suggest a continuance of the larval structure. The boss carrying the anal armature is abundantly and finely wrinkled, and has a full armament of spines. In a cocoon formed among loose chips or dead leaves and moss. The larva does not burrow into rotten wood or otherwise excavate a cavity. The cocoon is of loose texture, composed of very pale brownish or nearly white silk, with the hairs of the larva interwoven, and, inside this, a more dense cocoon of tough white silk, morsels of wood being worked into both. (Condensed from Dr. Chapman's memoir.) It also frequently spins up in crevices of bark. In this state through the winter, occasionally two winters.

The moth sits openly and conspicuously upon tree trunks in the daytime, usually upon those with rough bark, oak trees in woods and at roadsides being especially selected. It flies at dusk, and comes eagerly to sugar, settling down quietly to feed, or if but just arrived, will fly round in wide circles, looking, from its size and pale colour, very conspicuous. Not rare in the outskirts of London, and common in most parts of the more Southern counties, though not continuing so very far west. Scarce in South Dorset and in Somerset; rare in Devon and Cornwall. Generally distributed and moderately common in the Eastern counties, the Cambridgeshire fen district, and Northamptonshire; rare in Warwickshire and Herefordshire, and apparently extending

no further north, nor have I any record of it in Wales. Rare in Ireland, but recorded from Galway and Cork.

Abroad it is found nearly all over Europe, except the coldest regions, also in Asia Minor, Northern India, and Cashmir.

3. **A. megacephala**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings dark grey, mottled and spotted with blackish; a large pale blotch beyond the stigmata; hind wings white with black nervures.

Antennæ of the male rather slender, simple, naked, grey; head dark-grey; thorax moderately stout, grey, dusted with black; shoulder lappets raised, and, with a small crest at the back of the thorax, tipped with black; abdomen pale grey, rather smooth, with two or three indistinct and often prostrate darker dorsal tufts, a strong lateral ridge of tufts, and a broad anal tuft dotted with black. Fore wings rather broad, not so triangular as in the last two species; costa gently curved, apex very bluntly angulated, almost rounded; hind margin decidedly rounded, long, and oblique; dorsal margin rather straight. Grey, softly mottled all over with dark grey and blackish, and with, when fresh, a delicate faint pinkish or lilac flush; first line indicated by a double transverse row of blackish spots; second line more complete, deep black, indented throughout and expanded near the anal angle into a considerable cloudy black spot; orbicular stigma whitish-grey, ringed with black, and tolerably conspicuous; reniform stigma very large and ill-defined, forming part of a large ovate pale blotch; along the costa are several black spots; cilia grey, broadly spotted with black. Hind wings short, rounded, shining white, with the nervures grey, more blackish toward the hind margin, along which is a dusting of grey; cilia whitish, dashed with grey. Female similar, but with the hind wings more clouded with grey, especially toward the dorsal and hind margins.

Underside shining whitish with a grey cloud along the

costal half of the fore wings, a black spot on the costa, another under the reniform stigma, and the nervures grey; nervures of the hind wings also greyish, and upon them a series of black dashes indicating a central transverse stripe; central spot grey, body and legs whitish.

Usually very constant in colour and markings, but there is occasional variation in the intensity of the dark colouring of the forewings and in the size and distinctness of the large ovate pale blotch, which even in rare instances is no paler than the rest of the wing. In the collection of the late Mr. Bond is a specimen of a unicolorous black-grey. The pretty pinkish or lilac tinge which is sometimes observable, rather indicates extreme freshness than any variation, and unfortunately very soon fades.

On the wing from the end of May to August in a single generation. So far as I know there is but a single record in this country of the appearance of specimens of a second emergence in the year. This occurred at the end of July 1858.

LARVA stout, rounded and rather flattened; long whitish hairs on the sides and on the second and anal segments; head large, rounded, slightly bifid, not highly polished. Greyish-ochreous with three converging waved bands of collected black dots on the back; spiracular line, and a line above the black spiracles, waved and composed of an accumulation of dark grey dots; dorsal spots from the third to twelfth segments raised and of a reddish-orange colour; remaining dots also raised, but of the ground colour; on the eleventh segment is a large half-oval prominent dorsal patch of a dull ochreous or greyish-ochreous edged with black, the rounded portion in front. Head pale bluish-grey, the lobes margined internally and externally with black, or else black with a broad pale greyish stripe down each lobe; mouth black; legs and prolegs deep yellow; under-surface very pale grey, the centre greenish. (C. Fenn.)

The infant larva has the head black, the general colour rufous except the third, fourth, and eleventh segments, which are very pale; the spots are large raised bosses, paler than the rest of the segment, but without very defined margins. Each has one hair, dark at the base, pale at the tip, and of one half the length of the larva; second segment with a pale plate; the sides are paler than the back, the eleventh segment is peculiarly wide and flat and its hairs paler than the rest. As it grows it becomes more flattened from the tenth to the thirteenth segments, and a dorsal lozenge of bright yellow appears on each of the pale segments. After the third change of skin some approach is made to the appearance of the full-grown larva; sometimes a yellow patch appears on the back of many of the segments, and the raised spots partially change colour to yellow, with some brown or black. As it grows all the spots become yellow, the dorsal region blackish, changing on the sides to very light fuscous, and dotted closely with small yellowish or greenish-white points, each carrying a minute hair, thus forming a fine pubescence covering the larva; by this time the tubercular hairs have become proportionately shorter, and the adult appearance is gradually assumed. (Condensed from Dr. Chapman.)

August and September on poplar and aspen, also rarely on willow. It reposes on the upper side of a leaf and lies always in a curve or bend, with the head placed near or against its side. Feeds by day and is quite easily seen.

PUPA cylindrical, with tapering abdominal segments of the usual form. Smooth and shining, limb cases not very distinct; reddish, with the dorsal region darker; anal tip rounded, black, with a number of curved and hooked spines. In a strong compact cocoon of dark silk mixed with morsels of wood; under bark or in a chink or crevice, or even in a hole bored into rotten wood. In this condition through the winter, sometimes through a second winter. Dr. Chapman has even found one-half the pupæ of a brood to lie over.

The moth sits in the daytime, conspicuously, on the trunk of a poplar or aspen, or occasionally on that of some neighbouring tree, or on a paling; but is more restless than its allies, and will readily fly if the sunshine is hot. It flies at dusk round the poplars, and is readily attracted to sugar, on which it settles down, and is easily captured. It is an insect of ordinary occurrence in all the outskirts of London, and common throughout the Southern and Eastern counties, though but local in Devon and Cornwall. In the Midlands, it is common round Birmingham, and in other parts of Warwickshire, Worcestershire, and Staffordshire, also moderately so in Leicestershire, Herefordshire, Derbyshire, Cheshire, and South Lancashire; scarce in the north of that county, and rather local in Lincolnshire, Yorkshire, and Cumberland. Probably in all suitable parts of Wales, since it may be found, occasionally, in Pembrokeshire. Local in Scotland, but found in the southern districts, and in the eastern and northern portions to Ross and Moray. Always scarce in Ireland, and apparently not found in the north, but recorded from Dublin, Wicklow, Westmeath, Galway, Monaghan, and the coast of Down. Abroad it is generally common throughout the continent of Europe except the extreme northern portions, also in Siberia and in Asia Minor.

4. **A. alni**, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Fore wings light grey with a broad black cloud along the dorsal margin and across the middle; hind wings white.

Antennæ of the male simple, grey in front, black at the back; palpi deep black with the final joint grey; head light grey; thorax whitish-grey, with the collar and shoulder lappets rather raised, and the latter edged outwardly with a deep black stripe which extends from the back of the eyes over the base of the wings; at the back of the thorax is a crest of two small tufts, each tipped with black; abdomen greyish-white; on the back of the basal segment is a broad fan-like crest of divergent, nearly erect scales, often tipped

with black; lateral and anal tufts whitish, small but spreading. Fore wings of moderate breadth, with the costa very faintly curved, apex blunt, almost rounded, hind margin long, oblique, and decidedly curved below the middle, the curve sweeping smoothly round to the straight dorsal margin; ground colour whitish-grey with a broad deep black cloud from the base along the dorsal margin nearly to the anal angle, and also forming a cloudy black band across the middle to the costa; in it are some faintly browner clouds; on the costa, near the base, are three ill-defined blackish streaks, from the third of which arises a blackish first line, which crosses straight to the black cloud; beyond the black central cloudy band is a series of black costal dashes, from the second of which arises the second line, which sweeps broadly outward and downward to the middle of the wing with several undulations, thence bends inward and proceeds to the dorsal margin, being rendered visible in the black portion by being edged inside by two grey or reddish-grey crescents; through the upper of these crescents passes a straight, deep black streak, direct to the hind margin close above the anal angle; orbicular stigma large, indicated by a slender black ring; reniform stigma obscurely indicated by purplish-grey clouding in the black band; space between it and the second line tinged with smoky-ochreous; the upper portion of the second line is bordered outside by a grey cloud, from the middle of which a small straight black streak runs to the hind margin, which also is clouded with dark grey; cilia white, clouded with dark grey and regularly barred with black. Hind wings clear white, with a greyish cloud along the apical portion of the hind margin; cilia whitish, barred with dark grey. Female hardly differing in colour or markings, but with the apical grey edging of the hind wings rather broader.

Underside shining whitish-grey; costal half of the fore wings tinged with greyish-brown and with some blackish clouds along the edge; underneath the reniform stigma is a

black spot; cilia white, barred with black; a central blackish spot on the hind wings and two blackish cloudy spots on the costal margin, from the second of which commences a slender series of blackish streaks on the nervures; body greyish-white; legs whitish, first pair broadly barred in front with black.

Hardly variable, except in an occasional extension of the blackish clouding to the hind margin and in some degree over the pale portions of the fore wings. In some of the specimens reared by Dr. Chapman the smoky ochreous space outside the reniform stigma is large and ovate, paler, sometimes whitish-grey; in others the orbicular stigma is strongly black-ringed; or the pale portion near the costa and base is marbled with black.

On the wing from the middle of May to the middle of June. It has been reared in September as a second generation.

LARVA cylindrical, tapering a very little behind; head deeply notched or almost bifid above, black; body, with the legs, black, deep velvety black on the back; across the back of each segment, except the head, is a broad rather rectangular blotch of a rich golden yellow; on the second segment are six long black spatulate hairs, and segments five to twelve have each a pair of similar long black pointed, but spoon-shaped hairs, of so conspicuous a character that from them alone the creature may be at once recognised; on the anal segment are four such hairs, but on segments three and four are two pairs of ordinary shorter bristles. This remarkable costume is that of full growth, or, at any rate, only after the fourth change of skin. The appearance of the younger larva is admirably described by the Rev. Hugh A. Stowell: "I was looking over some standard roses when I noticed upon a leaf what appeared to be a recent deposit of the same nature as that which proved so injurious to Tobit's eyesight. A nearer inspection, however, resolved it into a lepidopterous larva, half doubled round upon itself and

resting upon a slight silken pad. Its length was about ten lines; head small, dark brown, somewhat deeply notched above; body rather slender, of uniform thickness; colour dark dirty brown, gradually paler towards the belly, except the last three segments, which were white with the ground colour faintly showing through; upon each segment were conspicuous black warts, small, but conspicuously raised, bearing short slender brown bristles of the ordinary type, except those on the post-capital segment, which were slightly clubbed. Whole body very glossy, appearing as if varnished."

Dr. Chapman says that the newly hatched larva has a large black head; segments 3, 4, 11, and 12 are pale, the others dark. The raised spots are large, especially so on segments 5 to 9, 12 and 13, where they appear as though fused together, the plates being fuscous in colour and the lines between them rufous. The eleventh segment has the characteristic *Acronycta* form, projecting slightly laterally, depressed dorsally, and with the tubercles and hairs much smaller than in any other segments. The raised spots carry single hairs, and the second segment has a black dorsal plate; head, viewed from the front, distinctly heart-shaped. After the first moult it appears almost black, but is really dark red-grey, with white dorsal and sub-dorsal lines; the tubercles or raised spots are still very large and black. At the second moult the curious appearance, so strongly mimicking the excrement of a bird, is assumed. It feeds up very rapidly, moults usually four times, spends four days in feeding in each skin, and two in each moult, and is full fed in a month from its emergence from the egg. (Condensed, Dr. Chapman's Memoir.)

End of June to August or even September, on alder, apple, oak, birch, hawthorn, beech, maple, hazel, poplar, willow, lime, elm, rose, sycamore, chestnut, horse-chestnut, and even bramble. Most catholic in its tastes as to food, and even appearing to change to a fresh food-plant in

some cases, after a change of skin, if the opportunity is given it ; but in confinement it must be supplied with water, or it will not thrive.

PUPA of the usual plain noctua form, cylindrical to the end of the wing-cases, thence tapering regularly to the tail ; nervures perceptible in the wing-cases ; general colour rich dark-brown, dorsal region a little blacker ; anal point with a distinct round knob, on which is placed a curved series of decidedly hooked bristles. In a cocoon in a deep hole excavated by the larva in rotten wood, decayed twigs, soft bark or bramble pith ; or among chips or morsels of wood or bark. Dr. Chapman says : “ It (the larva) is not particular in which direction it burrows, but seems to prefer to enter horizontally and then turn upwards, so that the pupa rests head downwards. The depth of the burrow varies from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches. It is made very rapidly, often in three or four hours, though usually from eight to ten, no doubt varying with the nature of the material. It throws out all the excavated material, then when the tube is completed, stretches out its head and picks up some of the chips or any other material within reach, and with this and some silk makes a tolerably firm diaphragm across the opening. Then retiring to the bottom of the opening, it there makes the cocoon proper. The top of this is made firmly with silk and chips and lined closely and smoothly with silk ; the walls have but little silk, but at the base some strong silk is loosely disposed round the sides, and in this the pupa takes a firm entanglement with the anal spines and groove. The space between the outer defence and the cocoon proper varies from half an inch to an inch, according to the depth of the burrow.” In this condition through the winter.

So far as I am able to discover, this moth is never seen in the daytime, and its method of concealment is quite unknown. It is indeed one of our rarest species in the imago state, the only captures, and those singly and at long intervals, seem to

have been at sugar at dusk. The larva also is very scarce, and when found far more likely to produce a batch of dipterous parasites than a moth. The female moth lays a large number of eggs—from 200 to 300—but its parasitic foes are so numerous and so industrious that probably hardly more than one per cent. in this country reach maturity. In the year 1880, however, from some unknown cause, the moths, and especially the larvæ, were decidedly more frequent, and a good many were obtained in the New Forest, Hants. From some of these, eggs were obtained, and it was found that by confining the male and female moths in a gauze bag sleeved on a living branch of a tree in a garden, and feeding the moths at night with a little syrup, eggs in plenty could be obtained. The larvæ from these, being protected from their enemies, were easily reared, and from this source large numbers have been brought to maturity, to the great benefit of our collections.

The captures of the moth, so far as recorded, are excessively rare, but it has been taken in the New Forest, at Foxley Wood, Norfolk, and in a few other places, at sugar. The larva, on the other hand, has been met with, usually singly, in almost all parts of the country; most frequently in the New Forest, Hants, and in Sussex, more casually in every one of the Southern, South-Western and Eastern counties, also in Warwickshire, Worcestershire, Herefordshire, Leicestershire, Staffordshire, Derbyshire, Lincolnshire, Cheshire, Lancashire, and even in a good many localities in Yorkshire. This seems to be the limit of its range northward. In Wales it has been found in Glamorganshire and Carmarthenshire; and in Ireland there is a single record by the late Mr. E. Birchall at Powerscourt in the County Wicklow.

Abroad also it is scarce, though widely distributed in Central Europe and the warmer portions of Northern Europe, also in Piedmont.

5. **A. strigosa**, *Fab.*—Expanse $1\frac{1}{8}$ inch. Fore wings pale grey mixed with yellowish; a black spot on the costa, and a

succession of deep black streaks from the base to the anal angle; hind wings whitish.

Antennæ of the male simple, very slightly ciliated, greyish-brown; palpi grey, black at the sides; head and thorax grey, shoulder lappets uplifted; at the back of the thorax is a small tufted crest, flattened in the middle; abdomen rather shining, whitish-grey; basal segment with a broad, spreading, whitish crest, dusted with black or grey; lateral and anal tufts whitish. Fore wings narrow, the costa slightly rounded; apex bluntly angulated; hind margin at first but slightly curved, more fully so toward the anal angle and dorsal margin, which last is rather straight, but curves in, so as to render the base narrow. Ground colour pale grey softly shaded with very faint yellowish; at the base of the dorsal margin is an elongated yellow or orange-yellow patch, and bordering it, from the base of the wing, a conspicuous black longitudinal streak reaching the first line and there branching, but continued in the same direction by two more successive black streaks along the dorsal region, the third branched and running into the anal angle; between these and the dorsal margin the space is clouded and streaked with black. First line black, slender, much indented; second line blackish, very indistinct, but edged with white, indented and very deeply hollowed above the anal angle, then bending strongly back makes a wide sweep nearer to the hind margin, but curving in, hardly reaches the costa; lying in the deep hollow which it forms is a long white crescent which borders a black cloud at the base of the third longitudinal black streak; orbicular stigma whitish, imperfectly edged with black; reniform stigma large, tinged with yellow, edged internally with a black line, externally with a faint grey line; hind margin spotted with black; cilia greyish-white, dusted with black. Hind wings pale grey or whitish, with a slightly elbowed slender grey transverse line beyond the middle; hind margin dotted with blackish; cilia grey. Female with the hind wings a little greyer, otherwise similar.

Underside of the fore wings greyish, whiter at the margins ; a grey transverse line beyond the middle ; cilia pale grey spotted with black ; hind wings whitish with a black central spot followed by a slender blackish elbowed transverse line ; hind margin with black dashes ; body whitish ; legs whitish, dusted with grey ; anterior pair barred in front with black.

Apparently not variable except in very rare instances. A specimen in the collection of the late Mr. F. Bond, now in the possession of Mr. Sydney Webb, at Dover, is nearly black, except the reniform stigma, which is yellow.

On the wing in July.

LARVA rather tapering in front ; on the fifth segment are two small but distinct humps, and on the back of the twelfth is another, very prominent, double at the apex ; from this it tapers regularly off to the anal flap. Ground colour rich velvety yellow-green, well relieved by a deep crimson-brown dorsal stripe faintly bordered with yellowish, beginning on the head, where it occupies the full breadth, tapering a little on the second segment and again on the third, widened on the fourth so as to embrace the two humped tubercles on the fifth, and then diminished to no more than a broad stripe on the sixth and seventh, but suddenly widened on the eighth and ninth, and thence very gradually less to the hump on the twelfth, whence it is only narrow to the anal flap ; raised spots all of the yellow-green ground colour, even those on the dorsal stripe, though the bases of these latter are blackish ; each bears one long blackish hair and a few short ones, except on the lower parts of the body, where they are whitish ; spiracles white, finely outlined with black ; remainder of head greenish, glossy ; second segment slightly glistening ; legs and prolegs green. When quite full fed it becomes very dingy, dark velvety-green, and the crimson-brown of the back almost fades away ; the raised spots appear black, ringed with green, and sometimes a greenish dorsal line appears. One variety occurred, after the last moult, in which the whole

skin of the larva was of the richest velvety crimson-brown. When half grown it has no humps; the ground colour is green, the head black, and there are dark purplish-crimson-brown *blotches* down the middle of the back. (Condensed from Buckler.)

Of the infant larva Dr. Chapman says that it is very flimsy and transparent, with hairs nearly half its own length; segments, 4, 5, 8, 9 and 12 dark, the rest pale; on the eleventh segment the raised spots are small and the hairs short, as in the young larvæ of nearly all this group; head tinted with indigo. At this time it rests underneath a leaf curled in a horse-shoe shape, and eats holes in the substance of the leaf, and does not commence to eat *through* a leaf until after the second moult.

August and the beginning of September on hawthorn, and probably blackthorn.

PUPA of ordinary form, pale greenish-brown with a darker dorsal line, the leg and wing cases so transparent that the incisions of the segments of the body beneath them are very distinct, and the tracheal vessels running down the antennæ and legs are obvious. The whole pupa looks extremely delicate and fragile. The spiracles are dark raised rings and are the only solid looking parts of the pupa. The anal armature consists of two dorsal and six ventral spines; these are long compared to the size of the pupa, and are hooked. When ready to pupate the larva will bore into rotten wood or will go into a stem of reed or elder, or form a cocoon among sawdust or loose rubbish. In rotten wood, which seems to please it best, it prefers to go in horizontally in a perpendicular face and then bore upwards, but it differs from *alni* in that when it has closed the opening, to all appearance in much the same way, the diaphragm so made is the actual top or outlet of the cocoon proper, there being no inner structure. The space excavated is lined with a little silk, and here and there by a few chips removed apparently in

giving a proper shape to the cavity. The thin silk operculum, coated with chips, which forms the outlet of the cocoon, often shows no indication of the exit of the moth—the sides of the opening, which is an irregular slit, falling together again. (Dr. Chapman.)

In this state through the winter.

The moth is found occasionally, in its very restricted localities, sitting in the daytime on the trunk of a hawthorn, or an oak, clinging very closely to the bark and resembling a knob of bark or a small patch of lichen. It flies at dusk, and its flight is said to be low, undulating, and even slow. It comes readily to sugar, but prefers a sheltered situation.

It is one of our most local species, almost confined to the Cambridge district—Fulbourn, Whittlesford, Waterbeach, Isleham, Wicken, Chatteris, Newmarket; and Monkswood, Hunts. There is a record of the capture of two specimens at Castle Morton, Worcestershire, and the Rev. T. H. Marsh informs me of his capture of a specimen in North Norfolk. Moreover, the late Mr. J. F. Stephens, writing about the year 1829, stated: “Mr. Haworth possesses a single specimen of this insect, which I believe was captured in Norfolk.” Nearly all the recent specimens have been obtained in the Cambridge district, to which its range in these Islands is probably now almost limited. Abroad it inhabits Central Europe, Southern France, Southern Russia, and some portion of Siberia.

6. **A. tridens**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Fore wings of a warm grey, with a deep black streak at the base and on the costa, and a black dagger-mark at the anal angle; second line curved obliquely inward toward the costa.

Antennæ of the male rather stout, notched near the base, finely ciliated, dark brown, with the back of the shaft ashy-white; palpi and head tufted, greyish-white; thorax greyish, rather square, with a slight ridge in the middle of the collar; shoulder lappets rather upraised, edged outwardly with black; at the back is a small crest of two points, each usually

with a small blackish spot; abdomen whitish-grey, with two or three half-erect grey or blackish dorsal crests on the basal segments; lateral tufts large and spreading; anal tuft short and rather square. Fore wings somewhat triangular, with the costa very faintly rounded, apex bluntly angulated, almost rounded; hind margin curved and oblique; dorsal margin slightly rounded; colour rather a warm tint of grey, from a faintly yellowish gloss which is usually perceptible; from the base is a deep black longitudinal streak slightly forked at one-half its length, and on reaching the first line branched on each side; an equally black straight streak, branched on each side at its origin in the second line, runs into the anal angle, and forms the "dagger" from which the species derives its common name. First line indistinct, double, curved, and scalloped above the dorsal margin; second line placed far beyond the middle of the wing, black, slender, curved obliquely outward from near the costal margin, thence curved down and repeatedly toothed as it passes toward the anal angle, above which it crosses the dagger-mark before attaining the dorsal margin. Another but much smaller dagger, crossing the middle of this line, points to the hind margin; the stigmata are only indicated by an irregular black streak giving off slender lines which represent parts of their margins, this streak being united with the costa by a black dash. Beyond this dash the costa is regularly spotted with black, with whitish interspaces. The narrow area outside the second line is usually clouded with darker grey, and the margin is spotted with black, which runs into the whitish cilia. Hind wings white, nervures beyond the middle brownish, where also is a faint angulated brownish transverse line; hind margin dotted and edged with brownish; cilia white. Female very similar, but with faintly darker hind wings more dashed with brown.

Underside of fore wings pale silvery grey, with the costa spotted with black, a grey central lunule, and brownish nervures; in some specimens with a blackish elbowed trans-

verse stripe beyond the lunule; hind margin dotted with black. Hind wings as on the upper side, but with a black central spot. Body whitey-brown; legs white, barred with black.

Not usually very variable. A specimen in Dr. F. D. Wheeler's collection is remarkably large and of a most curious leaden grey. As a rule, however, the dark suffused variation so common in the next species is not produced in this. Freshly reared specimens often have almost a pinkish hue, which usually fades, leaving merely the warm yellowish under-shade, but some of the specimens reared by Dr. Chapman are permanently and most exquisitely tinged all over the fore wings with a strong and decided pink flush, which, so far, is permanent; while others reared by him are suffused with equally delicate pinkish-yellow or yellowish; and some are pale slate-grey, or dusted with darker grey.

On the wing in June. Specimens reared from the egg sometimes emerge in September. This Dr. Chapman has once found to be the case with one-half a brood. No such second emergence seems to occur with us out of doors.

LARVA rather hairy, moderately cylindrical, with the incisions rather deeply indicated; a large black tubercle on the back of the fifth segment, and a broader hump on the twelfth, somewhat flatly pyramidal, white, with large black spots or irregular markings. Ground colour of the body black, with a very broad orange-coloured dorsal stripe interrupted with whitish; subdorsal stripes also broad, orange-red interrupted with black; two white dots on the black portion of each segment, from the fifth to the twelfth; spiracular stripe pinkish-grey, bright pink, or orange-red on the third and fourth segments and round the hinder part of the thirteenth; under surface and legs pale grey; head black. It may at once be discriminated from the following species by its short stout tubercle on the fifth segment, the orange dorsal colouring and the breadth and beauty of the sub-

dorsal red and black markings. The infant larva is described by Dr. Chapman as having no humps, but is almost covered with the plates formed by the raised spots, which are large and crowded, in some cases apparently fused together; each bears a long hair; the general colour is whitish, but segments 5, 8, 9, and 12, are reddish-brown. After the first skin is cast more hairs appear, and also indications of the coloured markings, but the eleventh segment is inferior to the rest in these respects. By the time that the second change of skin arrives an orange-coloured dorsal stripe has appeared, interrupted on the fifth segment, where already are faint indications of a hump, and on the twelfth, where is a white cross; the thirteenth segment is now bright orange-red. After the second moult the larva becomes very brilliant, a row of white spots on segments six to ten, and the white cross on the twelfth contrast with the rich orange of the dorsal band and the black below "so as to give the effect of gems richly set." After the fourth moult the head becomes black, the dorsal hump on the fifth segment has come to look like an excrescence rather than a portion of the segment, which in size and shape otherwise resembles the rest; from this the segments diminish to the eleventh, which still is rather small and weak, while the twelfth is large and furnished with its hump; the markings now tend towards those in the full grown larva, but are more complicated; orange-yellow on the back, then black with white spots, "like a boss of white porcelain," and orange-red spots and streaks; below this, fuscous marbled with reddish-white or dirty-white in small rings; below this, orange-red lines and patches. As it comes to full growth the inferiority of segment eleven vanishes, and the adult colouring is assumed; the hairs after the fifth moult are at first long, but gradually become broken or injured and far less conspicuous. When it has finished feeding and desires to spin up, the colouring becomes much more dingy. Dr. Chapman's details are so full that it is difficult to compress them into the space that can

be spared in a work of the present nature, yet I am unwilling to forego the advantage of them.

August, September, October, on hawthorn, apple, pear, plum, oak, birch, willow, but especially on fruit-trees and rosaceous plants.

PUPA of the usual form, of a polished brown horny texture and rather semi-transparent, so that a darker dorsal internal line and a paler lateral line are perceptible, the ventral surface being also paler; anal point with a series of fine bristles very slightly curved. In a cocoon behind a piece of loose bark, or in a chink of rotten wood, where a suitable cavity is hollowed out and finished off with a little white silk. The larva will, however, use a hollow stick, or hollow out the pith from a stick of bramble, raspberry, or elder, in which case the hole is closed by the top of the cocoon. If nothing suitable is provided, the accommodating creature will content itself with sawdust or even earth, forming an ordinary cocoon of silk and the surrounding materials. In this condition through the winter, and occasionally until a second year.

Not a common species, but probably sometimes overlooked from its close resemblance to the next. In the moth state it is very rarely captured at all, either at rest, or flying, or at sugar. Very possibly it prefers concealed situations, such as the higher branches of trees, since the vast majority of specimens in collections are reared. Hence its range is ascertained from recurrences of the larva rather than of the perfect insect, but, so far as is known, its habits are similar to those of its allies. Formerly it was not scarce in the London district, but seems now to have disappeared. Probably still to be found over the greater part of England, since it is recorded, in the Southern counties, from Kent to Cornwall, and in the former county and Sussex not uncommonly, also in Norfolk, Suffolk, the Cambridge Fen district, Gloucestershire, Herefordshire,

Worcestershire, Warwickshire, Derbyshire, Cheshire, Lincolnshire, and Yorkshire; in the latter county very local. I have no record further north in England, but in the south of Scotland there is a single record by Dr. F. B. White, of its occurrence in the Solway district. Probably throughout South Wales, since it has been found in the Swansea district, and in Pembrokeshire rarely. In Ireland it is recorded from Dublin, King's County, Galway, Sligo, and Donegal. The difficulty found in ascertaining its accurate range is increased by a misleading common name—it has erroneously been called the "Dark Dagger," and consequently there is reason to fear that some of the local records are merely of dark varieties of the next species.

Abroad it is widely distributed in Central Europe and the temperate portions of Northern Europe, as well as in Northern Spain, Bulgaria, Southern Russia, and Siberia.

7. **A. psi**, *L.*—Expanse, $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Very like *A. tridens*; of a rather colder grey; the second line makes a broader and more squared bend when turning in toward the costa.

The description of *A. tridens* is also that of this species, so very nearly that the only advantageous course appears to be to point out the slight distinctions. The thorax and abdomen in the present species seem to be slightly more robust and the shoulders a little more squared; fore wings slightly broader and more triangular; the ground colour of a colder grey—devoid of either pinkish or yellowish tone—but varying from whitish-grey to shades very much darker than are observed in *A. tridens*. The second line of the fore wings, at its origin on the costa, runs at first more parallel with that margin, and so, as it bends, makes a broader and more squared curve above the middle of the wing. Costal spots usually rather less distinct. In the female the hind wings are often more smoothly and generally suffused with brownish-grey, which in some instances is quite dark,

The present species is also very much more variable in ground colour than the last, from a whiter grey to a deep slate-grey or grey-black, but the markings are always distinctly deeper black and, in the vast majority of instances, the ground colour, whether darker or paler, is uniform. In some specimens, and more particularly in the paler forms, the two stigmata are completely outlined, in others the orbicular only, and in some, dark varieties more especially, the usual partial outlines are much restricted. Usually the hind wings vary darker, in some degree in accordance with the blackening of the fore wings, but this is not invariable, there being in some instances a sharp contrast. The blackest specimens are obtained in the outskirts of London. In a brood, reared by Dr. Chapman at Hereford, a number of specimens in both sexes have the dagger near the anal angle so much shortened that its upper end hardly extends over the inner side of the black second line; in these the first line is distinctly duplicated, and the enclosed pale stripe very conspicuously and obliquely shows itself in crossing the wing; the second line is also more angulated and flattened in its upper portion. This is a very remarkable aberrant form; Dr. Chapman calls it var. *bidens*.

On the wing in June, July, and August, in one generation emerging over a long period. I have no knowledge of any second emergence within the year.

LARVA cylindrical, with distinct segmental incisions; on the back of the fifth segment is a long, conspicuous, slender, upright tubercle, and on the twelfth a much shorter and broader dorsal hump. Head large, rounded, shining, slightly hairy; all the usual raised spots of the body emit a few blackish or reddish hairs. Colour greyish-black on the sides, a broad lemon-yellow dorsal stripe is interrupted on the fifth, twelfth, and thirteenth segments; spiracular stripe broad, whitish; between these stripes are two transverse bright red dashes on each segment; the long tubercle on the fifth

segment brownish-grey; hump on the twelfth edged behind with blackish. Head dark-brown, with a distinct dull orange facial Λ -mark. Spiracles black. On the second segment is a narrow dorsal line. Dorsal stripe sometimes chalky-white, especially when full-fed (C. Fenn).

The newly hatched larva is very distinctly larger than that of *A. tridens*; the raised spots are larger and more angulated and the lateral plates of the pro-legs very distinctly darker; segments 3, 4, 6, 7, 10 and 11 are pale, the rest dark, except segment thirteen, which is intermediate. Segment twelve is already large and dark. Each raised spot has a single hair. After the first moult the larva is blacker with longer hairs, second, fifth, and twelfth segments almost humped, the dorsal hairs black, the lateral white; dorsal stripe beginning to appear. After the second moult the dorsal stripe is more distinct and continuous, and the adult colouring begins to be noticeable, but the tubercle on the fifth segment is still only a hump formed of some of the dorsal raised spots; the hairs arising from the spots are more numerous, and the sides are reddish-grey marbled with yellowish-grey. From the third moult it gradually completes its change to the adult appearance. (Dr. Chapman.)

August, September, October, on rose, lime, hawthorn, birch, willow, and, indeed, on all the ordinary leaf-bearing deciduous trees.

It is very noticeable in the autumn from its bright conspicuous colouring, singular dorsal tubercle, and from its habit of wandering about the trunks of trees in the daytime, not only when full-fed and in search of a soft spot for pupation, but also when little more than half grown. Its wanderings are sometimes extended to footpaths and fences. Readily separated from the last species by the long, slender tubercle on the fifth segment, its pale yellow or whitish dorsal stripe, and narrower sub-dorsal black and red stripe.

PUPA elongate, shining, anal extremity blunt with several

minute bristles placed in a partial circle; deep mahogany red. In a compact silken cocoon in a hole or chamber in rotten wood. I have known a dead bough, from the top of a birch tree, when broken off by the wind, to show, at the point of fracture, the chamber inhabited by a pupa of this species, which ultimately produced the moth. The larva, however, is not particular, but will make use of the old cocoon of a *Cerura*, or any suitable hole in a tree, or will spin up under bark or among chips. In this condition through the winter.

The moth is a common and familiar object through the summer, loving to sit on a paling, the trunk of a tree, or the wall of a house. It flies at dusk, and comes readily to sugar, though not in the numbers which might be expected from its apparent plenty.

Common in all parts of England and Wales, and on the mainland in Scotland; common in Ireland, and there always of a pale colour. Also plentiful all over the Continent of Europe, except the coldest portions, and in Siberia and Northern Africa.

(*A. cuspis*, *Hüb.*—This is a species very similar to the two last, but larger and more strongly marked. Its larva has a long tubercle on the fifth segment, crowned by a singular tuft of long erect bristles. The species was recorded as British by Stephens (Illustr. 2-41), from his memory of a specimen in the collection of Mr. Hatchett and taken at Dulwich. This identification seems never to have been confirmed, and there is little doubt that the specimen in question was a large *A. psi*.)

In Dr. Mason's immense collection at Burton-on-Trent are two fine specimens, correctly named, which were obtained by him from the collection of the late Mr. Edwin Brown. They are labelled "Carter, Carrington Moss." There is, however, I believe, no reason whatever to think that *A. cuspis* is a genuine inhabitant of these Islands.)

8. **A. menyanthidis**, *Esp.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Fore wings grey with white clouds; orbicular stigma very small; second line sharply black; a black dash from the middle of the costa; hind wings grey.

ANTENNÆ of the male simple, rather stout, pale brown, barred at the back with white; palpi depressed, shaggy with long grey scales; head pale grey; thorax shaggy, whitish-grey; collar upright; shoulder lappets upraised; at the back a blunt, indistinctly divided crest; abdomen pale brownish-grey, each segment covered with long shaggy scales arising at its base; the basal segment having also a depressed grey dorsal tuft or crest, half hidden by the long loose scales; back of the following segments ridged and having diverging scales in the ridge; lateral tufts spreading, whitish; anal tuft greyish. Fore wings rather broad, with the costa nearly straight; apex bluntly angulated; hind margin long, oblique, regularly curved; dorsal margin rather short. Colour, pale slate-grey clouded with whitish-grey, or else with darker; from the middle of the base is a short, rather thick, black streak, below it, at the base of the dorsal margin, is a whitish tuft; first line only indicated by blackish atoms and a black dash on the costa; second line placed near the hind margin and well marked, black, scalloped between the nervures, and bending deeply inward below the middle, where it forms broader black scallops, the whole edged on the inner side by a whitish line; a very slender and small black dagger-streak crosses the black scallops, and points toward the anal angle; orbicular stigma remarkably small but sharply ringed with black; reniform stigma indistinct, black, but divided into two perpendicular black dashes, the inner of which is connected with the costa by one of a series of black costal spots; space beyond the second line darker grey; hind margin edged with faint black streaks; cilia whitish-grey, dashed with dark grey. Hind wings pale grey or whitish, clouded with grey, sometimes

clouded along the costal margin with grey-brown, and often with the nervures grey-brown; a central streak is faintly visible, grey-brown; cilia whitish, sometimes faintly spotted with grey. Female very similar, but the fore wings are usually more of a slate-grey, and the hind wings uniformly darker and varying to dark grey-brown.

Underside of fore wings dull grey-brown, margins rather paler; cilia dashed with blackish. Hind wings grey-brown or whitish, paler from the middle to the costal margin; central spot distinctly lunate, black; cilia whitish, clouded and dashed with dusky grey. Body much tufted, smoky white; anal segment dark brown and black; legs grey. In some specimens the fore wings beneath are silvery white with a leaden central shade, which also runs along the dorsal margin toward the base; in others the costa is spotted with black or has two large cloudy black blotches, with black central and dorsal clouds. The hind wings are sometimes pure white—the whole underside is, indeed, rather variable in this species.

Usually rather constant in colouring on the upper side, but in some specimens considerable blackening is shown at the outer edges of the first and second transverse lines. Such specimens are occasionally obtained in the Lancashire mosses. Blacker examples still are found, though rarely, in Yorkshire; Mr. S. J. Capper has two such, of a very dark grey with still blacker markings, and Mr. W. H. B. Fletcher one of a smoky-black.

On the wing in June and July.

LARVA stout, hairy, slightly attenuated at each extremity; head shining black; ground colour black, velvety; spiracles white, and beneath each, two red blotches; the usual raised spots emit bunches of reddish-brown, or black, hairs; one of these bunches lies between the pairs of red blotches on each segment; legs shining black. (Chas. Fenn.)

Dr. Chapman says that when just hatched the raised spots are pale, but soon become black, and the larva is then almost

entirely black. As it grows it shows the same pale segments and much the same colouring as the more closely allied species, the dark segments become smoky brown and the hairs are black, from one to six on a raised spot, and twice as long as the larva is thick; the pale segments show themselves more especially in white spaces around the raised spots; but there is variation at this stage, some of the larvæ being black and white. At each change of skin it is at first black, then grows paler; and when nearly one-half grown the fifth segment is thickened, as also is the twelfth, but as it continues to grow this thickening disappears. As it progresses toward full growth the colour is somewhat inconstant, being in one variety jet black, with the hairs either black or dirty whitish; in another the skin is browner, with few black hairs, the majority being pale brown; while a third form is intermediate, the third and twelfth segments blacker than the rest, the remaining segments with more black hairs, but the brown ones paler. None have any markings except the red lateral spots, which are dirty brick-red in varieties two and three, but in variety one of a rich pink-red. Of the full fed larva there is an aberration of a deep brown colour.

August, September, on willow, heather, sweet gale, whortleberry, bramble, bog-bean (*Menyanthes trifoliata*), birch, and even rushes and grasses. Very fond of the dwarf willows and birch bushes growing at the edges of wet spots on heaths. Feeding by day, and usually near the top of its food-plant.

PUPA very cylindrical, being of nearly the same breadth from the shoulders of the wing cases to within a short distance of the tail, where it is very suddenly tapered off; rounded in front; covers of the eyes and palpi prominent; abdominal segments each with a raised ridge like the hoop of a cask; anal bristles very small, on a short thick spike, unicolorous black-brown. In a strong, tough cocoon of brown silk among fallen leaves or rubbish, close to the

surface of the ground. In this condition through the winter, Mr. Fenn states that the cocoon is sometimes made among heather, and in such a case is ornamented on the outside with blossoms and fragments of heather.

The moth may be found in the daytime sitting on railings, if accessible, or on stones, or the bare ground in the mosses and on the moors. It flies at dusk, and is readily attracted by sugar; but is more frequently taken in the larva than in the imago state. Widely distributed in Yorkshire, Lancashire, and the north of Cheshire and Staffordshire, on mosses and heaths, and sometimes commons; also found in Cumberland, and probably in suitable places throughout the North of England. The only instance which I know of its occurrence farther south in England is the capture of two larvæ, one at Hickling, the other at Barton Turf, both in the Norfolk fens, by Dr. F. D. Wheeler, twenty years ago. One of these was reared, and so fully authenticated. There are instances of the capture of the species in North Wales (by Dr. Chapman and Mr. R. Newstead), but its favoured home is Scotland, where it is common on heaths and in moorland districts in Perthshire and throughout the West and North, in smaller numbers in the East and middle districts, and extends to Sutherlandshire, Moray, and Ross-shire; on the mountains ascending to upwards of 1000 feet. Much less common and more local in Ireland, though Mr. Kane has found larvæ in plenty in Galway, and it is recorded from Westmeath, Sligo, and Donegal. Abroad its range seems to be somewhat restricted, but it is found in most parts of Northern and Central Europe.

9. *A. auricoma*, *Schiff.*—Expanse $1\frac{1}{2}$ inch. Fore wings pale grey, marbled with darker, lines cloudy black; orbicular stigma distinct, reniform stigma elongated; an obscure dagger at the anal angle; hind wings pale grey.

Antennæ of the male simple, dark brown; palpi dark

brown, tufted, apical joint small, pale, and surrounded by a few long scales; head grey, mixed with black; thorax grey; collar and shoulder-lappets raised, the latter edged outwardly with black, an obscure crest at the back tipped with dark-grey; from below it long fascicles of yellow hair-scales converge over the base of the abdomen; the latter is yellowish-grey, and has upon its basal segment a broad oblique tuft or crest, not very visible from the abundance of long coarse yellowish hair-scales which cover this and the following segments, and rise on the dorsal ridge, into additional, faintly darker, tufts; lateral tufts small, yellowish-white, anal tuft similar, but longer and rather divided. Fore wings with the costa very straight; apex blunt; hind margin oblique but very little curved till below the middle, whence the curve sweeps round the anal angle; dorsal margin rather straight; colour greyish-white, much clouded and marbled with dark-grey; a black doubly-branched streak from the middle of the base crosses the first line, which is black, indented, not well-defined, but duplicated from the costa to the black streak, thence scalloped to the dorsal margin; second line far beyond the middle of the wing, black, deeply indented and scalloped, but clouded, and sometimes not very distinct; orbicular stigma conspicuous, white, ringed with black, and placed in a large squared whitish space; reniform stigma rather long and narrow, accurately kidney-shaped, edged at the back by a black line which arises on the costa, otherwise irregularly margined, and sometimes divided, with black; inside the second line is a slender parallel edging of white, outside it a broad transverse ill-defined cloudy-grey stripe, beyond which the sub-marginal region is paler grey dappled with whitish; hind margin spotted with black, the black extending in dashes through the greyish cilia. Hind wings whitish or pale brownish-grey, with the nervures rather browner; beyond the middle is a faintly whitish transverse stripe; hind margin more tinged with brown, and with a cloudy brown spot at the anal angle; cilia whitish. Female

very similar, the colour of the fore wings sometimes rather darker, and the hind wings more of a uniform pale grey-brown.

Underside pale greyish-brown, with three blackish costal clouds, from the third of which is a dark grey transverse stripe; cilia pale grey, barred with blackish. Hind wings whitish dusted with grey, with a distinct, slender, central, transverse, curved stripe, and in the curve a grey central spot; beyond it a second and more slender transverse line; hind margin edged with grey; cilia whitish. Body whitey-brown; legs whitish barred with grey.

Slightly variable in the depth of ground colour and in the distinctness of the markings, some specimens being pale and sharply marked, others much obscured with dark grey.

End of April, May, and again at the end of July and in August.

Certainly in some degree double-brooded, since the moths of the spring emergence are said to be the larger; and the moth has been reared in August from a June larva; but Dr. Chapman when studying the species did not find that the produce of eggs of the early specimens produced moths until the following spring.

LARVA, when full-grown, about one inch and a half long; cylindrical, but the head smaller. Ground colour of the body and ventral legs dark slate-grey; head and anterior legs black and shining; a black plate on the second segment; all the segments divided by very narrow black bands; a broad velvety-black transverse band across the middle of the back of each segment on which are placed four orange tubercles in the usual order, the anterior pair being much the larger, except on the third and fourth segments, where they are of equal size and placed in a transverse row; all the tubercles are furnished with bright golden-yellow silky hairs, which give the larva a very beautiful appearance. Spiracles white,

ringed with black; the sides of the body slightly garnished with hairs of a pale drab colour. (W. Buckler.)

The larva when newly hatched is pale, but very shortly the raised spots become black, and they are so closely set together as to make the larva appear quite black; when stretched out in feeding it can be seen that the third, fourth, sixth, seventh, tenth, eleventh, and thirteenth segments, are paler than the others. As it grows the spots separate and the larva becomes of a chocolate-brown with black spots and lighter markings—principally whitish rings round the raised spots and on the pale segments, and a white streak below them. The head is then black, the raised spots are furnished with from five to seven or eight hairs each. After the first moult the body again appears black from the larger size of the raised spots, but very soon the brown colour is again apparent; the fifth and twelfth segments are now swollen, or rather humped, and the eleventh noticeably small and slender; the hairs are more numerous, and the whitish rings round the raised spots gradually assume a yellow colour on the pale segments. A similar process of colour-changes takes place after the second moult, and yellow markings appear on the last two segments. After the third change of skin some larvæ continue similar to before, others begin to assume brighter colouring, and many of the raised spots become of a brilliant orange colour; the hairs, which are now still more numerous, varying from black to orange according to their position; the fifth and twelfth segments are still rather humped, and this continues after the fourth moult and till near full-growth when the twelfth segment has become even with the rest, and the fifth but very slightly larger. At the same time the adult colouring is gradually assumed, in some larvæ with only four changes of skin, in others with five. (Condensed from Dr. Chapman's memoir).

June, and the beginning of July, and in a second generation in September; on oak, birch, bramble, raspberry, and whortleberry.

PUPA rather cylindrical, rounded in front, elongated, with the abdomen slightly curved forward; segments of the abdomen with a distinct smooth hoop-like band; anal segments with a tuft of short stiff bristles. Colour dark chestnut brown, with the incisions of the free segments black. In a cocoon of whitish silk covered with morsels of leaf or rubbish, at the foot of a tree, or on the underside of a leaf, on the ground.

In this condition through the winter.

I find no record of the place of concealment adopted by this species in the daytime except that it occasionally sits on the trunk of a tree. It flies at dusk and is readily attracted to sugar, but restless, and easily frightened away. It is an exceedingly local species, inhabiting woods in the extreme south of England, apparently only in the counties of Sussex and Kent—Brighton, Hastings, Hailsham, Canterbury, Tenterden, Gravesend, and formerly rather common in the Rochester district.

Abroad it is found throughout Central Europe and great part of Northern Europe, Northern Italy, Northern Spain, Southern Russia, Armenia, and Siberia. Also widely distributed in North America, extending to the Hudson's Bay Territory, and bearing the names of *impressa*, *fasciata*, and *Verrillii*.

10. **A. euphorbiæ**, *Fab.*, *myrica*, *Gn.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings dark slate-colour, with lines and stigmata obscurely black; hind wings of male white, of female dark grey.

Antennæ of the male thick, simple, dark grey, toward the base barred, at the back, with whitish; palpi short, tufted, blackish-grey; head dark grey with a whitish tuft at the base of each antenna; thorax densely covered with blackish-grey raised scales, dusted with whitish; shoulder-lappets slightly raised and edged outwardly with black; at the back

is a crest divided into small double tufts edged with black; fascicles short, greyish white; abdomen dark grey or blackish thinly covered with soft white downy hair-scales; on the basal segment is a broad depressed dorsal crest rather obscured by long hair scales, and the following segments exhibit slight dorsal tufts of dark raised scales; lateral tufts spreading, whitish; anal tuft mixed grey and black. Fore wings slightly narrower than in the preceding species, with straight costa, blunt apex, oblique rounded hind margin, and rounded dorsal margin; colour blackish-grey, dusted with minute white scales so as to appear of a dark slate-grey, and having a white patch at the base of the dorsal margin; first line only visible as a series of blacker angulated streaks and spots; second line a succession of black scallops or deep crescents, edged inwardly with whitish; orbicular and reniform stigmata indicated by black outlines; cilia chequered, black and white. Hind wings white, with faintly brownish nervures, and tinged with grey along the costal margin; hind margin edged with black, cilia white.

Female darker, and with dark grey hind wings having white cilia; otherwise similar.

Underside of fore wings in the male pale grey much dashed with whitish between the nervures; costa spotted with black and one of the spots prolonged into a faint grey transverse line; cilia white, barred with black. Hind wings white, clouded with grey along the costal region; central spot, and a spot near the costal margin, black; hind margin edged with grey, cilia white. In the female the fore wings beneath are dark smoky-grey with the margins a little paler; hind wings paler smoky-grey with the spots faintly visible. Body mottled, grey and blackish, legs dark grey, first pair black with whitish bars.

Apparently not variable with us, yet regarded abroad as a permanent variety of a somewhat different Continental mountain form.

On the wing in April, May, and June.

LARVA hairy, moderately stout, tapering to each extremity; the spots tubercular and emitting bunches of rather short hairs, incisions deeply cleft; head small, rounded and shining. Ground colour dark olivaceous-grey, broadly and transversely banded with deep velvety black; a conspicuous pale lemon-yellow subdorsal blotch on each segment, interrupting the transverse black band, which is also interrupted laterally by a shining tubercle; spiracles prominent, whitish; below each of them is a red blotch tinged beneath with yellow; these blotches unite when the larva is contracted, and form a stripe; second segment with a red transverse dorsal blotch; tubercular spots emitting bunches of rather short, mixed, blackish and yellowish hairs. Head black with a yellow V on the face; under surface yellowish or pale brown, legs dark brown; pro-legs tipped with brown. (Charles Fenn.)

Dr. Chapman says, that when just hatched it is hardly distinguishable from the allied species; after the first moult it may readily be distinguished; it is reddish-grey much blackened by the black hairs and raised spots or tubercles; there is a yellow longitudinal line beneath the spiracles and a yellow transverse line across the back of the third segment. After the second moult, as it grows, the dorsal region between the spots becomes paler, sometimes nearly white, the spots conspicuously black, and the yellow lateral line broader. After the third moult the fifth and twelfth segments are rather disproportionately large, the colouring remaining much the same; but after the next change of skin this swelling of the two segments disappears, and shorter whitish barbed hairs appear, plentifully intermixed with the black ones; from this the adult colouring is soon assumed. Some are almost creamy white, others have a white trefoil-shaped mark on each segment, and some have even less white colouring; but the hairs are mixed, black and white, and give their own tone to the apparent colour. (Condensed from Dr. Chapman's Memoir.)

July, August, and September, on heather, sweet-gale, birch,

sallow, rose, and bramble, on heaths, but in cultivated ground on thistle, dock, sorrel, plantain, ragwort, and low plants generally. It has been fed up, in confinement, on poplar. It feeds by day, and revels in the bright sunshine.

PUPA elongate, anal extremity blunt and fringed with minute bristles; colour blackish with a purplish tinge at the incisions. In an elongate, compact cocoon of thin papery silk, spun up in a slight crevice in the face of a rock, among stones, etc. (Charles Fenn). Dr. Chapman says that at the top of the cocoon a weak place is left for emergence, silk being there rather sparingly used, though bits of external rubbish are brought closely together. He also remarks that the cocoon often has bits of burnt heather attached to it—though why larvæ should select places where the heather has been burned is not quite clear. Probably they like either the young shoots of heather or the low plants which soon begin to cover the burnt places. In the pupa state through the winter.

This species does not appear to have been noticed in these islands till the year 1846, when specimens were obtained in Perthshire by Richard Weaver of Birmingham, then a well-known collector for sale. Probably this indicates that, up to that time, very little had been done in working out the *Lepidoptera* of Scotland, since it is there a very well known and widely-spread species, not only on the moors and mountains of Perthshire, where it sits in the daytime upon the rocks and large stones, but in Ayrshire, Dunoon, and other parts of the Clyde district; also in Argyleshire on moors; and in Aberdeenshire and Kincardineshire, where it is common in the cultivated districts, by the road sides, and along the coast, and may be found sitting on walls and palings; also throughout the Northern counties to Sutherlandshire. In mountain districts it reaches an altitude of 2000 feet above the sea level. In Ireland it is rare, but recorded in the counties of Cork, Kerry, Galway, and Sligo.

I know of no record of its capture in England or Wales. Abroad, however, it, in various shades of colour, is very widely distributed through the Continent of Europe, including Southern Europe, where it even extends to Syracuse and Turkey, becoming of a very pale colour. It is also found in Asia Minor, Armenia and Siberia. The form of the species found in Scotland also occurs in the Alps, and is there called var. *montivaga*.

11. **A. rumicis**, L.—Expanse, $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Fore wings grey, much mottled, streaked, and dotted with black; a clear white double spot close to the dorsal margin before the anal angle; hind wings pale grey-brown.

Antennæ of the male rather stout, simple, brown, with the back of the shaft blackish; palpi dark grey, the final joint surrounded by tufts of long scales; head grey mixed with blackish; thorax rough with raised scales; collar nearly erect, greyish-white tipped with black; shoulder lappets uplifted, whitish, edged with grey and black, rest of the thorax dark grey mixed with white and having at the back a small double crest the tufts of which are tipped with black; abdomen yellowish-grey, with abundant long yellowish hair-scales covering the basal segments, of which the first also bears a broad, dorsal, black and white crest, partially concealed by the long scales and easily shaken off; lateral and anal tufts mixed with dark-grey or blackish scales. Fore wings moderately broad; costa very slightly curved; apex blunt, almost rounded; hind margin curved and but little oblique; dorsal margin straight to near the base, where is a tuft of dark yellow scales; colour dark grey marbled with black; from the base above the yellowish tuft arises a short black streak broken and much obscured; close above it are, very commonly, a white or greyish-white patch and some small black lines toward the costa; first line black, duplicated, broken into separate curves, much obscured by black marbling; second line also obscured, deep black, consisting

of a series of crescents having long points upon the nervures ; orbicular stigma indistinct, ringed with black, and containing a central black dot ; reniform stigma still more obscure, but connected with the costa by a black line ; outside the second line is a series of ill-defined white spots near the hind margin, and a far more distinct pair of white spots or lunules precedes the anal angle ; hind margin whitish regularly spotted with black, the black colour extending into the whitish cilia. Hind wings pale yellowish brown, lightest in colour in the middle ; nervures rather darker ; an ill-defined dark grey-brown band lies along the hind margin ; cilia whitish. Female a little larger and with stouter body, otherwise quite similar.

Underside of fore wings pale-grey with darker nervures ; costal region paler but spotted with blackish ; a small blackish cloud lies near the costa in the middle ; cilia grey, spotted with black. Hind wings whitish, dusted with ashy-grey ; cilia whitish, faintly spotted with brown ; body whitish-brown ; legs with greyish-white tufts but barred in front with black.

A rather variable species in the depth and extent of the black marbling, which in our northern and western districts is frequently so much extended and intensified as to obliterate the pale grey ground colour and change the whole to blackish-grey with still deeper black markings, though the twin white spots before the anal angle, and the white dots outside the second line are usually constant and often conspicuous. This variety is known by the name of *salicis*, and was named and figured by Curtis as a distinct species. His figure is very accurate, yet is quoted by Staudinger as a variety of *A. menyanthes*, to which species it appears to bear no resemblance. This error doubtless arises from Curtis's figure of the larva, which is erroneous. This variety is found even so far south as Salop, and is said by Mr. T. C. Woodforde to be common near Market Drayton. In the mosses of Lancashire it is sometimes found having, in addition, a deeper black, broad central band ; sometimes also one of the white twin spots is

obliterated, and occasionally both. Some very beautiful black forms are taken in the South of Ireland; indeed both forms are generally distributed and co-existent in that country, and very pale clearly marked specimens are found at Armagh and in Down. Mr. Adkin has reared various forms, ranging from grey to nearly jet-black with but one white spot, from eggs laid by one of the dark forms from that country. He has also curious pale small specimens from the Scilly Isles. A specimen in Mr. F. J. Hanbury's collection, and taken in Essex, has the base and hind marginal space blackened, the middle of the wings grey, and is very pretty.

On the wing in June and July, and occasionally, as a second generation, in August or September.

LARVA stout, tapering to the head from the fifth segment, which is stout and almost humped, twelfth segment also broadly humped, head rounded, highly polished; body hairy, the hairs arranged in transverse rows of bunches which arise from the usual spots; lateral spots raised. Ground colour black or blackish, the back velvety black: a series of couples of red dorsal spots, two on each segment, the hinder of the pair transversely placed; these spots are obsolete on the last two segments and less conspicuous on the second and third; on the fourth, and from the sixth to the twelfth is a series of conspicuous wedge-shaped silvery-white subdorsal blotches, rather obliquely placed, and with the apex behind; spiracles distinct, white; below them a conspicuous stripe from the fifth to the twelfth segment composed of Λ -shaped primrose markings, alternating with reddish blotches; hairs pale reddish-brown, those on the fifth segment greyish-brown; head and legs black; under surface dark greyish or purplish-brown. (C. Fenn.) Dr. Chapman has found, at Llandudno, a curious variety of this larva—"ground colour light salmon, with some darker marblings, lateral line white, interrupted by a salmon-coloured subspiracular tubercle; some dark marks between the dorsal yellow dashes and subdorsal white

marks; spiracles white on a dark mark extending forward to the next incision; hairs reddish-salmon; head black with the large lateral area reddish, and clypeus reddish with a black centre."

The newly hatched larva is pale, but very soon the raised spots or tubercles become black, and some of the segments present the usual alternate pale and dark colouring, while the eleventh segment is, as in the other species, weak; the pale segments are pale reddish, the raised spots on them being ringed with white; the dark segments brown, with reddish rings round the raised spots. The hairs are few, either one, or five to six, on each spot, and of unequal length, black. After the first moult the body is darker, appearing blackish, but with the tubercular spots ringed with paler; the fifth segment is enlarged and the twelfth decidedly humped; the hairs longer and more numerous. As it approaches the second moult the colour has become fuscous-brown, and the white rings round the spots take the form of a series of small orange-yellow spots and blotches; those round the lower lateral tubercles almost form a yellow lateral line. After the next change of skin it is again black, the tubercles and more abundant black hairs leaving nothing else visible except a reddish lateral line and some pale markings in the hinder segments. It now begins to sit in the peculiar attitude of the larva when full grown—"head pressed flat, with the jaws forward; dorsal surface rising thence rapidly to the hump on the fifth segment, then falling with a hollow sweep to the eleventh, and rising suddenly to the hump on the twelfth." After the third moult the fifth segment is more conspicuously humped, the general colour is black, but there are conspicuous square white markings on the eleventh and twelfth segments, and similar indications on other segments; also a row of dorsal red spots, which tend to be red transverse lines, in the incisions of the segments; and a broad red lateral line. After the next change of skin the larva "viewed dorsally, looks like a black cross in a white setting; the dorsum is black and the fifth

segment with its tubercles and hairs is also black, whilst the subdorsal hairs of the second, third, fourth and sixth segments and onwards are whitish; and white lozenges on the tenth, eleventh and twelfth complete the white border toward the tail." The colour gradually changes till, before the following and final moult, the adult colouring is assumed. (Condensed from Dr. Chapman's memoir.)

July, August and September on dock, plantain, knotgrass, sorrel, strawberry and many other low plants, also on bramble and sallow; feeding by day in the hot sunshine.

PUPA cylindrical to the end of the two free segments of the abdomen, then rapidly tapering, but with the segments ridged, the hind margin of each being raised in a smoothly rounded projecting rib or hoop. In front are two rough knobs situated between the bases of the antennæ; wing and limb-covers well marked; anal extremity conical, broadened at the tip, with a dense brush of fine bristles. Deep blackish purple, or black, incisions paler purple or reddish. Tightly spun up in a tough silken cocoon covered outside with morsels of earth, wood, moss, or rubbish, above or upon the surface of the ground. Mr. D. C. Campbell of Londonderry writes, "we noticed a strange habit in the larva. Having partially formed its cocoon on the side or in the corner of a box it descended to the mould below and attached its threads to many small particles of earth; it then ascended again, and ensconcing itself again in the cocoon, drew up the little particles around it by means of the threads. I have watched the process from beginning to end." In the pupa-state through the winter.

The moth may be found occasionally, though not frequently, on the trunk of a tree or on a paling in the daytime, but, doubtless, it usually hides among leaves. It flies at dusk and is readily attracted by sugar placed upon tree trunks, on which it settles down with the utmost confidence, and may be taken off by the hand. Not very common in the extreme South-Eastern Counties, but occurring everywhere in suitable

districts in England, and in many parts, especially wooded districts, in abundance. Formerly it was common in the outskirts of London, but from some cause has not been noticed there for several years. In Wales it is plentiful, to Pembrokeshire; in Scotland generally common in both pale and dark forms; extending to Moray and West Ross, and in the mountains reaching an altitude of 2000 feet above the sea-level; also all over Ireland, and perhaps more extreme in its variations there than in Scotland or England. Abroad it is very widely distributed all over the continent of Europe except in the extreme north, also in Northern Africa, Northern Asia, Turkey, China, Japan, and the Corea, occurring in the same variations. Its habit in this country of producing a partial second generation in the year is confirmed, and doubtless extended, in warmer climates, since at Gibraltar it is said to emerge from the pupa in February.

The figures 320, 321 called "*euphorbia*" and "*euphrasia*" in Wood's *Index Entomologicus* appear to refer to the dark varieties of this species, as well as that of *salicis* in Curtis's work.

12. **A. ligustri**, *Schiff.*—Expanse $1\frac{1}{2}$ inch. Fore wings dark olive-green or olive-brown, abundantly marbled with black; orbicular stigma paler; a large ovate pale blotch beyond the reniform stigma; hind wings dark grey-brown.

Antennæ of the male rather short, simple, dark-brown; palpi tufted, whitish barred with black; apical joint obscured with long scales; head whitish with three black horizontal bars; thorax mottled, black and white, the collar and shoulder-lappets being white, broadly edged with black, the upper surface similar, and at the back a large crest bordered and tipped with black; fascicles of moderate size, yellowish; abdomen yellowish-brown with a dorsal row of four or five black tufts or crests; lateral and anal tufts small, brownish. Fore wings rather broad; costa gently curved; apex bluntly rounded; hind margin not very oblique, and very gently rounded, with the anal angle rather full; dorsal margin

straight to near the base; ground colour dark olive-green or olive-brown, very much obscured with black marbling, especially so in the basal area and in a broad ill-defined band across the middle, otherwise rather mottled with white; costal margin dotted with white; first line double, much indented and greatly obscured, deep black and margining the basal blackened region; second line also black but indistinct and much indented; orbicular stigma rather large, round, white or whitish, ringed with black and centred with blackish-brown; from it a small white blotch attains the costa, and a series of white, or pale olive, clouds and dashes passes to the dorsal margin; reniform stigma very indistinct, faintly edged with black, its outer half lying in a large ovate white blotch which occupies the greater part of the apical region from the costa to below the middle, and is much rippled with blackish cloudy lines; it also contains a small slender dagger-streak, and is often followed by cloudy white blotches similarly rippled toward the hind margin and apex; hind margin ornamented with a slender white line placed in crescents which enclose black spots; cilia whitish with large regularly placed black spots. Hind wings pale grey-brown, darker toward the hind margin, and with obscurely browner nervures; cilia grey-brown tipped with white. Female very similar, slightly stouter.

Underside of the fore wings dark grey in the middle, paler at the margins, and the costa spotted with black; cilia white with round deep black spots. Hind wings whitish dusted with grey; central spot dark-brown followed by a slender, curved, dark grey transverse stripe; a dark grey cloud lies along the anal angle; cilia whitish with large brown spots. Body dusky pale brown, legs whitish with large black bars.

Variation in this species appears to be in a great degree climatal; the more northern and western districts producing forms in which the ground colour is of a deeper olive-green, or deep olive-brown or even almost purplish-black; the

transverse lines double and the other dark markings intensified; broken black clouds lying between the nervures; the white markings obliterated, or only existing as faint dashes between the double transverse lines, at the edge of the stigmata, and in small scallops along the hind margin; and the usual large ovate blotch obliterated; the hind wings and underside also darker. Almost every intermediate shade of variation also occurs, or the white markings are replaced by yellow, and in many the white ring of the orbicular stigma is very distinct. These dark forms are sometimes called collectively by the name of var. *coronula*, a name which Haworth appears to have used to designate a grey variety which he looked on as a distinct species. There is in the collection of Dr. Mason a specimen in which the base of the wing to the first line is strongly tinged with yellow.

On the wing in June and July.

LARVA nearly cylindrical, tapering but little at each end except that the head is decidedly smaller than the second segment; not very hairy, a single hair only arising from each raised spot. Very clear, semi-transparent, glaucous green, so that the internal vessels are visible; the head especially transparent, green with the mouth brownish; dorsal line yellow or white, very slender, sometimes only visible on the middle segments; subdorsal lines narrow, yellow, complete; spiracles pink or orange; raised spots very small, black; legs and prolegs green.

Dr. Chapman says that when newly hatched it is whitish or colourless, except the head, which soon becomes black with the jaws brown; the raised spots are slightly outlined in a darker shade; each has a single hair which is greyish at the base; the raised spots or tubercles do not appear crowded as in young larvæ of the allied species, but the eleventh segment is flatter than the rest, as in them, and its spots and hairs smaller. After the first moult the head becomes greenish with a large black shade over the upper

portion, and the yellow stripes begin to appear. After another change of skin the head is still paler, but with a distinct black lunule on each side, the yellow stripes are more distinct, and the general colour has become a pale apple-green. When about to moult the new hairs beneath the skin are readily seen, folded across the back in a regular pattern. After this stage there is little alteration in appearance, except that the adult colouring is soon assumed.

August and September on ash, privet, and occasionally hazel. Apparently it feeds mostly at night, since it is always found in the daytime resting on the underside of a leaf and usually stretched along its midrib, or even along the petiole of an ash leaf, its more usual food. Here, Dr. Chapman says it is difficult to see, its form and colour assimilating it so closely to the leaf-stalk or rib on which it rests.

PUPA short and thick, cylindrical or a little the broadest across the base of the abdomen, but tapering very rapidly off to the anal extremity, which is broadly and bluntly pointed and provided with eight stout points hooked downward; there is a decided protrusion in front of the rounded thoracic portion. The back of the abdominal rings is, in such, sculptured into furrows or channels, two on each, and the pupa is in most respects very unlike those of its congeners. Its colour is brown, clouded with black on the back. In a cocoon of dark, nearly black silk, in one dense layer of considerable strength, but without any mixture of extraneous material; adhering, if possible, to some neighbouring object, and irregular in shape. Very frequently the cocoon has a valvular slit, apparently as a provision for the exit of the moth. Often it is spun up under moss on the trunk of a tree, or else attached to a stem or leaf at the surface of the ground. (Condensed from Dr. Chapman's memoir.) In this condition through the winter.

The moth usually sits in the daytime on the branch of a tree and may occasionally be knocked off, when it falls, as though dead, to the ground. It flies at dusk and comes to

sugar on tree trunks, sitting down perfectly quietly. Its habits are quite like those of other species in the genus, but in many small details of structure in its stages of growth it differs from them to such an extent that its removal alone into a separate section of the genus, by Dr. Chapman appears to be fully justified. It is not a very common species, but widely distributed, occurring where ash is common in almost every English and Welsh county, though in many of them local or uncommon. Also widely scattered in Scotland, through the district of the Solway, the Clyde and the Tweed, Aberdeenshire, Kincardineshire and Moray, and even common in Perthshire and Ross-shire. Very much more local in Ireland, since it is only recorded from Galway, where it has been met with in several localities.

Abroad it is found throughout Central Europe, the temperate portions of Northern Europe, Southern France and Southern Russia.

Genus 3. **ARSILONCHE.**

Antennæ simple, ciliated; eyes naked, with prostrate lashes at the back; head tufted; thorax covered with long, loosely prostrate scales, not crested; abdomen smooth; fore wings long and rather pointed; hind wings not very ample, vein 5 very slender and weak, arising from an angle in the middle of the cross-bar.

LARVÆ hairy, brightly coloured

We have only one species.

1. **A. Venosa**, *Bkh.*; **Albovenosa**, *Stand. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings pointed, reddish white, with two or three longitudinal brown or blackish lines; hind wings pure white.

Antennæ of the male stout, simple, brown in front, back of the shaft white; palpi tufted to the tips, whitish with a brown dash on the outer side; head and thorax whitey-brown, loosely

scaled; collar and shoulder lappets a little raised; no real crest at the back, though the long thoracic scales are drawn together into a faint knob; abdomen rather long, white, covered with long white scales which rise in ridges not amounting to crests, on the back of several of the segments; lateral and anal tufts dense and spreading. Fore wings rather narrow and pointed; costa gently curved to the apex, which is sharply angulated; hind margin slightly hollowed below it, then obliquely and gracefully rounded off to the dorsal margin, which is also curved. Colour whitish, abundantly dusted with pale brown or pale reddish scales, and with longitudinal faintly brownish stripes, occupying the spaces between the nervures; a slender dark-brown or blackish longitudinal line, from the middle of the base, extends in a faint curve beyond the middle of the dorsal portion of the wing and sometimes nearly attains the hind margin; another of a paler brown, above it, lies along the upper side of the median nervure, through the middle of the wing; these two streaks being the only conspicuous markings. Cilia white with a faint brownish dividing line. Hind wings pure clear white; cilia similar. Female much stouter and with the fore wings more pointed and frequently longer; otherwise similar. Underside white, faintly dusted with yellowish atoms along the costal margins of all the wings; fore wings with a row of slender black dashes at the base of the cilia; body white; legs brownish, browner in front.

Slightly variable in the degree of reddish, or brownish tinge on the fore wings and more so in the length and intensity of the dark longitudinal lines.

On the wing in June.

LARVA nearly cylindrical but flattened beneath; rather thickly covered with very soft short hairs; head rather large, rounded, black, with a large white triangle on the face, and a pair of converging white lines above it; body pale yellowish dusted with black, with a broad black dorsal line, sometimes

interrupted at the junction of the segments; subdorsal stripe broad, blackish-brown, interrupted by a series of large blotches—orange-red above, orange-yellow below, and with small white markings at the segmental divisions; under-surface pale greyish or whitish; hairs mixed black and white; legs and prolegs pinkish.

Dr. Chapman says that the newly hatched larva is whitish but soon gets darker, the head becoming black, and the fifth, eighth, ninth and twelfth segments brown, while the remainder continue pale, the raised spots are distinctly larger and darker on the dark segments, but very small on the eleventh; they have from one to three long hairs apiece. As in other species constituting the section *Viminia*, these spots are very large, crowded, and black after each moult; and segment eleven is depressed and weak. After the second moult the colour is rufous marbled in two shades; the fifth segment is now the largest and from it the larva tapers behind. After the third moult the colours are black and orange, with bluish grey sides and a yellow subdorsal stripe; the dorsal area being of a blackish-brown, and the hairs are still long. From this the adult form is gradually assumed, the inequality of size in the fifth and eleventh segments disappearing altogether, and the hairs assuming their shorter length.

July to September on common reed (*Arundo phragmites*) and sometimes on *Poa aquatica* and other coarse fen grasses. Feeding openly upon the reed leaves in the early evening and at night, but usually concealing itself lower down upon the plants in the daytime.

PUPA much like that of *Acronycta rumicis* but more slender; the marginal hoops of the six abdominal segments very distinct and pronounced; apical segments very shortly and rapidly tapered off; anal point with a bunch of bristles. In a thin slender cocoon of whitish silk among dead grass-leaves, bits of reed, drawn-together reed leaves, or among rubbish near the ground. (Condensed from Dr. Chapman.)

Mr. E. Newman noticed that larvæ which he reared, cut a number of blades of grasses upon which they happened to have been feeding, into short lengths of an inch or an inch and a quarter, and then spinning a cocoon, generally between two principal stems of the grass or reed, thatched it with the small cut-off pieces, leaving no part of the silk visible.

In the pupa state through the winter.

This moth differs altogether in appearance from those of the preceding genus. Its colour and markings, like those of so very many other fen-frequenting species, being accurately suited to its habit of hiding in the daytime among the dead leaves of reed, sedge, and marsh grasses. Yet its larva and pupa so closely agree with those of one section of that genus that Dr. Chapman includes it with them, as already stated, in the section *Viminia*. It flies at dusk, and at night, and may occasionally be taken flying, or at a strong light, but does not appear very susceptible to the attractions of sugar. Sometimes it may be found at night sitting upon the upper parts of the reeds. Strictly a fen-frequenting insect, widely distributed in those of Norfolk, and tolerably common in Wicken Fen, Cambridgeshire. Formerly in all the Cambridgeshire fens, and doubtless at one time throughout that extensive region in which Hereward so long kept the Norman Conqueror at bay. Abundant at Whittlesea Mere, when that grand preserve of the fen insects still existed. Also recorded from St. Ives, Hunts; Wisbech; and in some small remains of fens in Suffolk. This appears to be the extent of its present range in these islands. Abroad it is found in similar situations, in Holland, Germany, Northern and Eastern France, Hungary, Bulgaria, Central and Southern Russia, and in North America.

Genus 4. **AGROTIS.**

Antennæ either pectinated in part, notched, or naked; eyes naked, lashes prostrate; thorax crested, though in some cases but faintly so; abdomen smooth, usually rather flattened; fore

wings long, narrow, usually somewhat blunt, in repose laid flat on the body and rather overlapping; hind wings rather ample, of thin texture, deeply folded in repose and with vein 5 very weak, originating from the middle of the cross-bar.

LARVÆ not hairy, thick-skinned and shining, of dirty colours, but with glossy raised spots, and with horny dorsal and anal plates. Hiding by day under the surface of the ground, feeding at night on grass and low growing plants.

PUPÆ of ordinary form, but with two diverging anal spikes; subterranean.

The transition to this group of comparatively plain-looking species of more typical *Noctuæ* appears somewhat abrupt, but the connection of this with the genus *Acronycta* through exotic species is very close. Variation in some of the species is so extremely wide that a satisfactory table seems to be impracticable.

1. **A. valligera**, *Hüb.*; **vestigialis**, *Staud. Cat.* Expanse, $1\frac{1}{2}$ inch. Antennæ of male pectinated; fore wings pale brown; stigmata all conspicuous, dark, divided by an oblique pale stripe; hind margin dark brown, preceded by black wedges; hind wings whitish.

Antennæ of the male pectinated with solid teeth in nearly opposite rows, the teeth ciliated, tapering off shorter beyond the middle of the shaft, so as quite to disappear and leave the apex threadlike; olive-brown, the shaft paler. Head and palpi strongly tufted, olive-brown, blotched with white; collar very broad, pale olive-brown or reddish-brown, barred with darker brown, and edged with white; shoulder lappets conspicuously whitish, edged with brown; remainder of thorax covered with very long pale olive-brown scales, tinged with deeper brown or reddish, and partially erected so as to form small top and back crests, the tips of which are whitish; fascicles long, white; base of abdomen covered with long

loose whitish scales, remainder pale brown; lateral tufts inconspicuous; anal tuft long and narrow, pale reddish. Fore wings narrow, almost truncate; costal margin straight, apex squarely angulated; hind margin, below it, straight, but elbowed in the middle and curved off at the anal angle; dorsal margin gently curved; colour drab, or very pale olive-brown or reddish-brown; all the nervures edged with white, the median broadly so; basal line indicated by two blackish streaks edged with white; first line incomplete, formed of one, two, or three black curved streaks edged inwardly with white, not approaching the costa; second line oblique, a little bent but obscure, composed of ill-defined black crescents edged outwardly with white; subterminal line white, preceded by a row of black wedges pointing inward, but usually obsolete toward the costa; hind margin clouded with dark brown and edged with flat black lunules; orbicular stigma small but distinct, ovate, whitish, edged with black; reniform stigma large and conspicuous, clouded with dark brown and bordered with black; between them is a rather squared blackish or brown spot in the discal cell; claviform stigma long and large, like a canine tooth, dark purple-brown edged with black; between this and the two upper stigmata a broad oblique stripe of pale ground colour, arising at the base of the wing, and sometimes branched along the costa, is very conspicuous and reliable; costa edged usually with broken blackish streaks; cilia long, whitish, chequered with brown dashes. Hind wings very slightly hollowed below the apex, otherwise rounded; glossy white with a brown central lunule, brownish nervures, and a slender pale grey transverse stripe along the hind margin and extending itself more broadly along the apex and costal region; hind margin usually dotted with brown or black; cilia pure shining white.

Fore wings of the female rather narrower and more obscurely coloured, dark brown or dark olive-brown, nervures blacker and hardly edged with whitish, except the median, which is bordered by the usual broad oblique pale stripe; the

edges of the transverse lines are also usually pale, that of the first line more especially so, as also is the interior of the orbicular stigma and the inner edge of the reniform stigma; hind wings grey-brown, sometimes more whitish toward the base, but with grey nervures.

Under side of the fore wings glossy pale grey, the whole surface of the discal cell covered with long soft hairlike scales; reniform stigma black, followed by a curved dark grey transverse stripe and a parallel whitish stripe; nervures whitish; cilia whitish, tipped with grey. Hind wings white, with a large grey central spot, beyond it a curved transverse row of grey streaks, and at the apex a grey cloud; margin streaked with black; cilia white. Body dark brown, tufted with whitish scales; leg tufts large, brownish white; legs very bristly, dark brown, barred with white.

Rather variable. In the male the ground colour is sometimes whitish drab, and in such specimens all the markings are occasionally obscured and indistinct, so that the fore wings are nearly unicolorous, but in other cases the stigmata are all strongly marked, while the other markings are almost obliterated. Olive-brown specimens are sometimes as obscurely or as sharply marked, and frequently the black spot between the two upper stigmata is obliterated. The more reddish forms are commonly well marked, showing the lines, stigmata, and hind marginal wedges to great perfection, and frequently these specimens are of slightly larger size. In the female the range of variation in colour is quite as great; these are occasionally of a pale drab, but more often dark red-brown or deep olive-brown, sometimes clouded with blackish, especially toward the middle of the dorsal margin, in others richly clouded with reddish, while the pale oblique stripe comes out most conspicuously; the stigmata are large and very dark, in a deep brown stripe, and the hind marginal wedges and clouds very sharply defined. Sometimes a dark cloud along the costa unites with the upper stigma, in other cases the subcostal region is conspicuously pale. The thorax

varies in depth of colour in conformity with the fore wings, and the hind wings in both sexes follow suit—from clear, pure white in the palest males to pale greyish brown in the darkest; and in the females from pale grey, varied with white, to dark grey. Occasionally, in both sexes, the fore wings are tinged with grey rather than brown. There is also a tendency to local variation, a peculiar faint shade of umbreous, for instance, in Lancashire specimens, differing a little from the various shades observable on other coasts, while in the south-west are seen rather brighter shades of reddish. All the variations melt insensibly into each other; it appears impossible to draw any definite lines of variation; yet the species has been loaded with varietal or synonymic names—*sagittiferus*, *trigonalis*, *clavis*, *clavifera*, and others—which seem to have no definite application and to be of little importance:

On the wing in July and August; in very early seasons, and warm districts, occasionally before the end of June, but apparently in but a single generation.

LARVA smooth, shining, naked, moderately plump, two inches in length, pale olive-grey, rather tinged with brownish or purplish on the back; head yellowish brown; dorsal plate brownish, barred with blackish brown or purplish brown; dorsal and subdorsal lines darker grey or purplish grey, double, rather obscure; ordinary raised spots and spiracles black; under surface very pale grey.

August to May, apparently dormant only in very cold weather, feeding during the milder portions of the winter; on grasses, various species of *Galium*, *Alsine*, and other low plants growing on sand hills; hiding itself in the daytime at a depth of one or two inches beneath the surface of the sand, but coming out at night to feed. Will eat lettuce and dandelion.

PUPA pale reddish brown, beneath the surface of the sand.

The moth hides itself in the daytime among *Ammophila* and other coarse grasses on the sand-hills, and very frequently among the overhanging masses of grass roots in any place where the sand has fallen, or been blown away, leaving such shelter available. At dusk it flies freely, and may be attracted by sugar placed on twisted masses of grasses. It, however, greatly prefers flowers, especially those of the common ragwort (*Senecio jacobaea*) and of the marram-grass (*Ammophila arundinacea*). Apparently its flight is mainly at dusk and during the early part of the night—perhaps again towards morning. Its habits in the daytime are in some degree affected by the weather; when this is moderately cool or damp and cloudy the moth is quite sluggish, and when shaken out of its hiding-place will roll down upon the sand; but if the sun is hot it bustles up when disturbed, and flies vigorously to a safer hiding-place. In rare instances, in intensely hot weather, it will fly voluntarily throughout the afternoon, and I have seen it under such circumstances in scores flying to, and feeding from, the blossoms of *Scabiosa arvensis*, *Centaurea*, *Silene*, *Crepis*, and other plants.

Usually attached to sandy coasts, especially where an extensive range of sand-hills has accumulated and become covered with coarse grasses. Common in such situations on the coasts of the Eastern and Southern Counties, but less so toward the South-west. In Dorset it seems to be scarce, and also in Somerset and Gloucestershire; but more frequent in Devon, on both North and South coasts, and in Cornwall. I have taken it, though rarely, in Pembrokeshire, but have no record from other parts of South Wales, where it surely must occur. Rather common on the coasts of Lancashire and Cheshire and also of Yorkshire, where also it has been taken, rarely, inland. In Scotland it has been found in Ayrshire, at Ardrossan, all suitable places on the East coast to Morayshire, and in the Orkneys—where it is quite as pale in colour as in the south of England. Widely distributed on the Irish coast—Dublin, Antrim, Derry,

Donegal, Sligo, and probably in all suitable places, but not very common and in some situations even rare.

Besides the coasts there is one inland locality in which it is plentiful—the extensive sandy district known as the “Breck Sand” in the western portions of Norfolk and Suffolk, round Thetford, Brandon, Bury St. Edmunds and Tuddenham. These sands are supposed to have been the ancient coast when the sea extended from the Wash over the whole of the present Fen district, and here the present species, with several of its coast companions, is still found. There is a record of its occurrence even on the border of Huntingdonshire. Casual specimens also find their way on to the sandy heaths which lie near the sea in the neighbourhood of King’s Lynn.

Abroad it is widely distributed in Central, and especially in Northern Europe; also in the North of Italy, Corsica, and the South of France.

2. **A. suffusa**, *Hüb.*; **epsilon**, *Staud. Cat.*—Expense $1\frac{3}{4}$ to 2 inches.

Antennæ pectinated. Fore wings very long, dull brown, clouded to beyond the middle with dark brown; outside the reniform stigma is a distinct black wedge. Hind wings shining greyish-white with dark nervures.

Antennæ of the male long and strongly pectinated with solid ciliated teeth in nearly opposite rows, but tapering off from the middle of the shaft, so that the apical portion, for one-third of the whole length, is threadlike; colour dark brown. Palpi short, with strong separated tufts of scales on the first and second joints, by which the third joint is almost concealed; dark grey dusted with blackish. Head tufted, purplish-brown streaked with black; eyes edged at the back with mixed black and white lashes which are nearly prostrate. Collar raised, brown, barred strongly in front with black, above this paler purplish-brown; remainder of thorax pale purplish-brown, or pale brown dusted with

darker, and having at the back a very insignificant crest. Fascicles very long, broad and converging, smoky-white; abdomen smoky-brown, with long paler scales; lateral and anal tufts similar; small. Fore wings long and narrow, costal and dorsal margins very straight, apex blunt, hind margin rounded, rather full or almost bluntly angulated in the middle; colour pale brown with a faint reddish gloss; clouded along the costal region with smoky-black; extreme costal edge usually marked with five or six yellow dots; basal line very indistinct, blackish, edged faintly with yellowish; first line perpendicular, duplicated, blackish, looped and repeatedly angulated; second line far beyond the middle of the wing and nearly perpendicular, formed of an almost straight double row of small blackish lunules followed by a row of minute black dots; between the first and second lines, but nearer the latter, is a cloudy, blackish, transverse shade of varying width, often slender, sometimes broad and throwing a dark clouding back toward the base; orbicular stigma round or ovate, or with a projection outward, small, edged with black and centred with grey; reniform stigma also edged with black and containing a dark cloud edged inwardly with black; space between these two stigmata usually blackened; from the outside of the reniform stigma a deep black, wedge-shaped streak points toward the hind margin; claviform stigma small, obscure, edged with blackish; subterminal line, when visible, yellowish-brown, very deeply zigzagged, especially in the middle, where it throws off short black streaks pointing inward, two of these forming deep black wedges exactly facing the black streak from the reniform stigma; often, however, the pale subterminal line is broken into spots, though the black streaks are still present; hind margin clouded with dark brown and edged with slender black lunules; cilia light brown clouded with darker. Hind wings very ample and rather elongated; apex bluntly angulated; margin beneath it slightly hollowed, then fully rounded; pearly white, edged with greyish-brown,

sometimes faintly clouded with the same; nervures sharply brown; cilia white.

Female larger, usually having the entire space between the first and second lines clouded with smoky-brown or dull blackish, and the markings—except the black wedges—less distinct; hind wings usually much more clouded with brown.

Underside of the fore wings shining smoky-grey; costa paler, but with two dark indistinct lines near the apex; middle area abundantly covered with long raised downy scales; a row of blackish lunules along the hind margin; cilia brownish. Hind wings pearly white, thickly dusted with grey along the costal region; hind margin edged with dark brown. Body, and leg tufts, mottled with brownish and whitish; legs long, plentifully furnished with spur-like bristles, legs and bristles dark brown barred with white.

Very constant in colour and markings, but in the female the dark colouring of the middle of the fore wings is in some cases extended to the base, so that two-thirds of the length of the wing is black-brown. On the other hand the male is occasionally of a pale brownish-drab, with only the costal region and stigmata dark. Specimens from Ireland appear to show a tendency to pale variation. Dr. P. B. Mason possesses a specimen of less than one-half the ordinary size, and very pale in colour.

On the wing from the end of July till September, and probably after hibernation, and not as another generation, in April and May. It has been found on the wing as early as February, and eggs have been obtained from a captured specimen in March.

LARVA more than two inches long, stout, smooth and shining, very pale purplish-brown, paler beneath, sometimes with the under-surface and legs pale grey, usual spots blackish, shining, sometimes grey, each furnished with a short bristle. Dorsal line double, slender, greyish, on each

side a row of rather larger black dots, below which is sometimes a series of slender greyish longitudinal lines. Head shining black, face with two white spots, dorsal plate of the body-colour, or else spotted with black.

April to July on low plants, or on the succulent portions of cultivated plants such as mangold-wurzel, into the solid substance of which it loves to gnaw. Hiding in the ground in the daytime, and at night only protruding itself far enough from the ground to obtain food, as to which it probably is not dainty, eating the leaves of various low-growing plants. So far as can be ascertained, there appears to be but one generation in the year. I can find no record of the larva in autumn or winter, though it may probably be feeding in forward seasons as early as March or even February.

PUPA of ordinary form, red-brown, subterranean.

The question of the single or double-broodedness of this species was argued with some earnestness thirty years ago, and I do not find that much has been added to our knowledge on the subject since that period. The remarks of the late Rev. J. Hellins, written in 1862, are interesting: "From a pair of moths taken last March, and shut up in a box, I obtained a batch of eggs; as soon as these appeared I sowed some radish-seed in a large flower-pot, thinking the larvæ would like *roots*, however, when they hatched, the larvæ confined their attention solely to the radish *leaves*, and fed on them for some time till I thought of giving them lettuce; this they seemed to like much better and fed upon it very well; most ungratefully escaping at the bottom of the pot as soon as they were full-fed, only one remaining to undergo his changes in the place where he had been born and brought up. Though these larvæ did not eat the roots provided for them, I should say they were strictly subterranean in their habits." "*Suffusa* I know hibernates in the perfect state, but it does not pair till the spring." I think that Mr. Hellins was right. It is hardly likely that, if

double-brooded, and the second generation on the wing in September, the first would be out in March!

The moth hides, in the daytime, among leaves or plants on the ground, or in sheltered situations such as thatch, and is only seen by daylight when tumbled out from such a shelter. It flies swiftly at dusk and after dark, comes freely to sugared trees, and is very fond of ivy-bloom and even of ripe blackberries, hanging to the bunches of over-ripe fruit on warm autumn nights, till very late. It is somewhat irregular in its appearances, abundant in some seasons, comparatively scarce in others, and is found in greater or less numbers all over the East, South and South-west of England, as well as in the fen districts; also in less numbers throughout the Midlands, and generally in Herefordshire, Cheshire, Lancashire, and Yorkshire. In Cumberland and Westmoreland it seems to be scarce. This also appears to be the case in Scotland, where it is recorded in Roxburghshire, Stirlingshire, Perthshire, and casually throughout that country, occurring even in the Hebrides, and rarely in Shetland. It also seems to be found in all parts of Ireland to the extreme north, and in some districts commonly.

Abroad its distribution is very wide—all parts of Europe except the extreme north; Egypt, Siberia, Western Asia generally, India, China, Japan, Java, Nova Scotia, Canada, part of the United States, indeed, all North America from Hudson's Bay to Georgia and Texas; also in New Zealand and Honolulu.

[*A. crassa*, *Hüb.*; *lata*, *Tr.*—Of this rather widely distributed Continental species, which occurs in France, and of which Mr. A. Hodges has obtained examples even in Guernsey, a single specimen exists in the cabinet of Mr. S. Stevens. It was received among a lot of common species taken at Dover, and had most likely been accidentally introduced from abroad. No other specimen seems to have occurred.]

3. **A. segetum**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch.

Antennæ of the male pectinated; fore wings narrow, obtuse, pale brown with darker stigmata in the male, blackish in the female; hind wings of male clear white, of female greyish with darker nervures.

Antennæ of the male strongly pectinated with slender, solid, ciliated teeth, which diminish in length beyond the middle, leaving the apical third of the antenna threadlike; dark brown. Palpi almost hidden by dense drooping tufts of long brown scales. Head tufted, light brown, barred with darker; lower front of the collar dark brown edged above with black, leaving the remainder pale brown; shoulder-lappets pale brown, dusted with dark brown and black; remainder of thorax pale brown, the scales raised narrowly in the middle into a slender double crest from the collar to the back; fascicles very long, whitish; abdomen whitish-brown plentifully covered with long paler scales; lateral tufts small, anal tuft narrow, light brown. Fore wings rather narrow, costal and dorsal margins nearly straight, apex very blunt, hind margin bluntly rounded and very little oblique; colour pale brown much dusted with dark brown atoms; costa clouded and spotted with black; basal line double, black, deeply toothed, extending only half-way across the wing from the costa; first line perpendicular, black, duplicated and rather indented, but with the duplicate line fainter; second line less distinct, blackish, consisting of a series of small crescents with long points, through which passes a more direct parallel line, both are curved inward and then back before attaining the costa; subterminal line, when visible, a row of pale cloudy dots edged inside by a line of blackish cloudy spots; orbicular stigma ovate, edged and centred with blackish, but often obscure or hardly visible; reniform stigma more distinct, edged with blackish and nearly filled up with black-brown; claviform stigma small, edged with black, but inconspicuous;

hind marginal space sometimes clouded with dark brown ; extreme edge obscurely dotted with black ; subcostal region and space round the stigmata often clouded with darker brown, which in some instances extends across the wing as a dark central shade ; cilia shining brown, divided by a darker line. Hind wings rather ample ; apex and hind margin rounded ; shining, clear, transparent white, nervures sometimes faintly tinged with brown ; extreme hind margin brownish ; cilia white.

Female very different in colour, which in it is usually dark umbreous, grey-brown, or blackish brown, nearly unicolorous, with the markings so obscured as to be barely visible ; but occasionally it is paler umbreous, with darker nervures, and the markings more distinct, the dark reniform stigma especially so ; cilia always light brown, almost yellow-brown at their base, but divided by the dark line. Hind wings clouded with grey-brown, especially along the hind margin ; nervures dark brown ; cilia white. Head and thorax sometimes dark-coloured in accordance with the fore wings, often paler. Not very similar to the male.

Underside of the fore wings in the male shining whitish, the whole under surface of the discal cell downy with long grey scales ; beyond the middle is a white transverse band, followed by a grey line. Hind wings white, with the costal region broadly dusted with grey, and a grey line along the hind margin, cilia white. Body dark grey mixed with whitish, anal tuft browner ; leg tufts dense, purplish-brown in front, white behind ; legs long and bristly, dark brown, barred with white. In the female the underside of the wings is but little darker, but the body and leg tufts are more smoky-grey, the front legs blackish, with white bars, and the hinder legs whiter.

In the male the ground colour occasionally varies to pale drab or even to whitish-grey, and in this, and the paler brown forms, the markings are in some instances very sharp and

distinct, so much so as to give the impression of another, more beautifully marked, species, the second line resembling a graceful necklace of fine markings, and the whole appearance being so elegant that some difficulty is found in recognising the usually homely dingy insect. In other cases the male varies to dull dark brown, with a darker central shade, and obscure markings as in the female. In that sex the variation is equally great, from pale grey, much dusted with darker, and having a conspicuous pale yellow or whitish subterminal line, through various shades of obscure brown to smoky black, but in neither sex do the hind wings vary much. Casual aberrations are almost endless. In the collection of the late Mr. F. Bond is a spotless pale brown male, and also a coal-black female. In that of Dr. P. B. Mason, a female of grey colour with the two transverse lines distinctly double, and black, but enclosing white lines; another of an extremely pale slate-grey, devoid of markings; and a male of one half the usual dimensions. In that of Mr. Sydney Webb, a female of a smooth pale slate colour, with a singular soft bloom; and two others of a peculiar grey-brown, much dusted with darker grey, having the transverse lines very distinct, and in one placed much further apart than in the other. Mr. S. J. Capper has a male most exquisitely shaded with grey, the lines black, edged with white, and the orbicular stigma white ringed; another, brown with the orbicular stigma greatly elongated, and united by a narrow neck to the reniform stigma; while another, of a very pale brown, has a black central shade. Mr. Arthur Robinson has a greyish white male, shaded with dark grey at the apex and around the reniform stigma. Mr. F. J. Hanbury has some pale brown males with remarkably rich markings and dark hind-marginal clouding, and one of exquisite beauty, of a smooth clear pale brown, with the first and second lines elaborated into series of long distinct loops, or scallops with long points, and the reniform stigma very well marked. In the collection of Mr. A. C. Vine is a female of a peculiar

purple-grey colour, all the nervures and the dorsal margin striped longitudinally with dark grey.

On the wing, in multitudes, in June, and sometimes in small numbers, and, as a second generation, in September and October. But in the year 1884 Mr. E. A. Atmore noticed it at King's Lynn, after being, as usual, plentiful in the early summer, to be again abundant through the latter half of August and September. There is, however, no reason to believe that these autumn specimens remain alive through the winter.

LARVA smooth and rather shining, greyish white, or pale purplish grey, or pinkish grey, with the under surface and legs faintly yellowish-brown; head light brown, with two black or brown bars down the face; mouth white; dorsal plate shining, pale brown or pale grey, dorsal and subdorsal lines double, grey, but indistinct, and sometimes obscured with greyish clouding; spiracles black; raised dots grey, shining, each furnished with a single short bristle.

July to April, feeding through the milder portions of the winter and torpid only in cold weather. But a small proportion appear to feed rapidly up by the middle of August, producing the moths in the same autumn. Whether these pair and deposit eggs in late autumn, and so reinforce the great army of wintering larvæ by their additional progeny, is not known, but there is no reason to suppose that this is not the case. On turnip, dock, plantain, grass, green corn, and probably on almost every low growing herbaceous plant. Probably no species of larva is more mischievous and destructive in cultivated fields and gardens. It hides in the ground during the day, and comes only just to the surface at night, when it especially loves to gnaw young plants, close to the surface, in such a manner as to cause them to droop and die. It does not seem to devour roots under ground, but the large bulb of a turnip is its especial delight when tending toward full growth. In this respect it is a dangerous foe to the

farmer, gnawing its way into the solid turnip from the underside, and feeding in the hollow night after night, until decay sets in and the turnip is destroyed. Mr. Newman, in his "British Moths," has a most effective illustration of a turnip, in the underside of which, in a large cavity, are ensconced no less than eight well-grown larvæ of this species. In corn-fields the injury done is equally great, the young plants being bitten off and left upon the ground. Carrots, swede turnips, beet, cabbage, mustard, and other cultivated plants, as well as seedlings in gardens, are equally to its taste, and in its more abundant years the loss occasioned by it is at times very heavy—especially in countries in which its natural enemies, the birds, are discouraged. It is an object of special attention to economic entomologists, and the plans and nostrums devised for its abatement are very numerous. Kollar says that the Russian Government advertised for a prize essay on the means of its destruction; and it was the subject of an essay for which a prize was given by the Entomological Society of London between fifty and sixty years ago.

PUPA of ordinary form, reddish-brown, beneath the surface of the ground in a small earthen chamber.

The moth hides in the daytime upon the ground among grass, weeds, or dead leaves, or on banks among dry roots, and in almost any closely concealed situation. If disturbed it runs away swiftly or kicks its way from place to place with its strong bristly hind legs. At dusk it flies, and also during the night, visiting flowers and honey-dew on the leaves of trees, and comes to sugar upon tree trunks in such numbers at times as almost to cover the patches, and drive away more desirable visitors.

Abundant throughout England and Ireland, also in the south and east of Scotland, but apparently much less frequent in the west and north-west of that country, and not recorded from the Scottish Isles. Sir Thomas Moncrieff says that it ascends the hills to about an altitude of 600 feet

above the sea-level. It is plentiful almost all over Europe, and at Gibraltar is known to be regularly double brooded. Also abundant in South Africa, throughout Northern, Eastern, and Western Asia, India and Ceylon.

4. **A. corticea**, *Hüb.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Antennæ of male broadly pectinated; fore wings obtuse, pale brown in the male, with conspicuous dark stigmata, the reniform almost round, the claviform pale within; female often darker; hind wings grey-brown.

The antennæ of the male are strongly pectinated with long, solid, ciliated teeth, which decrease in length beyond the middle, disappearing at three-fourths the length, the remaining fourth being furnished with rows of fine bristles; pale brown. Palpi tufted with long, loose, pale brown scales, darker at the sides; head brown; collar erect, lower half dark brown, in the middle a slender black bar, above it light brown mixed with whitish; shoulder lappets long and broad, rather uplifted, pale brown edged with darker; central portion of thorax pale brown mixed with darker, faintly crested from top to back, the tips of the back crests dotted with darker brown; fascicles whitish, long and very broad, followed by long whitish scales on the basal abdominal segments, where they enclose some dark scales which mimic abdominal crests; remainder of abdomen light brown dusted with darker; lateral tufts very small; anal tufts long and rather narrow. Fore wings rather short and truncate; costal and dorsal margins nearly straight; apex blunt and squared; hind margin perpendicular and hardly curved except toward the anal angle; colour pale brown dusted with blackish; basal line indicated by two small black streaks from the costa; first line perpendicular, black, duplicated, waved; second line black, double, curving outward from the costa round the reniform stigma, then passing almost straight to the dorsal margin in a series of

crescents; subterminal line very faintly paler, edged by a series of cloudy blackish dots placed almost parallel with the hind margin, that on the costa near the apex larger and more conspicuous; orbicular stigma round, brown or blackish, ringed with deep black; reniform stigma large and conspicuous, blackish, margined with deep black; claviform stigma large, blunt, edged with deep black, pale centred, and cutting the first transverse line; costal margin partly edged with dark lines, hind margin dotted with black; cilia pale brown. Hind wings pale grey-brown, sometimes darker at the apex and along the hind margin; nervures brown; central streak rather long and faintly brownish; cilia whitish divided by a brown line. Female stouter and usually larger, with simple antennæ and darker hind wings, otherwise similar.

Underside of the fore wings rather shining smoky-brown, with the margins a little paler; reniform stigma marked by a large smoky-black spot, which is followed by a slender dark brown transverse stripe; nervures paler; hind wings whitish-grey, with the costal region broadly clouded and dusted with brown; central streak elongated, blackish, followed by a slender grey transverse stripe; hind margin and cilia tinged with brown. Body dark brown mottled with whitish; legs brown, barred with white; leg tufts brownish.

Variable in the ground colour from very pale brown to ashy-brown, reddish-brown, and smoky black-brown; far more so in the degree of dusting of black scales, which in some specimens is almost totally absent, in others suffuses the whole costal region or even more or less the entire surface of the fore wings, sometimes forming large blackish clouds, or entirely concealing the brown ground colour; but in almost every instance one of the stigmata, or more particularly the reniform stigma, is conspicuous. Usually the blackness extends in an equal degree to the thorax, but there are striking exceptions. In a specimen taken by myself on the

Norfolk coast, the fore wings are almost wholly black-brown, while the thorax is almost entirely pale brown, except the shoulders which are nearly white; in other such specimens the thorax is dark with the shoulder lappets pale and conspicuous. Mr. G. T. Porritt has a male specimen with the fore wings smoky-black, except the hind margin where is a pale grey stripe, and in which the thorax is black with pale grey shoulders. The curious whiteness of the shoulder lappets is sometimes observable in paler brown specimens, and of these some have the three stigmata pale and only faintly outlined with black, while others are nearly devoid of the usual transverse lines. These forms seem to occur most frequently near the sea; in Ireland there is sometimes a tendency to more reddish-brown colour. Mr. W. H. B. Fletcher has a series, from the north-east of Scotland, of beautiful pale grey and brown-grey colour, with the markings unusually distinct—the females darker and much mottled with black. A specimen from the Isle of Wight in Mr. F. J. Hanbury's collection has one half the fore wings nearly black, the other—the dorsal half—brown; another very pretty specimen—of a second generation, taken in September—is of a clear, pale, smooth grey-brown with sharply dark stigmata. Mr. G. W. Wynn has a specimen, taken in Warwickshire, of a pale ochreous-brown, with a strong clouding of deep velvety black, neatly stippled and placed in blotches, throughout the middle of the fore wings.

On the wing in June and July and, very rarely, as a second generation, in September.

LARVA rather stout, cylindrical, rugose; all the legs short and placed well under the body; ground colour brownish-grey finely freckled with a rather darker tint of the same; under surface and prolegs with a slightly greenish tinge and unfreckled; dorsal vessel hardly paler than the ground colour, enclosed between two lines of darker brown; sub-

dorsal line dark grey-brown with a fine thread of paler along its lower edge, followed at a little distance by another such pale and rather thicker line, though much interrupted or broken up by the deep wrinkles of the skin; at some distance again below runs the subspiracular stripe of the same pale greyish-brown, with a streak of the ground colour through the midst of it; the head has the front margins of the lobes broadly streaked with blackish, and a little at the sides also; the mouth is large and sometimes blackish; the plate on the second segment is not so noticeable as usual in this genus by any difference of colour, though it is a little darker brown toward the margin in front; the dorsal and subdorsal paler threads are faintly seen to pass through it. As the larva approaches full growth the skin becomes somewhat shining, and the raised spots, which immediately after the previous moult come out black, grow paler in the centre and are of a dark brown all round it, each furnished with a short fine bristle; the spiracles are black and rather small in size.

When first hatched it is of a greenish-grey, with blackish-brown head and dorsal plate, the raised spots black and furnished with hairs. After feeding a few days it becomes of a greenish-ochreous tint, and in another week of a greenish-olive, or rarely reddish-grey. From the time that it is about half an inch in length to about an inch its colour is ochreous, with a dark double dorsal line and two lines on each side, the raised spots small and dark brown. After the final moult it comes out at first very much darker than before, with quite a noticeable appearance of sootiness over it, all the lines being purplish-black and much suffused; the skin also presents quite a rough surface, and although this is afterward partly lost it yet remains a distinguishing feature to the end.

August to November, when it retires for hybernation; feeding again in March and until the middle of May. On low-growing plants generally. *Chenopodium*, *Polygonum*,

clover, dock, mullein, and doubtless many others; feeding at night and hiding by day under ground; but in dull weather, if fresh food is placed on the surface of the ground and shaded from the light, it has been found that it would be eaten readily by day. When very young, and until about half an inch in length, feeding exposed without burrowing in the ground. (W. Buckler.) Later it passes the daylight under ground like its congeners.

PUPA of ordinary form, rather stout and very smooth; light orange-brown. In a slight earthen chamber underground.

The moth conceals itself upon the ground among thick plants and leaves during the day; flying vigorously at late dusk and through the night. The male is strongly attracted by light, and may often be seen circling in wild excitement round a gas-lamp. Both sexes come readily to sugar, and even with far more eagerness to the blossoms of the lime, privet, valerian, and other flowering plants.

Never an abundant species, but fairly common in many of the coast counties, as Norfolk, Suffolk, Essex, Kent, Sussex, Hants, Dorset; less common in Gloucestershire, Somerset, Devon, and Cornwall; also in South Wales, where it has occurred at Swansea and in Pembrokeshire. Inland it is common in Surrey, and formerly might often be found on the gas-lamps of the London suburban districts; less frequent in Berks and Oxfordshire and in the Cambridge fen district, where it is rather uncertain in its appearance. Apparently absent from a large portion of the Midland Counties, though found rarely in Warwickshire and North Staffordshire. Also found in Herefordshire, Cheshire, Lancashire, and some localities in Yorkshire, though not generally. In Scotland in Ayrshire; in Moray and other parts of the Eastern districts; also in Perthshire, where Sir Thomas Moncrieff found that it attained on the hills an altitude of 600 feet above the sea-level. Local and by no

means plentiful in Ireland, yet found in Wicklow, Kerry, Louth, Down, Antrim, Derry, and Sligo.

Abroad its distribution is wide, over Central Europe, great part of Northern, Western and Southern Europe, Asia Minor, Siberia, the North-West Himalayas, Nilgiris, and other mountain regions in India, and at Madagascar.

5. **A. cinerea**, *Hüb.*.—Expanse $1\frac{1}{8}$ to $1\frac{3}{8}$ inch. Antennæ of the male pectinated; fore wings short, costa faintly hollowed; whitish-grey with darker transverse lines, no orbicular stigma; hind wings whitish; female smaller, antennæ threadlike; fore wings narrower, blackish-grey; hind wings dark grey.

Antennæ of the male strongly pectinated with solid, densely ciliated teeth which become shortened beyond the middle, tapering off so that only a short piece of the apex of the antenna is simple; deep dark brown. Palpi densely tufted, the long scales from the second joint partly enclosing the third, which resembles a small nipple, black-brown; head pale grey; collar rather erect, ashy-white except the lower portion behind the head which is broadly black-brown; shoulder lappets very broad, loosely raised, ashy-white edged and dusted with darker; rest of thorax rough, pale grey, slightly crested at the back and there tipped with dark brown. Fascicles dense, shining, pale grey, abdomen toward the base greyish-white with a golden gloss, browner behind, lateral and anal tufts small, golden brown. Fore wings short and narrow, costa faintly concave, apex bluntly angulated, hind margin rather oblique and curved off below the middle; anal angle distinct; dorsal margin almost straight; pale ashy-grey with a faint purplish gloss; basal line indicated by two curved black streaks from the costa; first line originating in a large black costal spot, slender, black, nearly perpendicular, much indented so as to form a series of large scallops and angles; the second line, originating from

another black costal spot, makes a wide curve, but bends in at the middle and thence proceeds straight to the dorsal margin, forming throughout its course a series of crescents with long points swelling into dots; subterminal line an indistinct series of small brownish clouds sometimes edged outwardly with whitish; orbicular and claviform stigmata absent; reniform stigma rather small, grey, edged on both sides with black; immediately before it is a very slender dark brown, or grey, transverse shade; costal margin partially edged with black, and besides the black spots in which the lines originate, having two sharp black points before the apex, which, with the hind margin, is edged with minute black lunules; cilia pale brown tipped with whitish. Hind wings whitish with grey nervures and the costal and hind margins more or less clouded with grey; central spot large, triangular, grey; beyond it is a very faint slender grey transverse stripe.

Female smaller, with narrower fore wings, smaller hind wings, and stouter, more pointed body; antennæ simple, dark brown; thorax dark grey-brown or blackish-brown with a broad black bar across the front of the collar; fore wings dark umbrous or blackish-brown abundantly dusted with dark grey or smoky-black, hind-marginal space usually paler; orbicular stigma visible as a cloudy blackish spot; first and second lines thickened, deeper black; central shade broadened and darkened, obscuring the reniform stigma; hind wings rather darker, sometimes very much so toward the hind margin.

Underside of the male very pretty, whitish-grey with whiter nervures; reniform stigma dark grey, followed by two slender dark grey transverse stripes which are divided by the white nervures. Hind wings whitish, costal region and apex broadly dusted with grey-brown; central lunule large, distinct, dark grey or black, followed by a dark grey transverse stripe which is most distinct on the nervures. Body brown; legs dark brown; leg tufts purplish-brown,

paler behind. - Female similar but darker, and with a black central spot to the hind wings.

Rather variable in the ground colour, which in the male is often tinged with brown or with slate colour, but in the female varies from light umbreous to smoky-black, in the latter case with all the markings obscured, or with the central shade intensified into a black central transverse bar. In the paler forms a suffusion of smoky-brown or smoky-grey is not unusual, sometimes in the middle of the wing, oftener toward the hind margin. Specimens in the cabinet of the late Mr. F. Bond, obtained from the West of England, are larger than ordinary, with paler colour and less distinct markings—in these respects drawing nearer to the much larger form found on the Continent of Europe.

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

LARVA when full grown an inch and a half long; stout; blackish-green, showing a double dorsal line enclosing the finest thread of paler; subdorsal line also paler, slender, edged above with darker green; below this a broader pale stripe, and another along the spiracles, which are large and black; raised spots dark brown, larger on the anterior segments, always furnished with a slender hair; head shining black, mouth greenish; dorsal plate jet black, finely divided; under surface paler green. In early youth the larva is green—at first yellowish-green, after the first moult much brighter in colour, but with the usual raised dots black. The markings, as mere pale longitudinal stripes, are very similar throughout. After the third moult the ground colour is pinkish-brown; after the fourth moult dingy grey-brown; after the fifth dark slate-grey, tinged with greenish beneath, and it is only after a sixth moult that the adult colouring is assumed.

End of June to April, on *Thymus serpyllum* (wild thyme). The full growth, with the six changes of skin, takes place by the end of September, and the larva, after feeding a little in

October, hibernates in the earth full grown. (Condensed from Buckler.) I have no reason to believe that it feeds again after hibernation in this country. Abroad it is said to feed in the spring on low plants.

PUPA short and stout, light brown, with very conspicuous spiracles. In a small chamber in the earth among the roots of plants.

The moth does not seem to be readily attracted by flowers, but comes to sugar in its very restricted haunts; its habit appears, however, to be to sit on grasses at night, where it may be found by searching with a lantern; when flying it will come to light. It hides by day at the roots of the short grass of the downs, but the female has occasionally been taken tumbling or running over the grass, in hot sunshine, in the afternoon. Apparently almost entirely restricted, in this country, to chalk hills and downs, or limestone mountains. In Kent at Dover, New Romsey, Folkestone, Sevenoaks and elsewhere; in Sussex on the downs near Lewes, Brighton, Worthing, and probably on all the chalk hills; in Dorset, near Studland, Isle of Purbeck, but rare; more frequently at the Isle of Portland; rare in Devon, recorded only from Plymouth and Torquay; also at Durdham Downs near Bristol; on the Cotswolds, Gloucestershire; at Newbury, and once at Reading, Berkshire; at Whitchurch and Chinnor, Oxfordshire; on the Gog Magog Hills near Cambridge; and at Brandon, Suffolk. Also in the west near Leominster, Herefordshire; and at Llangollen in North Wales. This appears to be the extent of its range in these Islands; abroad it is widely distributed over Central, Western, and great part of Northern Europe; Northern Italy, Turkey, the Ural Mountain district, and Armenia.

6. **A. puta**, *Hüb.*—Expanse $1\frac{1}{4}$ to $1\frac{3}{8}$ inch. Male, fore wings pale drab with a blackish basal blotch and reniform stigma, hind wings white. Female, fore wings

blackish, a large drab blotch round the orbicular stigma; hind wings grey.

Antennæ of the male pectinated with short, pointed, abundantly ciliated teeth which become shorter beyond the middle, and taper off, leaving the apical third threadlike. Palpi tufted, final joint slender, short, pitted at the apex, pale yellowish-brown, barred with dark brown; head yellowish-brown; collar similar, very prettily barred with black crescents; above these very pale brown; thorax pale brown or whity-brown, with the faintest possible back crest, otherwise the scales are smoother and more prostrate than in most of the allied species; fascicles whitish; abdomen very pale brown with numerous long whitish scales; lateral tufts hardly indicated; anal tuft tipped with yellowish. Fore wings narrow, truncate, with straight costal and dorsal margins; apex blunt, hind margin rather straight and perpendicular, but elbowed below the middle and rounded off a little at the anal angle: colour very pale brown or drab-brown, with a large ill-defined blackish blotch occupying the costal space from the base to the first line, and a smaller similar blotch beyond the middle enclosing the reniform stigma, costa also clouded with brown; basal line obscure, limited to two black crescents edged with pale brown and situated in the dark cloud; first line black, much indented, perpendicular to near the dorsal margin, where is a large loop, also duplicated by an inner grey line, the two enclosing a pale slender stripe; second line much less distinct, but when visible, composed of a series of slender brownish crescents with black dots at their ends; hind-marginal region softly clouded with dark brown from the apex to near the anal angle, and enclosing a series of pale wedges which represent the subterminal line; orbicular stigma flattened, prostrate, very narrow, with a dark outline, and containing a dark brown streak or diamond-shaped spot; reniform stigma edged with a black line, and containing

a kidney-shaped dark brown spot; claviform stigma small, sharply pointed, edged, and sometimes filled, with black; hind margin dotted with black and with a blackish streak on each nervure; cilia pale brown, dusted with darker. Hind wings rather short, white, with brownish dashes on the nervures and a very faint grey central spot; along the apical and hind margins is a row of slender brownish lunules; cilia white.

Antennæ of the female threadlike; thorax ashy-grey with the crescents in front of the collar black and conspicuous; fore wings black-brown with a purplish gloss; markings very obscure and indistinct, but before the reniform stigma is a blotch of pale drab enclosing the crushed orbicular stigma; and sometimes a fainter drab patch beyond it. Hind wings more tinged with grey; abdomen rather short.

Underside of the fore wings of the male shining pale brown; costa yellowish, dorsal region whitish; at the reniform stigma is usually a darker brown cloud, and beyond it a slender, faintly blackish, transverse stripe; apex and cilia tinged with reddish: hind wings whitish, costal region dusted with grey; central spot very small, blackish; beyond it is a slender transverse line consisting of dots and dashes on nervures; margins and cilia white, dashed with brownish. Female more tinged with smoky-black. Body pale greyish-brown; anal tuft more yellowish; leg-tufts grey-brown; legs dark brown or blackish, barred with pale brown.

Not very variable, but a recurrent form of the male, in which the whole of the basal portion of the fore wings, to the first line, is more or less filled in with blackish, and the transverse lines are more distinct, was formerly described as a separate species under the name of *radia*; a variety of the female in which a brown transverse stripe lies along the second line was described as its female. The late Mr. Bentley when writing upon these varieties and showing that they were of the same species as the typical form—then

known as *A. radiola*—also pointed out that the variation in colour of the hind wings is very remarkable, and described a form of the female in which they are silvery-white. A very fine male of this variety *radia* is in the collection of Major J. N. Still, and was taken in Devonshire. Colonel Partridge has a female of which the fore wings are of the colour of the male, but set off by two conspicuous straight perpendicular, blackish, transverse bars; this was taken at Portland.

On the wing in July and August; but occasionally, though rarely, in May and June. On the Continent it is said to fly in June.

LARVA plump, cylindrical, but with the head and anal segment small; in the region of each spiracle is a rather semicircular inflation; segmental divisions deeply cut; legs and prolegs small. Colour brownish-ochreous or dull ochreous on the back, bounded on each side by the dark brown edge of the subdorsal line; there is a delicate mottling of rather darker brown, of a pear shape, on the back of each segment, its broad end in front, through which runs the dorsal line, brown or pale brown, thin at the beginning, but expanding almost into an elongated diamond form at the end of each segment, and distinctly edged with darker brown, particularly at its widest part. The subdorsal line is dark brown, having close beneath it a mere thread of very pale greenish-grey, and from this to the spiracles the sides are greyish-brown; another pale thread, much interrupted, running a little above the spiracles; below them is a very faint trace of a double dirty-whitish line; all the rest of the lower and under surface being of a pale greenish-grey tint, and semitranslucent.

The head brown, the lobes and mouth marked with darker brown and very shining; on the second segment is a dark brown plate having three pale longitudinal lines. Spiracles black; usual raised dots very dark brown, each furnished

with a minute short hair. When younger the dorsal region is of a darker brown ; but when quite full fed, the markings become less distinct, and the larva nearly unicolorous. (W. Buckler.)

September until—probably—May, certainly till March, but many appear to be full fed in December and January. On lettuce, dandelion, knot-grass, and probably on many other low-growing plants, more particularly those growing in damp meadows.

PUPA undescribed. Dr R. C. R. Jordan once dug up a pupa in Devonshire, in April, from which he reared the moth on May 1st. From this circumstance he deduced double-broodedness in the species. In view of the great rarity of such early appearances, it appears more probable that they are produced by more advanced larvæ, which have fed up, as noticed by Mr. Buckler, early in the winter.

The moth hides, like its congeners, on the ground among thick herbage or dead leaves, and among rubbish, in the daytime. At night it is very active, strongly attracted by light, and often to be seen flying wildly round a gas-lamp. It has even been known to fly to a light through the open window, in the room in which I am writing. The female also comes to light occasionally. Sugar is attractive to it, also honey-dew and blossoms of the lime-tree.

Formerly abundant in some seasons in the suburbs of London, and not yet utterly driven out by the smoke. More especially common in rather low, damp districts, meadows, and slightly marshy places, all over the South of England from Kent to Cornwall, including the Scilly Isles ; and to Berkshire, Gloucestershire, Oxfordshire, and the Cambridge Fen district ; less common in Norfolk and Suffolk ; found also in Herefordshire ; and recorded, though very rarely, in Cheshire, Yorkshire, and Cumberland ; but apparently absent from the Midland district, and, so far as I can ascertain, very local in Wales, where it has been found

commonly in Carmarthenshire. In Scotland it is said to have been noticed at Dumfries. In Ireland a single specimen has been taken by Colonel Partridge at Enniskillen.

Abroad it is found in France, Belgium, Southern Germany, and other parts of Central Europe; at Gibraltar (where it has been taken at ivy bloom in October); in Northern Africa; Egypt, commonly; Syria and Bithynia.

7. **A. exclamationis**, *L.*.—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch.—Collar broadly barred with black; fore wings narrow, obtuse, pale brown, with the three stigmata black, the claviform long and conspicuous; hind wings whitish. Colour in the female often more reddish-brown, with the hind wings grey-brown.

Antennæ of the male pectinated with extremely short teeth, which are surmounted by small tufts of fine bristles; dark brown; palpi tufted, brown, apical joint very small; head and collar pale brown, the latter with a central transverse conspicuous bar of deep black; thorax brown, or reddish-brown, very slightly crested at the top and back; fascicles long, white, followed by an abundance of long whitish hair-scales on the basal segments of the abdomen, which is otherwise pale brown; lateral and anal tufts small. Fore wings rather narrow; costal and dorsal margins very faintly rounded; apex bluntly angulated; hind margin almost truncate, but elbowed below the middle, notwithstanding which the anal angle is rather full; smooth pale brown, either of an umbreous or reddish shade, nervures usually a very little darker; basal line either absent or indicated in blackish near the costa; first line usually obscure or absent, when visible nearly perpendicular, black, repeatedly indented; second line also usually obscure or absent, when present rather fully curved and forming a series of crescents with darker points, which partially enclose a series of pale cloudy dots; this line is rather variable in

position ; hind margin usually clouded with smoky-brown, in which is an irregular paler subterminal line or series of faint pale cloudy spots ; orbicular stigma rather small, either round, ovate, or elongated, edged, and often filled up with black-brown ; reniform stigma large, broad, and conspicuous, black, or else edged and nearly filled with black ; claviform stigma long, deep black, shaped like a canine tooth or the upper portion of a thick note of exclamation ! These three stigmata are usually the only conspicuous markings on the smooth brown surface of the wing. Cilia glossy pale brown, clouded with dark brown. Hind wings white, nervures and sometimes the hind marginal line brownish ; cilia white. Antennæ of the female simple ; fore wings longer and more truncate, and often of a deeper or redder brown ; markings generally more obscure ; hind wings usually tinged with grey-brown, sometimes very darkly so, except that the base, or at any rate a dash or two from the base, is usually whitish ; body rather stouter ; in other respects as in the male.

Underside of fore wings in the male pale grey, with a golden gloss especially at the margins ; a faintly blackish cloud at the reniform stigma, and beyond it a rather curved smoky-grey transverse stripe ; cilia glossy pale brown. Hind wings white, dusted along the costa to the apex with greyish-brown ; and with a narrow, curved, cloudy transverse stripe chiefly visible upon the nervures ; cilia white, brownish at the apex of the wing. Body light brown ; leg tufts darker brown, dull ; legs brown, with blackish dashes. Female with the fore wings uniform deep brown ; hind wings extensively blotched or shaded with brown or grey-brown.

Variable in almost every respect—in the ground colour from pale drab or pale brownish-grey to deep dark red brown or even smoky-black. I have a specimen taken in Cheshire which is almost black, and Mr. G. T. Porritt has a Yorkshire example of an extremely dark purple brown. In the grey-brown forms there is, not unfrequently, a mottling of whitish

clouds in the middle area of the fore wings and a yellowish spot between the two upper stigmata. In all the varieties of ground colouring the transverse lines are usually indistinct, often obsolete; but occasionally very sharply distinct, and when so, they seem to present a most curious appearance of the profile of a sordid and brutalised human face, whereof the claviform stigma is the mouth, the reniform the eye, and the orbicular the nostril. The resemblance of course is fanciful, but it is conspicuous; in a female specimen in Mr. F. J. Hanbury's collection, most glaringly so. A far prettier variety is produced when the second line is placed somewhat far back and the hind marginal space behind it is clouded with black. The three stigmata, which ordinarily are the only conspicuous markings, are in some instances, in females more particularly, rendered quite obscure, or even almost obliterated; or some are so obscured, leaving only the reniform, or the claviform, distinct.

A curious and rather pretty recurrent variety, known as var. *plaga*, Steph., is produced by the union of the black stigmata by means of a black bar or streak, or a black cloud, but this even varies greatly; sometimes a black line connects the reniform with the orbicular, though usually it is carried along the lower edge of the latter to the claviform, in others it passes below the orbicular, uniting the other two; more rarely the orbicular and reniform are fused together, or united higher up, and the claviform left conspicuously separate; of this form a very handsome example is in the collection of the late Mr. Henry Doubleday at Bethnal Green Museum. The black bar which unites the stigmata in these specimens takes other forms; sometimes it is a small black streak just above the top of the claviform, in others it unites with that stigma only, and broadens or extends it in various ways; or other streaks appear above it, uniting the two upper stigmata as already described, or altering their shape and forming rayed or graded black blotches. In Miss Kimber's collection is a male specimen of the variety having the

transverse lines strongly marked, in which also are three black longitudinal stripes running along nervures, one from the claviform stigma and two from the reniform, all of them very conspicuous and attaining the second transverse line; another in the same collection has two large parallel black elongated blotches in the fore wings, totally concealing the stigmata. Mr. Eustace Bankes has a wonderful specimen, taken at South Norwood, London, of a uniform brownish-white, without trace of either transverse lines or stigmata, and with scarcely a trace even of the black bar across the front of the collar. Its resemblance to a *Leucania* is so great that it was originally supposed to belong to that genus, and was only recognised by the form of its thorax and fore wings. A specimen in the cabinet of the late Mr. F. Bond has its right fore wing extended laterally to double the normal width, the markings thereby rendered smeared and indistinct. Mr. S. Stevens has a very large and broad-winged female specimen which has an elongated blunt blackish blotch on each side of the median nervure, and the subterminal line shifted out of its usual position. Mr. C. W. Watts possesses a specimen taken by himself in the north of Ireland, in which the basal portion and the whole space beyond the second line are dark brown, while the central area is of the usual pale brown.

Variation in the hind wings is very slight, but an occasional male has a grey-brown band along the hind margin.

On the wing in June and July. There is a record of a casual emergence in October.

LARVA moderately stout; ground colour a rather warm brown varying in intensity a little in individuals; very constant in colour and design. Down the middle of the back on each segment is a pear-shaped blotch of darker brown, composed of freckles, the broad end of the pear in front; through these the dorsal line can scarcely be traced beyond the fourth segment, though it begins on the second, by

dividing the shining dark plate, as a distinctly paler line outlined with dark brown; on the third and fourth segments it soon becomes suffused with the ground colour, and its course thence is but faintly indicated by the dark outlines, which can best be discerned at the end of a segment. The subdorsal line is of darkish brown above and rather festooned in its course, thinly edged beneath with a faint paler line, which is followed by a broader line of darkish freckles and then by a paler line of the ground colour, and this in turn by a stripe of darker freckles, on the lower edge of which the spiracles are situated; beneath these, after a line of ground colour, is a paler or dirty-whitish line followed by the drab-coloured ground of the under surface.

Head brownish-drab, darkest about the mouth, with a blackish-brown streak down the front of each lobe; the shining dorsal plate is margined with dark brown, through which runs the pale dorsal line. The raised dots of the back are dark brown, the hinder pairs a little the larger; those on the sides are rather paler brown, and those below the spiracles still paler, each bearing a short bristly hair. The spiracles are quite black and furnish an important character, by which at a glance the larva can be separated from that of *A. segetum*, being usually larger than the raised spots before and behind them—never smaller. The warm brown of the back, without a tinge of grey or green, will also help to determine this larva; this is noticeable from the time when it is half an inch in length. The infant larva is tinged with grey and later with greenish. July to May, on plantain, lettuce, chickweed, *Chenopodium* and low-growing plants generally, also apparently, with that of *A. segetum*, which it closely resembles, in turnips and other autumn and winter crops, though perhaps more addicted to grass land than is the latter species. The greater portion of its growth is accomplished before the winter sets in.

In addition to its exploits in the destruction of crops, this larva has had the distinguished honour of causing no little

damage and risk in an important branch of manufacture—that of linen. A necessary process in this manufacture—that of bleaching—is carried on in the north of Ireland by spreading the linen, in the daytime, on the grassy hill-sides in the open air; and in addition to the material manufactured in that country large quantities are sent over from Lancashire to be bleached in this purer, cleaner atmosphere. So important is this process that it is carried on as a business separate from the actual manufacture of linen, extensive premises being set apart, and much capital invested in it. From time to time, for many years—usually in isolated years, however—complaints have been made of damage caused to the linen, when bleaching, by caterpillars, which were asserted to eat holes in it to such an extent as to render considerable lengths nearly worthless. In the year 1888 the Rev. W. F. Johnson, then living at Armagh, wrote to me that the mischief had re-commenced, and at my request sent over a number of larvæ which had been actually picked off the damaged fabric. The majority of these larvæ proved to belong to the present species. Arrangements were soon made, by one of the firms affected, to carry on certain suggested experiments, and it was soon ascertained, definitely, that the damage did not take place while the linen was lying upon the grass, but that many larvæ availed themselves of the covering, crawling upon the underside of it, so that they were taken up with it when the linen was brought indoors in the afternoon. It also appeared that if the fabric was at once placed in what is denominated the “dip,” a weak solution of chloride of lime, no mischief was done; but that any pieces of linen which remained heaped together as brought in, through the night, were seriously damaged. Larvæ were then wrapped up, purposely, in small pieces of linen and placed under some small degree of pressure, with the result that many of them gnawed their way through, and made holes precisely as in the damaged pieces.

So far as could be ascertained, all these belonged to the

present species ; the larvæ of *Triphaena orbona*, and *T. pronuba* found with them did not appear to gnaw the linen. The mischief was accordingly quite prevented by the very simple means of placing all the linen brought in from the grass at once in the dip, or shaking it so thoroughly that all the larvæ were dislodged. I have heard no further complaints of the damage of linen from the cause in question. It may be well to point out that it was only caused by the anxiety of the hungry larvæ, when night came on, to escape from confinement, and reach their natural food—not by any morbid taste for the fabric.

A curious point in the natural history of the larva was incidentally discovered in the course of these experiments—that submersion for the whole night, or for double that time, in the weak solution of chloride of lime had no injurious effect upon them ; although they had not done any mischief, they were all alive.

PUPA of quite ordinary form, reddish-brown ; in the earth in a small ovate chamber.

Probably the most abundant of all our *Noctuæ* in fields and woods, and even suburban gardens. It comes in crowds to sugar, sometimes covering the sweet attraction to the exclusion of better species ; it is also abundant at flowers, and especially fond of those of the red valerian (*Centranthus ruber*). Honey-dew, lime blossoms, the flowing sap of wounded trees, the sweet aphis-secretions on nettles, all available sweets, are greedily absorbed. The male is also keenly sensitive to the influence of light, and in dark nights in June may be seen wildly whirling round every gas-lamp, or sitting upon, or in it, or buzzing about the ceiling of a room into which it has made its way through an open window.

Probably everywhere in England, Wales, and Ireland, one might almost say *in every field*, and in Scotland throughout the mainland to Moray in the east and Argyle in the west,

yet apparently not observed as yet in the Hebrides, Orkney, or Shetland Isles. Curiously enough, it appears to be not very common in the Scilly Isles in the extreme south-west. Abroad it is found throughout the Continent of Europe, and Northern and Western Asia.

8. **A. lunigera**, *Steph.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Antennæ ciliated; wings blunt, narrow; costa straight; male pale brownish-grey; orbicular stigma a black ring; claviform thick and black; female blackish-slate, with distinct white orbicular stigma.

Antennæ of the male slenderly pectinated with short pointed teeth, each of which is rendered more noticeable by being surmounted by an erect tuft of minute bristles; these become shorter beyond the middle, leaving the apical portion of the antennæ simple; dark grey. Palpi densely tufted, dark grey in front, yellowish beneath; head grey; collar very broad, grey-brown, dotted with whitish scales, and barred with black; shoulder lappets pale grey, dusted and edged with black; remainder of thorax pale grey, slightly raised into a crest from top to back, the hinder tufts tipped with black; fascicles long, pale grey; abdomen yellowish-brown, much covered with whitish hairs from the base; lateral and anal tufts very small. Fore wings narrow, of nearly equal breadth at the base, and almost oblong; costal and dorsal margins very straight, apex blunt; hind margin very slightly oblique, but rather more so toward the anal angle; pale hoary-grey, with a purplish flush, much clouded with blackish along the costa; basal line incomplete, angulated, double, but formed of hardly more than four cloudy black spots or short streaks; first line indistinct, double, blackish, rather perpendicular, but much indented, and almost looped close to the dorsal margin; second line placed far beyond the middle, gracefully curved, and consisting of a series of cloudy-grey crescents, followed by a row of black dots; space between this and the hind margin clouded

with blackish-grey, in which a subterminal irregular line of pale dots is perceptible; orbicular stigma round, whitish, ringed, and often centred, with black; reniform stigma indistinct, dark grey, edged with black, and much obscured by a broad blackish transverse perpendicular shade through the middle of the wing; claviform stigma black, large, and conspicuous; extreme hind margin dotted with black; cilia light brown, shaded and lined with dark grey. Hind wings white, with the nervures and hind marginal line faintly pale brown; cilia white.

In the female the ground colour of the fore wings, with that of the thorax, is more uniform, of a deep shining dark grey or blackish-grey; orbicular stigma white, ringed with black, very conspicuous; reniform stigma grey, edged with black; claviform small, black; remaining markings obscured by the dark ground colour. Hind wings pure clear white, or else tinged with brownish along the hind margin, and having brownish nervures; body rather stouter, antennæ simple.

Underside of the fore wings of the male dark grey, except the dorsal region, which is broadly glossy white; under surface of the discal cell covered with long fluffy grey scales; costal and hind margins rather pale. Hind wings whitish, with the costal area dusted with dark grey; beyond the middle a slender dark grey transverse stripe is visible, mainly upon the nervures; on the hind margin are three or four blackish dots. Body yellowish-white, barred with dark grey; leg tufts mixed grey and whitish, legs very bristly, grey, banded with white. Female similar.

Variation in this species is not great; in the male it consists in greater or less clouding of smoky-grey on the fore wings; in the female mainly in the distinctness of the stigmata, or their suffusion with black colouring—which occasionally even obliterates the white orbicular, leaving the fore wings wholly smoky-black. In this sex the hind wings are rather uncertain, being in some examples pure white.

A curious aberration, in the cabinet of Mr. S. J. Capper, and taken in the Isle of Wight, is of the pale brown of *A. exclamatoris*, with all its markings sharply defined. Another far more curious, reared by Lieut. E. W. Browne at Portland, is distinctly gynandrous, its right side being male, left female, having the quite distinct colours of the two sexes, the simple antenna on the female side much larger than the ciliated or pectinated antenna of the other, while the white hind wing of the male half is much larger and longer than the clouded corresponding member of the female side. The apex of the abdomen in this specimen is very curious; on the right side is one of the usual harpes, or claspers, conspicuously covered with yellow scales, which are far more noticeable than in an ordinary male, while the left side shows a half cylinder in which distinctly reposes the brown ovipositor.

This species is on the wing in July and August.

LARVA brown on the back, with the central portion of each segment marked with dark brown, in the form of a diamond with the points cut off; dorsal line conspicuously sulphur-yellow on the dorsal plate only, while on all the other segments scarcely noticeable, and chiefly at the commencement of each as rather paler brown than the mottled portions it runs through. Subdorsal line dark brownish-green, edged above with wedge-shaped, buff-coloured spaces; below it the sides are blackish-green, with, immediately under the subdorsal line, a fine thread of dirty whitish-green, while another such fine line, but undulating and interrupted, runs between it and the spiracles, and a third above the legs. Spiracles black; raised spots blackish, large, and shining; head mottled, brownish, with a large black spot on each side of the crown; dorsal plate shining black; anal plate buff, horny and conspicuous; under surface and legs greenish-drab. This pattern, which is bright and sharply defined, fades as the larva becomes quite full-grown, the back being then

of a uniform dirty brown, with the sides greyish; the raised spots changed to brown rings containing buff dots, the hair or bristle from each only visible through a powerful lens; the general condition becomes less plump, and after a time the larva also becomes shorter. When young it is pale ochreous or pinkish on the back, the sides greyish-green, under surface paler; on the back of each segment a **V**-like mark, brown, prostrate, with the apex in front, through which passes the pale buff dorsal line, most conspicuous through the dorsal plate. As it arrives at two-thirds of its full growth the **V** marks disappear, and the adult colouring as described is assumed. (W. Buckler.)

August to May, reaching full growth by the end of autumn, shrinking somewhat in size, but continuing to feed, in mild weather, through the winter and spring, on low-growing plants on rocks at the seaside, but in confinement feeding on knot-grass, dandelion, plantain, chickweed, and slices of carrot. Lieut. Browne's account of this little-known larva is too interesting to be overlooked. "On July 22, 1890, I took some *A. lunigera* at Portland, and placed five of the females in a bandbox, with some honey on a small piece of sponge, to try to get ova. I looked at them every day, but could not see any eggs, and at the end of ten days, three of the moths having died, I let the survivors go, and thought that the experiment was a failure, until, being about to throw away the sponge used for the honey, I noticed some ova thereon, and, on examining it carefully, was surprised to find that the cells of the sponge were full of eggs, which had evidently been deposited by the moths as far inside as they could reach, and as much concealed as possible. There were no eggs on the outside of the sponge. The larvæ commenced to hatch out on August 3, and were fed on dandelion leaves. On this food beginning to fail at the end of September, I gave them slices of carrot, which they took to all right, and continued on this diet until the dandelion was again available in the spring. They

continued to feed from August, right through the winter, up to the end of April; that is to say, some of them did, for the slices of carrot were always eaten, more or less, even during severe weather. They were kept in two large flower-pots, under an open window facing the north, and led an entirely subterranean life, the four inches of earth in the pots being honeycombed by their burrows. I often looked at the pots after dark, but never saw any larvæ on the surface, except once when their food was short, and a few were wandering about looking for more, when, on seeing my light, they immediately retreated into their holes backwards. The food, too, was invariably eaten from below, never on the top or edge, the slices of carrot being scooped out on the underside. On several occasions I noticed a dandelion leaf sticking straight up in the pot, having apparently been grasped in the centre and partly dragged into the hole occupied by the larva, just as if it had been bent and forcibly stuck into the ground. I stopped giving them food on April 30, and in looking at the pots on May 25, there were eight larvæ on the surface apparently dried up, but on May 31 these eight had turned to pupa."

PUPA, when but just changed, cream-coloured all over, gradually changing to deep red, the red colour commencing at either end and extending inwards, a white band round the centre remaining visible for some days, so that the last trace of white does not disappear for ten days. In a brittle cocoon of silk and earth underground. (Lieut. Browne.)

This moth appears never to be captured in the daytime, doubtless it hides among thick herbage in rifts of the rocks. At night it flies freely in its very restricted haunts, and comes readily to sugar if any one is reckless enough to tempt it with that dainty. It also frequents blossoms of ragwort, wood-sage, and other plants; and is strongly attracted by light, and a constant visitor at lighthouses. Its sole haunts appear to be high sea-cliffs and precipitous rocks. In such

places in the Isle of Wight it has been taken by Mr. A. J. Hodges in abundance, but apparently only by venturing at night into such situations as are hardly to be called safe or easy in the daytime. Also rather common at Portland, and found in less numbers at other places on the Dorset coast. In Devon at Torquay, Seaton, and Bolthead not uncommonly, on the rocky portions of the Cornish coast, and even abundantly in the Scilly Isles. In South Wales near Swansea, near Laugharne, Carmarthenshire, at Caldy Island near Tenby, and elsewhere on the limestone sea-cliffs of Pembrokeshire; and in North Wales at Aberdowry, near Barmouth. In all probability it only needs to be looked for in other rocky portions of the coast of the South of England and Wales. In Ireland it is found at the Hill of Howth, near Dublin, at Castle Bellingham, and on the coasts of Cork and Kerry. In Scotland, in the Edinburgh district and on the coast of Moray. So far as is known, these are its limits in these islands, and, indeed, in the whole world, unless a report of its occurrence in the North of France be correct. How it can fail to occur there in plenty is almost beyond comprehension, its best English localities being so directly opposite. An opinion has been hazarded that it is merely a local form of *A. trux*, a species common in mountain districts of France, Italy, and Spain; but upon what grounds such a suggestion has been made, it is difficult to judge. Putting the far greater size of *A. trux* out of the question as unimportant, the two forms hardly appear to have any characters in common in either sex. Herrich-Schäffer, when suggesting the possible identity, actually pointed out the excellent specific distinctions.

[*A. spinifera*, *Hüb.*—The capture by himself of a specimen, flying in the sunshine one afternoon in August 1869, in the Isle of Man, was announced by Mr. C. S. Gregson in the *Entomologist*, 1872. This specimen, which is now in the collection of Mr. Sydney Webb at Dover, is of a clear pale

purplish-brown, with the reniform stigma normal, the orbicular long and narrow, outlined with black and joined to the reniform; and the claviform very long and sword-shaped, the sword having a hilt. Hind wings and abdomen very white. So far as I can ascertain, the capture of no second specimen has been established, and this can only be looked upon as an accidental introduction. It is decidedly a South European species, occurring in Southern France, Spain, and Sicily. At Gibraltar Mr. J. J. Walker says of it, "Found occasionally on the Rock at ivy-bloom in October; also met with in February. It is, however, more plentiful among coarse grass and herbage on the eastern beach (of the Mediterranean) three miles north of Gibraltar, in October. Some very richly marked specimens were seen on the Tangier sandhills in September 1888." To its limited European range may therefore be added some portion of Northern Africa and probably a large extent of Asia, since it is well known to be plentiful in India. That it is a resident in any part of the British Isles is altogether improbable.]

9. **A. ripæ**, *Hüb.*—Expanse $1\frac{1}{2}$ inch. Fore wings narrow and rather pointed, pale yellowish-brown or whitish-brown; stigmata darker; lines indistinct, often obscure; usually a row of short brown wedges before the hind margin; *hind wings clear white*, slightly tinged with greyish in the female.

Antennæ of the male deeply notched with short pointed teeth, from which arise closely placed tufts of fine bristles, serving as apparent pectinations; these become shorter beyond the middle and disappear, leaving the apical fourth part of the antenna threadlike; pale brown. Palpi short, loosely tufted, whitey-brown; head rather densely tufted, whitish-brown; collar similar, doubly barred and edged with brighter brown; shoulder lappets slightly raised, very pale brown, streaked or dotted with brown or black at the tips; remainder of thorax pale brown, furnished with a very faint

crest at the back; fascicles short, closely curved, snow-white; abdomen pale yellowish-brown; basal portion whiter; lateral tufts small; anal tuft long, yellowish. Fore wings very narrow at the base; costa straight; apex rather sharply angulated; hind margin gently rounded, more so below the middle; dorsal margin straight; colour very pale wainscot-brown or yellow-brown, or even whitish-brown; subcostal region often paler, or dusted with grey or white; basal line scarcely visible, indicated by fragments of curved brown lines near the costa; first line double, dark brown or black, formed into three rough crescents, and placed rather obliquely *outward* to the dorsal margin; second line a curved series of small black crescents with long points, the enclosed spaces often showing as whitish spots; beyond is a transverse band of roughly wedge-shaped black-brown streaks edging the subterminal line, which is very indistinct, pale brown; hind marginal space beyond it clouded with smoky-brown; orbicular stigma small, round, brown, broadly ringed with blackish; reniform stigma edged and nearly filled up with blackish-brown; claviform stigma small, black, or edged with black; extreme hind margin edged with slender blackish crescents; cilia light brown. Hind wings rather small, rounded, pure white, or with the faintest possible tinge of brownish on the nervures and hind margin; cilia pure white. Female similar, with simple antennæ, stouter body, and the nervures of the hind wings more distinctly pale brown, also in some instances a clouding of pale grey-brown on the hinder half; cilia white.

Underside of fore wing shining white, faintly tinged with yellowish or greyish along the costa, with a faintly grey central spot, and beyond it a slender grey transverse stripe; hind wings white, dusted with brown along the costal margin; body yellowish-white; legs pale brown; leg tufts pure white.

This species is subject in a remarkable degree to local variation. On our south-western coasts it is often well, or even strongly marked, showing all the markings distinctly;

on the coast of Hants and the Isle of Wight, and generally in the south and south-east the tendency is often to shades of reddish on a white ground, or to a very opaque whiteness, the markings in both cases being often obscured; on the coast of the Eastern Counties the ground colour is usually whitish, though not of so opaque a quality, or perhaps more of a whitish-drab, and the markings are rarely very strong, usually faint or partially obsolete; on the north-western coasts more tinged with grey. These forms melt into each other, so that the ground colour varies from pure white through pale reddish, rich reddish, reddish-drab, yellowish-drab, and various shades of pale brown to brownish-grey, and the markings to all degrees of distinctness or obliteration—especially the latter. In the collection of the late Mr. Henry Doubleday at the Bethnal Green Museum is a very handsome series of well coloured and well marked specimens, unfortunately without locality-labels, but which there is reason to think were obtained near Torquay. In Mr. F. J. Hanbury's collection is a specimen the fore wings of which are of a rich bright light red with the markings and nervures slenderly edged or lined with white; another with thorax and wings clear smooth white, except faint indications of the three stigmata, and part of the first and second lines; and a third example of whitish ground colour, but with all the markings clearly shown, and all the interspaces delicately dashed and clouded with grey, reddish, and brown. In the collection of Mr. S. J. Capper is a specimen of a creamy-yellow, with the three stigmata distinctly marked but the transverse lines totally absent. Dr. Mason has a specimen of a greyish-white with a reddish flush, and the stigmata faintly indicated in reddish-brown. It is scarcely possible, in words, to indicate the delicate loveliness of some of these forms.

On the wing in June and July.

LARVA elongate, rather flattened, shining, with plates on the second and anal segments; head rounded and polished.

Dull ochreous; dorsal line dark grey enclosing a pale thread; subdorsal line broad, grey, shading off downwards; parallel and close below it is a faint grey line; dorsal dots grey, prominent, shining; lateral spots shining, but less distinct; spiracles very large, black and conspicuous; head pale brown; plates dull yellowish; under surface paler; legs and prolegs tipped with dark brown. When young the colour of this larva is pale greenish. (C. Fenn.)

Mr. Buckler figures the full grown larva greenish, as well as dull ochreous, but in my own experience the latter colour is predominant. Very possibly the food plant may have some influence, since the Rev. J. Hellins, who fed them on the same food plant, had them in both colours, and one larva green for one half its length, grey the other half! July or August, to May and even June, but feeding up in the autumn, on *Salsola kali*, *Cakile maritima*, *Sueda maritima*, *Eryngium maritimum*, *Convolvulus soldanella*, various species of *Atriplex* and *Chenopodium*, and probably on almost any plant which grows freely in sand within the immediate influence of the sea; in confinement on lettuce and slices of carrot. Also fed by Messrs. Buckler and Hellins upon Hound's-tongue (*Cynoglossum officinale*), but this plant does not usually grow in such spots as this larva loves, and it is probably only a substitute food. The larva feeds at night with avidity, crawling freely over the plants, but hides by day in the sand at a depth of one or two inches, usually under its food plants, and chooses more particularly the loose sand near high water-mark rather than that which is bound closely together by the roots of *Ammophila* and other plants. When full-fed at the end of autumn it burrows more deeply into the sand for hibernation, but in the spring comes again more nearly to the surface or else assumes the pupa state in the small chamber in which it passed the winter. In confinement it must be supplied with a considerable depth of sand, which must not become too dry, and pieces of carrot should be left on the surface in order that any larva which

has not fully satisfied its hunger may, on coming up, find food. If not fully provided it may very probably supply the deficiency by devouring a companion or two.

PUPA of ordinary form, thin skinned, very pale brown; in a chamber in sand, often at some depth.

The moth is extremely sluggish in the daytime, hiding itself close on the surface of the sand—which in appearance it strongly resembles—at the roots of its food plants, or of grasses, under ledges, under pieces of timber stranded by the sea, or in any close shelter. At night it flies vigorously, and may be attracted by sugar and by light. Wholly confined to sea-sands, but widely distributed on the English coast—Deal; Isle of Wight; Portland and Studland in Dorset; Torquay and elsewhere on the coast of Devon; Weston-super-Mare, Somerset; Hunstanton and Yarmouth, Norfolk; coasts of Essex and Suffolk; Spurn, Lincolnshire, and elsewhere on the sandy coasts of that county and Yorkshire. Formerly at Runcorn, Cheshire, whence it in all probability was *not* exterminated by the Manchester Ship Canal; on the Lancashire coast and that of the Isle of Man; and recorded, though at long intervals—1859 and 1888—in the west of Cumberland. In Wales it appears to be fairly common on the south coast, having been found near Swansea; at Pembrey, Carmarthenshire; and at Tenby. The only record in Scotland of which I am aware is by Mr. P. Cameron at Troon, Ayrshire. The late Mr. E. Birchall recorded it at Malahide on the Dublin coast, and although the record has not been confirmed I have little doubt of its accuracy.

Abroad its distribution is not wide, as it appears to be confined to the coasts of Sweden, Denmark, Northern France, and Northern Germany. The white varieties already described are also found in Pomerania and Denmark. The insect known under the name of *instructa*, Walk. appears to me to be nothing more than the female of this species.

10. **A. cursoria**, *Hüb.*—Expanse $1\frac{3}{8}$ to $1\frac{1}{2}$ inch. Fore wings long, narrow, rather pointed, with straight costa; yellowish-brown, clouded or marbled with darker brown, no wedges along hind margin, stigmata edged with whitish; hind wings white, bordered with grey.

Antennæ of the male pectinated to the middle with short pointed teeth tipped with fine bristles, tapering off beyond the middle, and leaving the apical portion threadlike; colour pale brown. Palpi and head strongly tufted, light brown; collar pale brown or whitish-brown, with two large dark brown or even blackish-brown crescents just within the upper margin. Thorax pale brown, barred and blotched with whitish, or with the collar and raised shoulder-lappets edged with white; faintly crested at the back, the tufts mottled with white and often edged behind with dark brown; fascicles dense, white; abdomen yellowish-brown, basal portion with abundant long whitish hair-scales; lateral tufts prominent; anal tuft rather compressed and bluntly pointed, light brown. Fore wings rather long and narrow; costal and dorsal margins very straight and diverging but little; apex bluntly pointed; hind margin beneath it nearly straight, oblique, bending and becoming more oblique below the middle; colour pale yellowish-brown or brownish-buff, usually somewhat dusted and rippled with darker brown; basal line brown, abbreviated, broken, but distinct near the costa; first line brown, perpendicular, formed into a series of irregular crescents, usually edged inwardly with whitish, and duplicated; second line curved out from the costa, but bending back above the middle, and then proceeding obliquely *straight* to the dorsal margin, but rippled throughout into crescents with long points, which touch an exterior series of dark dots or streaks; subterminal line whitish, rippled and meandering in its course from before the apex, where it touches an oblique dark brown streak or triangle, to the anal angle, edged inwardly with brown, but almost

always devoid of the wedge-like streaks which are conspicuous in some other species. Outside this line is an irregular dark brown cloud lying along the hind margin; orbicular and reniform stigmata rather small, either brown edged with whitish, or wholly whitish or greyish-white; the space between them often darker brown, sometimes conspicuously so, forming a somewhat squared spot; claviform stigma only indicated by a small, uncertain, brownish streak; nervures in the middle area of the wings, especially the subcostal and median, often indicated in white or paler brown; between the first and second lines is sometimes a rather slender cloudy brown transverse shade; costal edge dotted or spotted with brown; extreme hind margin edged with minute black lunules; cilia light brown, yellowish at the base. Hind wings rather short, apex rounded, hind margin rather sinuous; whitish, with the nervures brown, and the costal and hind marginal regions clouded with brownish-grey, sometimes faintly and narrowly, often broadly, and sometimes even darkly so toward the hind margin; in some cases also forming a cloudy grey transverse stripe; central lunule elongated, grey; cilia rather long, pure white. Female similar, with the body stouter, the antennæ simple, and the fore wings slightly narrower.

Underside of the fore wings greyish-white, becoming shining white before the hind margin, usually clouded more or less with slate-grey in the middle area; reniform stigma indicated by a blackish spot, just beyond which is a narrow, angulated, dark grey transverse stripe. Hind wings white, dusted along the costal and hind margins with grey atoms; a faint transverse stripe of similar atoms lies beyond the middle; central spot elongated, grey. Body whitey-brown; legs pale brown, the first pair spotted in front with black; leg tufts whitish-brown.

Variable in an extraordinary degree, hardly two specimens being precisely alike, and all the varying forms shading insensibly into each other through intermediates.

Indeed the form from which the above description is taken is looked upon as the type merely because it is more common and more generally distributed than the rest, most of which are in some degree local—and of course because it is the form from which the original description of the species was obtained. The varieties in colour and marking seem to extend equally to both sexes, and even with regard to the hind wings there is apparently no strict rule.

In the forms ranging more particularly around the type the ground colour varies from brownish-buff to pale buff, yellowish-brown, reddish-brown, dull umbreous, and greyish-brown, throughout its area of distribution; in eastern districts to whitish-brown or even slate-white; while in the west the more dull umbreous tints prevail, intensified in the west of Ireland to an exceedingly dull sordid umbreous, and blackish-brown. In nearly all cases the colour of the upper part of the thorax follows that of the fore wings. In some of those already mentioned the transverse lines of the fore wings are distinct, as also are the transverse clouded markings, and brown blotches are noticeable between and beyond the stigmata and outside the second line; in others the lines are distinct but the clouded markings absent, or the lines have disappeared and the clouding has taken possession; the upper stigmata moreover are white, or white with a brown central cloud, or obscure and devoid of white, or nearly imperceptible; the nervures range from whitish to yellowish or very pale brown, or are concolorous with the rest of the wings, or very often a portion of the median in the middle area is marked with a slender straight whitish line. In individuals where the dark clouding is absent and the transverse lines are conspicuous, the stigmata are sometimes almost obliterated and the first and second lines drawn nearer together, duplicated and formed into a very pretty pattern quite unlike the ordinary forms. In other cases the lines also disappear, and the fore wings become unicolorous yellowish-brown, except that a brown spot then shows itself

in place of the lower part of the reniform stigma. In the grey-white or slate-white varieties, which seem confined to the east coast, and are rare there, the markings are usually neat, small, sharp, often abundant, the pale nervures edged with darker and the lines and shades well but slenderly marked; more rarely these, following the example of the brown forms, have the markings mainly obliterated; but on the north-east coast of Scotland they are sometimes found much intensified and blackened. On the Lancashire coast a form is not uncommon, of a dull pale umbreous with the transverse lines and the upper stigmata indistinct, but the claviform stigma, a spot before the orbicular, a square blotch between it and the reniform, and a central basal streak all blackish. All along our eastern coasts, in company with the paler forms already described is a range of far more beautiful varieties, having the ground colour smooth yellowish-brown, or whitish-brown, shading off to fawn colour, having a very smooth creamy appearance from the absence of the usual umbreous clouding. In these the dark crescents on the collar are often black or deep brown, the transverse lines are sometimes slenderly distinct, but more frequently absent; there is a broad white or whitish-brown straight stripe from the base along the subcostal region, the two upper stigmata are wholly white or but faintly clouded with brown, coalescing with the stripe, the claviform stigma is distinct, edged, or filled with brown or black, and the large squared spot between the orbicular and reniform stigmata is either rich dark brown, bright brown, or black; very often also the space beyond the reniform stigma is richly clouded with fawn colour. Other specimens have the white subcostal stripe joined to the two white stigmata, but are devoid of the dark spots and clouding of fawn colour, and lean toward the whitish-grey varieties. Others, more particularly from the coast of Aberdeenshire and Kincardineshire, are most exquisitely coloured, the markings just described intensified, the subcostal stripe, the two upper stigmata, and the median

nervure snowy-white, the claviform stigma and the spots before and between the other stigmata brilliant black, the hind margin blackened, and the middle of the wing clouded with rich purplish-red, shading off to brownish-white, or ashy-white. Another beautiful form from the same district is dark purple-brown or red-brown with the transverse lines black, the two upper stigmata dark with sharp white outlines, the claviform black-margined, and the hind margin rich dark purple-brown. For these lovely forms I am much indebted to Mr. Arthur Horne of Aberdeen. An extreme variety from this district is deep black-brown but showing the typical shape of the elbowed second line; others have the central portion of the fore wings entirely deep black or black-brown, and the transverse lines obliterated; and others again in unbroken sequence shade off to dull dark-brown, pale brown and pale buff, all the typical markings more or less obliterated, until the species is hardly recognisable; one specimen is of the colour and appearance of *Hadena chenopodii*, another bears a most curious resemblance to *Agrotis suffusa*, and a dark purple-brown example so closely resembles one of the varieties of *A. tritici* that it can only be recognised with any certainty by its underside. A curious form brought from the Orkneys by Mr. McArthur is dark slate-colour, smooth and unicolorous except the two whitish stigmata; others from that locality are much more ordinary. Those obtained from Unst, Shetland, have the rich fulvous or tawny colouring, with strong markings, like those from Aberdeenshire, and they vary comparatively little. A specimen in the collection of Dr. P. B. Mason, and taken in Norfolk, differs from all others that I have seen. It is almost smooth straw colour, but with the transverse lines thick and complicated, the spaces between stigmata and hind marginal cloud red-brown, and the whole wings beautifully variegated.

In many of the forms the hind wings are occasionally quite white, or on the other hand wholly tinged with greyish-

brown, but in the vast majority the grey-brown hind marginal band is more or less visible.

The underside of the fore wings is far more constant than the upper, the hind marginal space, beyond the dark stigma and stripe, being always pale and shining, often white. By this the species may be recognised when all the characters of the upper side seem to have been lost.

On the wing at the end of July, through August and in the beginning of September.

LARVA cylindrical, tapering a little at the first three segments, the head being the smallest, though rounded and full in outline; it tapers also in the two hinder segments; the segmental divisions and subdividing wrinkles are very well defined. Head and dorsal plate pale brownish-buff, body of the same colour when full grown, dorsal line bluish-grey, edged with darker grey; subdorsal line whitish-grey or pale grey, edged above with a strongly contrasting dark greenish-grey line; midway between this and the spiracles is an interrupted undulating whitish-grey line; spiracular stripe broad, greyish-white, having a fine dark grey line running through it; spiracles black; raised dots dark brown.

When young it is rather long and slender, but as it approaches half growth it becomes tolerably stout, and when full grown is very decidedly plump. The general colouring of the body up to more than half growth is a lively glaucous-green on the back and rather bluish or greenish-grey on the sides. Soon after half growth it comes to be parti-coloured for a time, the front segments remain green, whilst a patch of ochreous tinges the back of the hinder segments; by-and-by this, by degrees, spreads below and extends gradually forward, keeping pace with the growth of the larva until maturity, when the colour is as already described. (W. Buckler.)

September to June or even July on *Aira præcox*, *Triticum junceum*, *Arenaria poploides*, *Viola*, and other sand-hill

plants. Hiding in the daytime at a depth of two or three inches under the surface of the sand, among the roots of its food plants; coming up at night to feed. Apparently hibernating when rather small.

PUPA of ordinary shape, moderately stout, smooth and rather shining, of a pale golden-brown colour. In a compact, egg-shaped cocoon, at some depth in the sand.

The moth hides in the daytime in dense tufts of *Ammophila arundinacea* (Marram-grass) close to the surface of the sand, and among other plants on the sea sand-hills, but more particularly under the ledges from which the sand has been blown away, leaving masses of entangled roots exposed. From among these it may readily be shaken out, when it falls upon the sand quite inert, or crawls lazily away in search of another shelter. Its partiality for this shelter is apparently well known to the birds, as is testified by the numbers of detached wings to be seen lying about. At night it flies vigorously, but does not seem to leave the sand-hills. It is readily obtained by sugaring bunches of marram-grass, but seems even more fond of the blossoms of the same grass, and of ragwort growing on the sands.

Entirely confined to sand-hills on the coast, but local, usually preferring those of extensive range. Irregular in appearance, occurring in hundreds in favoured years, but in some seasons hardly to be found. Apparently on all extensive sand-hills of the east coast from Suffolk to Yorkshire, and very abundant at times in Norfolk. Much scarcer on the south coast, but found in Dorset and Devon. In Wales extremely local, and only recorded from near Neath, but it reappears in Cheshire and Lancashire. There is no reason to believe that it has ever been seen in the Breck-sand district of Norfolk and Suffolk. In Scotland, on the Edinburgh coast, and those of Aberdeen and Kincardine, as well as in the Hebrides, Orkney, and Shetland

Isles. Widely distributed on the Irish coast—Dublin, Louth, Down, Antrim, Derry—to Portrush in the extreme north—Donegal, Sligo, Kerry, and Wicklow. Abroad it does not appear to be quite so exclusively confined to the coast. It is found in France, Belgium, Holland, North Germany, Denmark, Finland, Livonia, Pomerania and Central Russia.

11. **A. nigricans**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings narrow, blunt, dull brown or blackish-brown; markings very obscure; stigmata often tinged with yellowish; hind wings pale brownish-grey or greyish-white.

Antennæ of the male sharply and regularly notched, each notch surmounted by a small tuft of fine bristles, to beyond the middle; apical third part simple but ciliated; colour dark brown. Palpi short, thickly tufted, blackish-brown; head dark smoky-brown; collar large, black-brown, dusted with paler; rest of thorax similar, with a long divided crest from collar to back, where it is tipped with pale grey; fascicles short, expanded, rather scanty, brownish-white; abdomen dull pale reddish-brown or purplish-brown, with spreading lateral and anal tufts, the latter barred above with smoky blackish. Fore wings rather narrow, specially so at the base; costal and dorsal margins straight; apex almost rounded or very bluntly angulated; hind margin rounded and very full; colour dark purple-brown, dark umbreous, or black-brown, with the markings very obscure; basal line suggested by a double blackish streak on the subcostal and median nervures close to the base; first line only faintly perceptible, smoky-black, often edged with dull whitish, perpendicular but angulated and curved; second line curved but not very oblique, formed into a series of faint black crescents edged outside with yellowish dots, or with a yellowish-white line; subterminal line a row of barely perceptible yellowish dots; orbicular stigma rather paler, reniform tinged with yellow, claviform just visible,

all edged with black; cilia smoky-brown with a paler line at their base. Hind wings whitish at the base, with the nervures dark brown, and the hinder portion clouded with smoky-brown, darkest toward the margin; central spot smoky-grey, indistinct; cilia white. Female very similar but with threadlike antennæ, stouter body, and hind wings darker.

Underside of the fore wings shining pale grey, dusted with white along the costal region, apex, and hind margin; sometimes with faintly paler, or darker, clouding about the reniform stigma; hind wings white, broadly dusted with grey upon the costal region and toward the hind margin; cilia white.

Variation in this species, in spite of the obscurity of its markings, is very considerable; in the ground colour especially—to umbreous, clay-red, purple-red, reddish-brown, pale brown and pale purple-brown, in the southern and eastern counties and the Fen districts; to blackish, with yellow reniform stigma, in the north and north-west; and to almost jet black in Ireland. In some instances, irrespective of darker or paler colour, the markings become distinct, and are even added to, a black spot preceding the orbicular stigma, and a square black or brown blotch occupying the space between that and the reniform stigma; while the first and second lines are occasionally bordered with yellowish, or the reniform stigma is more distinctly yellow, or is quite of the ground colour; in which last case all the markings are usually obliterated, leaving the wings unicolorous, or mottled with the faintest possible confused black streaks. Of these the dull black and black-brown forms, with yellowish edging to one or both stigmata, were formerly looked upon as a distinct species under the name of *A. fumosa*; while those of more reddish colour, with the interspaces of the discal cell black, appear to have been known as *A. obeliscata*; and light red or clay-coloured specimens without the black inter-stigmatic spots as *A. ruris*.

Another form of very dark purple-brown colouring, but the transverse lines and stigmata all yellowish, and the former rather spread and clouded, was known as *A. dubia*. A still more extreme form in which the yellowish colour runs in slender longitudinal lines is probably what was known as *A. Marshallana*, though this is not so certain; but the identity of all as one species has long been recognised, and all are so inextricably blended together by every shade of intermediate variation, that even as varietal names the value of these designations is doubtful. The last named appears to be the most rare. I have taken it on the Norfolk coast. Typical specimens of nearly all these forms with the original names attached, from the Haworth collection, still exist in that of Dr. P. B. Mason, at Burton-on-Trent. Mr. F. J. Hanbury possesses a specimen having the purplish front margin of the fore wings as in *A. ravidata*, which it curiously resembles; and another which has before the hind margin a distinct row of short, black wedges. A beautiful specimen taken at Howth, near Dublin, by Mr. G. V. Hart, is of a rich deep black, with the reniform stigma edged with yellowish, but the other markings very indistinct; its hind wings are not unusually dark. The more brightly marked forms seem to preponderate in the Cambridge Fen district, but in most localities the dull and obscurely marked varieties are in an immense majority.

On the wing in the latter part of July and in August.

LARVA when full grown an inch and a half long, smooth and cylindrical. The colour of the back ochreous-brown, and in some individuals very bright ochreous; a thin grey dorsal line margined with blackish, and running through a series of blackish-brown triangular and diamond shapes is well defined in some individuals, though obscure in others. Subdorsal line greenish-black, in some varieties quite black, and edged below with a narrow line of dirty whitish-green, then a broad stripe of blackish-green, followed by another

dirty whitish-green, narrow, and slightly interrupted line, and then another darker, broad stripe of blackish-green, along the lower edge of which are the black spiracles. A double whitish stripe follows extending down the sides of the anal prolegs, produced by a line of pale dirty greyish-green running through the middle of the white; under surface and prolegs greyish-green; ordinary shining warty spots black; head greyish-brown, mottled and streaked with black; a dark brown shining plate on the back of the second segment is divided by three paler greyish lines. Some of these larvæ present great resemblance to several of the varieties of that of *A. tritici*; but the double white stripe above the feet, and the black warty dots, give distinct characters to the larva of the present species. (W. Buckler.)

September to the middle of June, on clover, plantain, *Heracleum sphondylium* and other *Umbellifera*, and almost every description of low growing weeds in cultivated fields, but apparently not on any grasses. Mr. Buckler's remarks on this subject are of great interest. "On May 11, 1865, Mr. H. Doubleday sent me some larvæ which proved to be of this species, and to that gentleman I am indebted for the following account of their destructiveness in a field of ten acres, which in the previous autumn was sown with wheat and with clover in the early portion of that year. The clover came up well and the field was green all over with it, until these larvæ began to attack it. So prodigious were their numbers, and so great their power of devastation, that by the 17th of May not a leaf of clover nor of any weed remained upon the whole ten acres, though the wheat was uninjured, and by that time they had left the open field and gone to the hedge-banks and ditches where a remarkable scene of destruction presented itself to view; the large *Heracleum* and other umbelliferous plants were stripped of their leaves, and in short nothing was left but grasses, which they did not appear to touch. I received other larvæ on the 14th of May from Ipswich, feeding on *Plantago major* and

P. lanceolata, and the sender reported that they liked a change of food, and would eat many low plants; however, I found that they took readily to clover, and like those before mentioned continued to feed to about the middle of June, the moths appearing from July 15 to 24, varying much in their appearance and becoming active and restless the moment their wings were dry."

PUPA of ordinary form, light brown, thin skinned; in an earthen cocoon beneath the surface of the ground.

The moth hides itself in the daytime on the ground at the roots of plants, or under rubbish, or any convenient shelter. It flies actively at dusk and at night; comes occasionally to light; very freely to sugar; and is extremely fond of flowers, frequenting those of dock, burdock, ragwort, sunflower; tansy and even leek, as well as various garden flowers, and it has been found at night sitting on leaves of tall reeds. Apparently almost confined to comparatively level localities, rich farm land, marshes and fens, and at the seaside, more especially to salt-marsh districts.

Not usually very abundant in the southern counties, though occasionally it increases so in numbers as to become destructive, yet found in Kent, plentifully in Sussex, Dorset, Hants, Somerset, less frequently in Gloucestershire, and by no means commonly in Devon and Cornwall. Usually abundant in Norfolk, Suffolk, and Essex, and in the Cambridgeshire and Huntingdonshire Fen district, where also it produces some of its most striking varieties; moderately common in Berkshire, Oxfordshire and Herefordshire, less so in Warwickshire, and rare in Derbyshire. I can find no record in Wales, where it surely must occur, though it does not delight in hills. In Yorkshire it is widely distributed; also common in Cheshire and Lancashire, where the mosses produce the darkest forms; and is found, though not commonly, in Westmoreland and Cumberland. In Scotland it is recorded from Ayrshire and elsewhere in the

Clyde district, and in the east so far north as Moray. Sir Thomas Moncreiff used to find it abundantly at Moncreiff Hill, and very variable, specimens having the yellowish-white markings being frequent. In Ireland it occurs in the Dublin district, in Louth, Galway, Antrim, and more rarely in Down and Derry. Abroad it is common throughout the continent of Europe except the extreme north and south, also in Asia Minor, Siberia, and in North America.

12. **A. tritici**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings rather narrow, blunt, brown in various shades; a whitish or pale brown subcostal stripe, and below it a blackish streak from the base; upper stigmata pale, in a dark discal cell; hind wings whitish or pale grey.

Antennæ of the male pectinated for three-fourths of their length, with short solid sharp teeth which taper off, leaving the apical portion threadlike, the whole finely ciliated, dark brown. Palpi tufted, dark brown or blackish, paler in front, but the third joint slender and blackish; head tufted, pale brown, barred across the front with dark brown; collar broad, brown, with two darker cross-bars; shoulder-lappets much raised, blackish-brown, paler at the edges; rest of thorax light brown, slightly crested at the back, and faintly barred with whitish, tips of crests white; fascicles long, whitish; abdomen dark brown shaded at the base with long whitish scales. Fore wings rather short and narrow, of fairly even width; costa only faintly rounded; dorsal margin straight; apex very bluntly angulated, almost squared; hind margin beneath it almost perpendicular, but bent at the middle, and rounded off at the anal angle; colour umbreous, greyish-brown, or purplish-brown, clouded and shaded with richer brown, or purple-brown; on the costal edge are five or six white dots, and from the base a broad white, whitish, or pale brown stripe lies straight along the subcostal region as far as the reniform stigma; median nervure also white to the same length, and the dorsal

margin is often tinged with white toward the base. In the middle of the base beneath the median nervure is often a short black longitudinal streak or spot—but frequently it is brown or merged in the dark ground colour—just outside it on the costa and the median nervure is a slight indication of a black basal line: first line deep black, cut off by the white subcostal stripe, but scalloped, broken, and edged inwardly with white; second line oblique, black, also cut off from the costa, interrupted but nearly straight, edged outwardly with white; orbicular stigma rather large, white, ringed with black and centred with brown; reniform stigma white margined with black and enclosing a long, curved, grey, black-edged streak; rest of the discal cell, before and between the stigmata, filled up with deep black; claviform stigma usually very distinct, edged with deep black; a black streak lies beneath the reniform stigma, and three or four more, wedge-shaped and edged with white, beyond the second line, the base of each wedge being in contact with the subterminal line, which is whitish, distinct, undulating, and partly broken up into spots; space beyond it dark purple-grey, or dark brown, with minute black lunules along the extreme margin; cilia grey, yellowish at their base. Hind wings rather ample, white at the base and often so in the central area; nervures grey, central spot indistinct, grey, forming a long crescent across the discal cell; apical and hind marginal region narrowly, or broadly, shaded with brownish-grey; extreme marginal line brown; cilia white, shaded at their base with light brown. Female slightly stouter, and sometimes with the fore wings a very little narrower; hind wings more suffused with grey; otherwise similar.

Underside of the fore wings dark grey-brown with considerable iridescence on the basal half, but with a narrow space of long dull scales in the discal cell, beyond which is a large cloudy-black spot or blotch, sometimes divided by a pale dash; hind marginal region dark grey or dark brownish-grey, rather shining; extreme margin edged with black

lunules; cilia pale grey with whitish dashes. Hind wings white or whitish, with the whole costal region and hind margin broadly, or narrowly, dusted and clouded with dark grey atoms; nervures and central lunule dark grey; very rarely a dark streak from the costa indicates the commencement of what should usually be a transverse stripe—here absent. Body brown, anal tuft reddish; legs blackish, barred with white; leg tufts whitish, greyer in front.

Variation in this species is so extensive as hardly to be defined by words, while all the forms, however extreme, are so completely united by all intermediate gradations that no satisfactory line can be drawn between any of the different varieties, though the names which have been applied to them are sufficiently numerous. The ground colour varies from whitish-brown through all shades of wainscot-brown, greyish-brown, reddish-brown, umbreous, chocolate-brown, and rich purple-brown, to deep brown-black. Specimens may even be found though rarely, of a pale slate-grey or whitish-grey, and others of a soft fawn colour. In my own experience such as these have occurred in Norfolk, where, on the other hand, I have found my blackest specimens. Elsewhere the blacker forms seem to be more particularly confined to the west coast of Ireland and the north and west coast of Scotland. In markings the variations are perhaps a little more defined. Ordinarily in all the variations of ground colour the orbicular and reniform stigmata are visible, either wholly pale or with pale margins; though in size the orbicular is far from constant. With these, especially in the coast forms, is usually the pale subcostal stripe—white, yellowish-brown, brownish, or even reddish—and in a considerable proportion of them a whitish line branches off from the stripe along the median nervure. In all these distinctly marked specimens there is a general tendency to clear, smooth colouring, often beautifully shaded, and to distinctness of the transverse lines, of the black wedges before the subterminal line, and especially of the deep black spaces before and between the

stigmata; and these various characters are combined or separated in every proportion and variation of arrangement. It is also a curious circumstance that these well-marked and handsome forms, in all the colours, seem to be confined, or almost confined, to the coast, and to the stretch of ancient coast in the west of Norfolk and Suffolk, known as the Breck Sand. In Sherwood Forest, as shown by Mr. G. T. Porritt, a deep purple-brown form prevails, but the usual inland forms, found mainly upon heaths, are pale umbreous mottled all over the fore wings with darker umbreous, sometimes showing the stigmata faintly paler, or the transverse lines rather darker, but often all obscured by the brown mottling. In these the only distinct marking is sometimes a well-defined dark brown cloud lying along the hind margin beyond the subterminal line. Perhaps the tendency of this range of variations may best be expressed by stating that the more extreme forms bear in some cases a most curious resemblance to *Caradrina cubicularis*, and in others to *Hadena chenopodii*. In the coast varieties very curious resemblances also occur, setting aside the constant resemblance of the browner forms to the very closely allied *A. aquilina*, some take a purplish or lilac shade which makes them resemble *A. obelisca*; others, with rich fawn colouring and strong markings, *A. cursoria*; others again, with strong markings and rosy shades of colour, a somewhat more distant approach to *A. agathina*; while in other purple-red forms an occasional specimen shows so red a subcostal stripe as to remind one of *Noctua plecta*, and I have a specimen from the north of Ireland which but for its far narrower wings would surely be mistaken for a red *Noctua xanthographa* with distinct yellowish stigmata. These suggestions may seem fanciful, but the actual resemblances are rather startling, and no method suggests itself by which they may be realised so good as that of pointing out the species which seem to be imitated. That there is *actual* imitation is not, for a moment, to be supposed. Perhaps the most curious apparent

imitation is that to a North American species—*A. subgothica*; of this a fine example is before me. Its general colour is rather dark umbreous, stigmata paler but not strikingly so, the orbicular small and oblique, the subcostal stripe very pale brown, and from it, just before the orbicular stigma, a similar pale brown stripe *obliquely* down the wing straight toward the anal angle. This oblique stripe appears, completely or partially, in occasional specimens of other colouring and markings, which do not at all resemble *A. subgothica*, and it is perhaps most frequent in an east-coast form having whitish-brown or very pale wainscot-brown ground colour, the fore wings of which are also rather narrow. For some of the most beautiful forms that I have seen of this species I am indebted to the kindness of Mr. A. Horne, who has obtained them on the north-east coast of Scotland. The usual dark markings in these are of a rich velvety black, purple-black, and purple-brown, the subcostal stripe clear white, and in some, the median nervure, the first line and the two stigmata outlined with the same; others have the subcostal stripe yellow. Mr. Kenneth Morton has found a curious form on one of the high hills in Dumfriesshire. It resembles *A. obelisca* in some degree, but is more dull in colour and devoid of the pale subcostal stripe; transverse lines distinct, black; stigmata of the ground colour but outlined with black; otherwise unicolorous. Hind wings dull pale grey. One taken in Norfolk by the sons of Mr. F. J. Hanbury is of a remarkably delicate light brown; another found on the Antrim coast by the Rev. W. F. Johnson is equally pale but has the whitish stigmata almost squared, and the intermediate spot strikingly black.

Many of the forms have been described as distinct species. Haworth's *valligera*—"fore wings reddish-grey with the three stigmata, the lines, and the hind marginal wedges fuscous;" *albilinia*—"wings with three reddish stigmata, a white longitudinal line, and black lines and wedges;" and his *lincolata*—"wings reddish with three greyish stigmata, lines and a hind

marginal stripe black ;" also Stephens's *sagittifera*—"fore wings grey clouded with white, with a longitudinal black arrow-shaped line from the base, upper stigmata whitish, centred with grey, hind wings white ;" *vitta*—"smaller than the last, fore wings reddish-brown, subcostal stripe whitish, median nervure also whitish to the middle, upper stigmata whitish centred with grey, and preceded and separated by black interspaces ; hind margin greyish with a whitish subterminal line ;" *pupillata*—"fore wings brownish, transverse lines grey, margined with dusky or black, middle of the wing rather pale, upper stigmata greyish, hinder part of the wing rather uniform brown ;" *hortorum*—"fore wings greyish-black with the ordinary stigmata reddish margined with black, hind wings fuscous with darker margins ;" *ocellina*—"fore wings reddish or dusky with a dusky costal stripe, lines black, stigmata pale grey ocellated with reddish, hind wings dusky"—are all supposed to refer to varieties of this species. The late Mr. Bentley, fifty years ago, characterised twelve varieties, but very judiciously refrained from giving the majority of them names, remarking, "It is useless to describe more varieties ; it is difficult to find two specimens alike. In some the teleform (claviform) stigma is wanting, in others very large ; some have no transverse lines, some one to four ; some have no pale costal stripe, some are grey, others dark fuscous ; some dark at base, others at the hind margin ; all are but one variable species." Excellent ! But it is doubtful whether he—or I even at this great length—have done full justice to the variability of this interesting species.

On the wing in July and August, often lasting into September.

LARVA plump, rather short, extremities both small ; head rounded, shining, dirty grey or sometimes dark brown ; general colour dusky grey, rather shining, minutely dusted with blackish ; dorsal line slender, of the ground colour, edged

with broader stripes of brownish-grey clouding, in which are a few black spots, one or two each on the middle segments; subdorsal and spiracular lines dusky brownish-grey; spiracles black; under surface and feet dirty pale grey; plate on the second segment barred or spotted with black. Sometimes the ground colour is wholly dirty reddish, with reddish-grey stripes deeper in tint. Very similar to that of *A. velligera* in colour and markings.

September to May or June on *Cerastium* and other chick-weeds, *Spergula nodosa*, *Galium verum*, *G. mollugo*, and probably almost any low-growing plants, especially those attached to sandy soils. Hiding, like its congeners, under the surface of the sand, or of the earth, in the daytime, but coming out at night to feed. On the Continent it is one of the species notorious for their destructiveness to crops. Kollar, in his treatise on injurious insects, quotes a paper by Count Beroldingen, in the Transactions of the Imperial Agricultural Society of Vienna, upon its devastations on his own estate, in the year 1835. "The buckwheat (*Polygonum fagopyrum*) is only cultivated in sandy unmanured soils, as a summer crop, where oats and barley do not succeed, in the middle of the month of June of the second year of the three years rotation of crops. In the beginning of July, when the buckwheat had attained the height of six inches, bare spots appeared suddenly in the middle of the fields, which from day to day became larger and more numerous. On a close examination of these spots a dark grey, partly brownish, caterpillar was found some inches deep in the earth; it was from one to one and a half inches long, and its thickness was that of a small quill. This creature, after feeding at night or early in the morning on the delicate shoots of the luxuriant buckwheat, passes the rest of the day in repose, or perhaps in gnawing the roots of the plants, in darkness, in the earth. The devastations of these insects proceeded so rapidly that, within a week, more than half of the buckwheat fields were so completely devoured that neither leaf, stem, nor root of

the plants remained, and the fields were completely bare. Many proprietors tried to raise a fresh crop of buckwheat on the same ground, and partially succeeded. In the middle of the month of July several very heavy showers fell, and all the caterpillars disappeared. Apparently it was not so much this sudden change in the weather as the period of their transformation into the pupa state having arrived, and the sudden cessation of their activity, that caused their sudden disappearance. Although painfully sensitive to the loss they had sustained, the farmers consoled themselves, when they saw the insect disappear, with the hope that it would not return, as until that period it had been unknown among them. In September the winter grain was sown as usual. A great deal of rain having followed this sowing the growth of the corn was greatly accelerated, and by the end of September the fields were rich in future promise, when all at once a second generation of these mischievous insects, which three months before had robbed the farmer of the greater part of his buckwheat crop, now threatened him with the more important loss of his bread-corn. The mischief spread with the same rapidity in the rye-fields as it had done in the buckwheat; and in the space of a few days very considerable portions were so entirely laid waste that not a trace was left of the young plants which had sprung up very thickly from the seed. Some farmers resolved to sow their fields a second time with rye, but those who attempted this too soon experienced only a repetition of their loss. I had the bare corn-fields again sown with rye about the last week in October. In ploughing, the caterpillars were found numerous and alive in the furrows, but they had retired rather deeper into the earth than usual and appeared less lively and active. A number of ravens, crows, and daws, the well-known autumnal birds, which arrived exactly at this period, and which were now looked upon as welcome guests, enjoyed a rich treat in these well-fed insects, and satisfied at least in some degree the wishes of the farmer by their partial destruction of them."

After a discussion of the various proposed methods of destruction of these larvæ, the writer goes on to say that moths produced from some of these caterpillars clearly showed them to belong to *Noctua tritici*. From this account it would appear that the strong attachment of this species to sandy soil, as noticed here, is also conspicuous abroad. Doubtless our more general toleration of birds, and especially of the rook, protects our crops from similar ravages.

PUPA of ordinary shape, glossy, smooth, yellow-brown; anal segment much rounded, both points minute; subterranean.

The moth hides usually in the daytime among dense masses of sand-hill grasses, or under the overhanging ledges of these hills, among the roots of grasses. Away from the coast it doubtless conceals itself on the ground, like its allies. Should the weather be hot it will fly when disturbed, and it has been known to fly voluntarily in extremely hot sunshine and to imbibe the nectar of field-scabious, ragwort and other flowers. Its ordinary flight is, of course, at night, and it comes freely to the attraction of sugar, to heather bloom, ragwort blossom, to those of scabious, tansy, lime and chestnut, and has even been found to sit upon the leaves of tall reeds at night.

Usually abundant on coast sand-hills, where also nearly all the strongly-marked forms are exclusively taken; inland by no means plentifully, and then almost confined to sandy heaths. Extraordinarily abundant at Deal on the coast of Kent, and thence plentiful all along the sands of the coasts of the Eastern Counties, to Yorkshire, Durham, and Northumberland. Common also along the South coast, and locally abundant, but becoming less so toward the West, especially in Devonshire and Cornwall; but more frequent in Somerset and Gloucestershire, and found in the Scilly Isles not uncommonly. Plentiful on the Cheshire and Lancashire coast, and northward to Cumberland. In Wales apparently less common and certainly scarce in Pembrokeshire. Inland it seems to

be found, in its browner forms, on almost all heaths but only in moderate numbers; until within a few years it even frequented the London district, but now is hardly ever seen there; in the English Midland Counties I find hardly a record, but in the Breck-sand district of Norfolk and Suffolk it is most abundant, and in richly coloured varieties. In Scotland it continues plentifully up the East coast, in suitable places, to the Moray district and to the Shetlands; it has also recently been found in the Orkneys and Hebrides, but otherwise the West of Scotland does not appear to be greatly favoured with its presence, the records only attaining to Ayrshire. In Ireland everywhere abundant on sandy coasts, to Antrim, Derry, and Donegal, but apparently hardly observed inland. Abroad it is found throughout Central Europe, Northern Europe except the coldest portions; in Southern Russia, Siberia, and North America.

Perhaps it may be well here to call attention to a view strongly urged in some quarters, that this species with *A. nigricans*, *A. aquilina*, and *A. obelisca* are all but forms of one extraordinarily variable species. In a paper translated from the German of Dr. Adolph Rössler for the *Entomologists' Monthly Magazine*, May 1883, by Mr. W. Warren, Dr. Rössler says: "*A. tritici*, L., is certainly the most variable of all our *Noctuæ* in size, markings and colour—nay, even the antennæ seem not to be quite the same in all examples. We had an opportunity of assuring ourselves on this point very completely. The devastation caused in vineyards on the frontiers of Moravia, recorded by Treitschke in vol. 10, part 2, page 19 of Ochsønheimer's work, has been repeated in our neighbourhood at Ockelheim near Bingen, in the years 1871 and 1872, to such an extent that many individuals had their vineyards destroyed. Hundreds of larvæ were collected here in both years." Here follows a description of the larva, which it is unnecessary to reproduce. "The larvæ lived

exactly like earthworms, by day underground, and at night only on the surface in order to feed. Salad and such-like succulent plants were much more relished by them than the tenderest shoots of the vine. The pupa, which possesses an extremely thin shell, lay in an earthen cocoon. Dr. Pagens-tecker bred a large number of the larvæ, with the same results as myself. In September occasionally a few pass through their stages and appear in the perfect state, as rather smaller specimens than those of the first brood, but the large majority hibernate as larvæ. The perfect insects conceal themselves by day on the earth, in deep crevices of the bark of trees near to the ground, in chinks of stones, &c. Among the large number of examples reared in the course of these broods there were those figured by Hübner as *fumosa*, *aquilina*, *obelisca*, *fictilis*, *unicolor*, *crata*, *carbonca*, *praticola*, *vitta*, and *ruris*; besides the following figured by Herrick-Schäffer: *adumbrata*, *rustica*, *fumosa*, *tritici*, and *obelisca*. All were plentifully represented, and it could not but be that all belonged to one and the same species, united as they were by numerous intermediate forms. Among them were several forms, especially of *fumosa* (*nigricans*) of a beautiful lilac tint, which however faded into grey in the course of a year. One *obelisca* was entirely lilac-coloured without markings, with a white costal streak. Of varieties collected at the same time by night, there are besides to be mentioned a pale yellowish example, devoid of markings except perfectly black outlines of the stigmata; and one found by Dr. Schirm, leaden-coloured throughout, without markings on the fore wings, of which only the margin of the reniform stigma is indicated by a black spot."

In connection with this Mr. Warren adds: "One summer many years ago I beat out of some ivy which covered the wall of a garden in this town (Cambridge) a great variety of common *Noctua*, and among them numerous specimens of *Agrotis nigricans* and *tritici*, and two each of *A. aquilina* and *A. obelisca*. I remember having been much surprised at

the time at the occurrence of the last two species, the examples of which I still possess."

It has seemed only reasonable to reproduce this evidence in detail. It does not convince me; indeed the circumstance last recorded is not remarkable, except for the occurrence of *A. obelisca*, and as there is no other record of that species in our Eastern and East Midland districts, nor an inch of locality such as it frequents, it is difficult to account for the two specimens obtained. Perhaps the curious imitations of other species by varieties of *A. tritici*, as already noticed, may partially explain Dr. Rössler's results, and it is hardly reasonable to suppose that his multitudes of larvæ were, in any case, all of one species. We have what seems to be sufficient evidence of the reliability of all these four species, and until two or more of them have been reared from eggs deposited by one specimen it will, I think, be safe to regard them as distinct.

13. **A. aquilina**, *Hüb.*—Expanse $1\frac{1}{2}$ inch. Very similar to the brown form of *A. tritici*; fore wings broader, especially so at the base, dull brown, clouded with darker; stigmata pale brown, in a darker cloud; hind wings whitish, tinged with brown, and with faintly brown nervures.

Antennæ of the male pectinated with short, sharp-pointed teeth; each crowned by a slender tuft of minute bristles; these teeth taper off beyond the middle, leaving the apical fourth part of the antennæ simple; the whole finely ciliated, brown. Palpi and head densely tufted, reddish-brown; collar similar, faintly barred and edged with ashy-white; remainder of the thorax reddish-brown, crested at the top and back, the hinder crests tipped with dark brown and whitish; fascicles spreading, whitish; abdomen dull brown with small lateral tufts and rather long reddish anal tuft. Fore wings rather broader than in *A. tritici*, costa very slightly rounded; dorsal margin also rounded; apex very bluntly angulated; hind margin beneath it nearly straight

and not very oblique, bending off below the middle; colour rather glossy soft golden-brown, or reddish-brown, or pale brown; in the middle of the base is a black streak; basal line sometimes faintly indicated as a couple of pale dots edged with blackish; first line rather direct, oblique, sloping outward toward the dorsal margin, composed of black crescents edged inwardly with paler brown; second line oblique in the opposite direction, blackish, hardly visible above the reniform stigma; subterminal line very faintly paler brown, edged inwardly by a row of long black wedges, outwardly by a darker submarginal brown cloud; a pale brown stripe lies along the whole subcostal region to near the apex, before which is a triangular brown costal spot, and on the remainder of the extreme costal edge are a few black dashes; orbicular and reniform stigmata pale brown, bordered with yellowish-brown, and outside this edged with black; before and between them the discal cell is occupied by rather squared black-brown blotches; claviform stigma small, edged with black; extreme hind margin edged with minute black lunules; cilia pale brown. Hind wings white, nervures light brown rather than grey; dorsal and hind margins tinged with light brown, and the latter edged with darker brown; cilia white, with a yellowish line at the base. Female more robust, fore wings broader and rather more truncate; antennæ simple; abdomen decidedly stouter, with a very short dull brown anal tuft; otherwise similar—the hind wings usually hardly darker.

Underside of the fore wings dull pale brownish, or yellowish-brown, whiter toward the base and dorsal margin, or often with the shining white portion extending into the middle of the wing; discal cell filled with abundant long oblique hairs; reniform stigma faintly grey, sometimes followed by a whitish dash. Hind wings whitish, dusted with brown along the costal region and hind margin, and with a slender commencement of a brown transverse stripe beyond the middle of the costa; central spot small, brown.

Not very variable, though the ground colour is occasionally more grey-brown, with the subcostal stripe and upper stigmata whiter, and the space beyond the second line whitish-grey. In well-marked brown specimens this space is sometimes whitish-brown, and in these the blackish wedges and all the minute details of other markings are more sharply defined. In other examples the markings, except the two upper stigmata, are often obscured and indistinct. In the female the hind wings in some specimens are nearly white, and in rare instances quite so, strongly contrasting with the fore wings.

On the wing in July and August.

LARVA, when full grown, an inch and a half long, cylindrical and rather shining; the head grey-brown, mottled with blackish; the back dingy brown; dorsal line rather paler grey-brown; the subdorsal line black, edged below with a thin line of grey-brown, which, like the dorsal line, runs through the blackish plate on the second segment; to this succeeds a broad stripe of dingy blackish-green; then another thin line of grey-brown, followed by another broad stripe of dingy blackish-green, the black spiracles being situated along its lower edge; under surface and legs grey-brown; raised spots dark brown and not very conspicuous; the general aspect of the larva very dark and dingy. (W. Buckler.)

May and June, but doubtless from September, and feeding at intervals through the winter; on clover, plantain, chickweed, knot-grass, poppy, even onion, and doubtless on any low-growing plant; burrowing in the ground in the daytime and feeding at night. Kollar says that the different species of bedstraw (*Galium*) are preferred, and he gives an account very similar to that already quoted in the case of *A. tritici*, of damage done to vines in Germany by these larvæ when their ordinary food fails. From his statement, however, it appears that the increase of this species to such an extent as to become a serious pest is a very rare circumstance,

the case noticed by him being the first observed in fifty years.

PUPA apparently undescribed.

This species is regarded by many entomologists here and abroad as merely a variety of *A. tritici*, and is so shown in Dr. Staudinger's Catalogue. My own opinion to the contrary is greatly strengthened by familiarity with the insect at large; where from its somewhat more robust build and the different shape of its fore wings it appears obviously distinct. The brown nervures of its hind wings also appear to me a good character. Its habits are as in its congeners—to hide on the ground among herbage during the day and to fly at night; coming very eagerly to blossoms of lime, ragwort, scabious, ox-eye daisy, *centaurea* and many other plants. Kollar found it flying in numbers about blossoms of *Clematis*. When actually in company with *A. tritici* on the same flowers it may instantly be discriminated.

In my own experience it is especially attached to chalk districts, though not confined to them. The records are somewhat incomplete and not always reliable; but it is found commonly in Norfolk and Suffolk, the Cambridgeshire Fen district, and Reading, Berks, whence I have recently seen very fine specimens taken by Mrs. Bazett. No doubt it occurs in suitable places throughout the Southern Counties, though the other records seem only to include Sussex, Dorset, Devon, Somerset and Gloucestershire, in no case commonly. Also in Oxfordshire, Herefordshire, rarely in Leicestershire and Derbyshire, apparently absent from most of the Midlands and not noticed in Wales. It certainly occurs in Yorkshire, but the record for Cheshire and Lancashire, "on sand-hills and in mosses," has a dubious appearance. In Scotland it is said to have been taken in Clydesdale, and Mr. South records it from the Hebrides; other Scottish localities, as the Tweed district, Moray and the Orkneys, are furnished by Dr. Buchanan White, but further evidence is desirable. It is not certainly

known to occur in Ireland at all; such recorded captures as I have had opportunities of investigating have proved erroneous; and Mr. Kane, while stating that it occurs in many places, only refers to it as a variety of *A. tritici*. Abroad it is found throughout Central Europe, and in Southern Russia, Siberia, and Armenia.

[*A. subgothica*, *Hav.*.—This species is very much like one of the varieties of *A. tritici*, already adverted to. Its antennæ are slightly pectinated in the male, thorax squared in front, but more narrowed behind, and the abdomen of the male rather slender; collar edged with black-brown; fore wings, as in the variety mentioned, except that they are decidedly broader behind, pale umbreous with the markings deep umbreous; a stripe of the pale ground colour along the subcostal nervure, and another branching from it along the median, the latter continued obliquely toward the anal angle; transverse lines hardly indicated; orbicular stigma triangular and intimately joined to the subcostal pale stripe, on each side of it, and also joined below it, is a deep black spot, the two forming a sort of hook; reniform stigma light brown; claviform long, blackish, and extended back in a broken stripe to the base; spaces beyond the reniform stigma and along the hind margin each clouded with deep umbreous, divided by the paler nervures. Hind wings whitish, with a cloudy brownish submarginal band.

Described as British by Haworth, who stated that it was very rare in England, but that he had seen three specimens in cabinets. Stephens figured it very accurately from a specimen obtained by the late Mr. Raddon, near Barnstaple, Devon. He also recorded it from near London and from Norfolk. Wood's figure appears to be from the same specimen; that of Noel Humphreys looks more doubtful, since its fore wings are narrower, but he states that it is a copy of Stephens's figure. It looks more like the variety of *A. tritici*. More recent writers on British species have ignored it,

In the collection of Dr. P. B. Mason at Burton-on-Trent are two specimens, both evidently old and rather carelessly set. One of these is ticketed as from the collection of Mr. Raddon, and taken near Barnstaple; the other is from the cabinet of the late Mr. Edwin Brown. That these are not *A. tritici*, and that they are *A. subgothica*, is fully demonstrated by their accurate agreement with the figures of Stephens and Wood, as well as with Haworth's description.

The species is, however, North American, as was pointed out long ago by the late Mr. Henry Doubleday; and this is further proved by the agreement, both of figures and moths, with photographs of *A. subgothica*, taken from North American specimens and furnished by Mr. M. V. Slingerland, of Cornell University, Ithaca, New York. Dr. Mason's two specimens have also been examined and recognised by Mr. W. Mansbridge, who has spent some years in the United States, and has found the moth abundantly in that country. He informs me that its larva is there well known as the Corn boll-worm, and that it feeds in the ears of maize, inhabiting the cob or envelope. Also that the moth sometimes abounds in granaries in April and May, hiding itself under any articles thrown upon the ground, such as matting, or under boarding, and creeping closely into any small crevice in the woodwork. Professor Smith states that it inhabits the United States and Canada, occurring in the more northern States in July and September, but in Colorado in August. So plentiful is it in the State of New York that 2382 specimens were captured, in one season, at a series of six experimental trap-lanterns set up on the University farm at Ithaca, for the purpose of testing the value of the lamps in the destruction of noxious insects. The effectiveness of this wholesale slaughter was, however, diminished by the circumstance that of the whole number of moths of this species destroyed, 2240 were males and only 142 females. No other species was captured in equal abundance.

Mr. Doubleday was of opinion that the supposed British

specimens had been received from North America and mixed, accidentally or otherwise, with British insects. But taking into account that the captor, Mr. Raddon, was a good entomologist and highly respected, it is far more probable that the specimens obtained by him had been accidentally introduced with produce—perhaps rough timber—from America; especially as Barnstaple, with Bideford, so long took a large part in the trade with that country.]

14. **A. obelisca**, *Hüb.*—Expanse $1\frac{3}{8}$ to $1\frac{1}{2}$ inch. Fore wings with rather a full anal angle; purple-brown, with paler subcostal stripe; upper stigmata small, pale, in a blackish cloud; hind wings whitish, margined with grey.

Antennæ of the male notched to the middle with short pointed teeth, each of which is tipped with a minute tuft of bristles; nearly the apical half simple; densely ciliated throughout; black-brown. Palpi rather broadly tufted, dark brown, paler in front; head red-brown, dusted with white; collar broad, reddish-brown, banded with black, whitish, and dark brown, in consecutive stripes, and edged at the back with white; shoulder-lappets blackish-brown, edged above with white dots; top of the thorax dark brown, fully crested from collar to back, all the points of the crests tipped with white and barred with purple-brown; fascicles slender, smoky-white; abdomen golden-brown, covered toward the base with shining greyish-white scales; lateral tufts spreading, anal tuft narrow, brown. Fore wings somewhat oblong; costal and dorsal margins straight; apex bluntly rounded; hind margin below it straight to the middle, then rounded rather fully at the anal angle; colour dark purple-brown; along the subcostal region is a broad paler stripe to beyond the middle; basal line only indicated by a faint blackish spot close to the costa and two black streaks in the middle of the base; first line black, faintly duplicated, forming two or three slightly oblique curves; second line indistinct, formed of an oblique series of black cloudy spots; subterminal line

a very slender, indented and irregular whitish thread, outside which is a smoky-brown cloud ; and inside it sometimes indications of a few blackish wedges ; orbicular and reniform stigmata rather small but conspicuous, ashy-white, the latter centred with yellowish ; the rest of the discal cell, before and between them, deep black ; claviform stigma black, broadly wedge-shaped ; cilia greyish-brown. Hind wings whitish ; nervures and hind margin dusted with golden-brown ; cilia white. Female similar, rather stouter ; hind wings in some specimens more suffused with grey-brown.

Underside of fore wings shining smoky-grey, with the nervures paler ; of the hind wings whitish, with the costal margin very broadly dusted with brown ; hind marginal line brown. Body golden-brown ; legs purple-brown, barred with pale brown ; leg tufts smoky purplish-grey.

Very little variable, and this mainly in the shade of colour of the fore wings, which in some specimens is of a paler purple-brown, in others, but more rarely, pale slate-brown ; in some examples the first transverse line is complete, dividing the pale subcostal stripe ; and I possess a specimen in which this line is very distinctly shown and more perpendicularly placed than usual. In the collection of Mr. F. J. Hanbury is another even more strongly marked. Specimens from the Isle of Wight seem to have a general tendency toward greyer colour, those from western districts to more purple shades.

On the wing in August and the beginning of September.

LARVA moderately stout, especially behind the middle, but with head and anal segment rather small ; pale slate grey ; dorsal line of the ground colour, bordered on each side by a purplish-brown stripe, which is sometimes broad and distinct, at others divided into two separate lines which represent its margins, having on its upper edge, on each segment from the third or fourth, a distinct black spot ; beneath are two more longitudinal stripes faintly purplish-brown or grey-brown, the

lower enclosing the spiracles, which are blackish, but in some examples quite black, and attended each by two black spots beneath, on each segment from the sixth to the eleventh; head and dorsal plate pale grey-brown, the latter strongly marked with the browner longitudinal stripes; legs black; prolegs and undersurface yellowish-white or very pale grey; usual raised spots of the ground colour, each bearing a short hair.

According to Mr. Buckler, when younger they are greyish-brown on the back, blackish-green on the sides; subdorsal stripes broadly blackish-green; dorsal line pale grey, thin, enclosed between the subdorsal stripes. Along the middle of the side runs in an undulating manner a pale greenish-grey line, somewhat interrupted and irregular in thickness; and at some distance below, immediately under the black spiracles, is a broad stripe of dirty whitish, having a fine line of dirty whitish-green running through the middle of it. In the middle of June, probably after a moult, much more brightly coloured, pinkish or pinkish-ochreous on the back, the dorsal line passing through a pear-shaped marking of pinkish-grey on each segment, the small end of the pear behind; the sides dark pinkish-grey with opaque whitish ragged lines below the spiracles, and the whole of the undersurface and the prolegs white, rather shining, and having a lovely opalescent gleam of pinkish. After ten days these bright colours begin to fade and the adult colouring to be assumed.

Probably from October to July, on *Helianthemum vulgare*, and doubtless on many other herbaceous plants, growing in the chinks and crevices of rocks, and high up on rocky hillsides. Mr. Gregson says that he obtained a number of larvæ by digging out the vegetation from the lines of softer stratification in the sides of rocks, finding the larvæ among the roots of the plants. Mr. Buckler's specimens were found early in June, at which time they differed greatly in size, the smallest being very dark,

PUPA apparently not described.

The moth doubtless hides during the daytime among thick herbage in chinks and crevices of rocks, but it is rarely seen by day. I took several specimens on one occasion on the railings of the balcony surrounding the lantern of a lighthouse, to which they had doubtless been attracted on the previous night. It comes freely to light and also to the blossoms of ragwort, and in either case settles down perfectly quietly. It has also been secured at heather blossom, and comes freely to sugar in its very restricted localities. These are usually rocks on the coast, or high hills inland. It is plentiful in some seasons at Freshwater, Isle of Wight, and is found at Torquay, Mount Edgecumbe, and Padstow, in Devon and Cornwall; in the Scilly Isles; has been recorded at Brighton and at Scarborough; at the eastern end of the Cotswolds in Gloucestershire; also in Herefordshire, Derbyshire, Lancashire and Cheshire. The most remarkable captures of the species in England, however, were at Sutton Park, near Birmingham, where two unmistakable specimens were taken, at sugar, in 1893 or 1894, by Mr. and Mrs. Abbott; and another by Mr. G. W. Wynn in 1895. This locality is 500 feet above sea level, but is not rocky, and the presence of the species there is somewhat perplexing. In South Wales I have obtained it from the Island of Caldy, near Tenby, and have little doubt that it is common on all the very wild and rocky range of coast of South Pembrokeshire. In Scotland it has been taken on several portions of the Eastern coast, extending to Stonehaven, Aberdeenshire; and also on the South-west coast. Inland, Sir Thomas Moncrieff found it commonly on Moncrieff Hill, Perthshire, from 100 feet upwards. In Ireland it used to be common on the Hill of Howth, near Dublin, but was nearly exterminated there by ruthless collecting; it has also been found near Dungarvan, Waterford; and at Mount Charles, Donegal.

Abroad it is said to be widely distributed in Southern,

Western, and Central Europe, and found also in the South of Sweden, North of Italy, and Livonia.

15. **A. agathina**, *Dup.*—Expanse, $1\frac{1}{4}$ inch. Fore wings bright rosy or purplish-red; upper stigmata whitish, united to a similar subcostal stripe, edged beneath with black; hind wings grey.

Antennæ of the male notched almost throughout with sharp conical teeth, each crowned with a minute tuft of bristles; purplish brown. Palpi moderately tufted, purple-brown, with the apical portion white; head pale grey in front, purplish-brown above; collar bright light purple, slenderly barred with black and edged with whitish; remainder of thorax rich purple-brown, with a slight divided crest from collar to back; fascicles dense, smoky-white; abdomen pale purplish-grey, lateral and anal tufts spreading, purplish-brown. Fore wings rather narrow at the base; costal margin faintly rounded; dorsal margin straight; apex squarely angulated; hind margin truncate, but rounded off at the anal angle; colour an exquisite pale rosy, rosy brown, or purplish-pink, with a broad paler or yellowish stripe along the subcostal region; a small black streak at the base of the costa, and another along the base of the median nervure; first line very slender, black, forming a series of long angulated bends, and placed obliquely; second line also very slender, black, sharply angulated at the dorsal margin, thence obliquely more direct to above the reniform stigma, where it bends strongly back to the costa; subterminal line a series of irregular whitish spots and angles, edged inwardly with deep purplish, and in the middle by three or four deep black wedges; outside it rather clouded with grey. In the space from the first to the subterminal line the nervures are mainly streaked with black. Orbicular stigma very small, whitish, usually enclosed in a long wedge-shaped black blotch, but sometimes united to the white subcostal stripe; reniform stigma also

united to this stripe, whitish, otherwise edged with black, and containing a grey cloud; claviform stigma slenderly edged with black; cilia shining purplish-white. Hind wings large, glossy whitish tinged with grey-brown, especially toward the hind margin where is a large cloud; nervures greyish; central streak elongated, grey-brown, followed by a slender similar transverse stripe; cilia white. Female with simple antennæ and stouter abdomen, otherwise quite similar.

Underside of the fore wings dark grey, strongly shaded with purple along the costa and hind margin; reniform stigma faintly blackish, followed by two very indistinctly blackish transverse stripes. Hind wings whitish, costal region dusted with purplish, hind margin with grey; central spot dark grey-brown, followed by a distinct grey transverse stripe. Body and leg-tufts purple-brown; legs blackish, barred with yellowish.

Rather constant in colour and markings, except for climatic variations. The colour is more richly pink in the South and East of England. In the north, and especially in Scotland, it is intensified into a deep dark purplish-brown, or purplish-black, most of the markings thereby obscured, but the pale subcostal stripe conspicuous though narrower and more curved, uniting with the pale orbicular stigma; the reniform stigma is also paler. This dark race is found as far south as Delamere Forest, Cheshire, and in some parts of Yorkshire. In the extreme north of Scotland, as at Stornoway, it disappears, and is replaced by pale colouring—pale purplish, pale lilac, or even purplish-white. Irish specimens are of rather full size, and usually of a greyer shade of rosy, but occasionally richly pink, and one specimen taken at the Hill of Howth by Mr. Fitzgibbon is of a singular pale colour, almost yellowish with a pink tinge. In Mr. E. A. Atmore's collection is a specimen, taken near King's Lynn, of a rich crimson, with the subcostal stripe yellow and the markings very conspicuous. Dr. Mason has

one of a curious pale lilac-grey, and another of a rich dark purple-brown, much clouded and streaked with deep black, and with the pale subcostal stripe cut short not far from the base.

On the wing in August and September.

LARVA smooth, cylindrical, slightly tapering in front, having a few minute hairs on the head and body. Colour purplish-brown, grey, or green, darker on the back and shaded with blackish on the sides; dorsal line whitish; subdorsal broad, white, margined above by a row of conspicuous, short, black, longitudinal streaks, beneath with reddish; having also a dorsal series of diamond markings, very indistinct; spiracular stripe broad, yellowish, with a pale purplish, greenish, orange, or reddish spot on each segment, and shaded beneath with dark grey atoms. Head pale brown, the lobes outlined with blackish; spots and spiracles black; undersurface pale brownish or greenish-ochreous. When young the dorsal line of diamonds is more distinct. (C. Fenn.)

Dr. Riding says that the young larva is at first bluish-leadен in colour and covered all over with short hairs; the head very large and brown; the abdominal legs on the seventh and eighth segments rudimentary; and the attitude of the infant larva sphinx-like, or looping as it walks. After the first moult the head, which is still brown, has become smaller than the next segment, which now bears a small plate; the body colour is now glaucous or pale olive-green; the raised spots faintly marked, black, each with a short hair; and the abdominal legs on the eighth segment better developed but still not fit for use. After the second moult the head is pale brown with darker lobes and paler central line; the body dark glaucous to olive-green, in some with a brownish shade; dorsal and subdorsal lines pale and distinct, especially the former; spiracular line white, broad and conspicuous, with the spiracles along its upper edge; legs brown; prolegs pale translucent green with brown

extremities which are furnished with many hooks; all the prolegs now fully developed and in use. After the third moult the head is pale brown with an olive tint and three pale lines; the body olive or grass-green in colour, darker on the sides than on the back; dorsal line almost pure white; subdorsal less conspicuous and faintly tinged with yellowish-green; spiracular line hardly so conspicuous as before, and with a pale yellow blotch on each segment beneath the spiracles. After the next moult the general colour is reddish-brown, most distinctly so on the back, and darkest just above and below the spiracular line, the underside pale brownish; dorsal and subdorsal lines white and very distinct, the former widest in the centre of each segment and both narrowed and darkened at each division; spiracular line broad and conspicuous, wrinkled, and having a rust-coloured blotch in the middle of each segment; head pale brown, translucent, and having a darker line on each side. After the fifth moult, when the larva is an inch long, the colour has become a rich velvety reddish-brown, mottled with pale spots on the back, and tinged with purplish or olive-green in the subdorsal area; the dorsal and subdorsal lines white but narrow and broken, most distinct on the second segment; the black edging above the subdorsal lines now begins to appear, but the spiracular line is still broad, white, and with the rusty blotches. From this stage the adult colouring is gradually assumed.

September to June, feeding through the winter, except in the most severe weather, on *Calluna vulgaris*, *Erica cinerea*, and *E. tetralix*; feeding at night and passing the daytime extended and clinging closely to stems of heather, "their colour admirably mimicking the reds and browns of the dead and living twigs, with their lights and shades, and rendering the larvæ very difficult to find. In confinement they seemed to keep to the thickest parts of the food plant during the day in preference to other places of concealment." (W. S. Riding.) It thus appears that this larva does not, by

preference, hide itself under ground, like most of its congeners.

In confinement, whether reared from the egg, or swept up from the heather, or found by searching it at night either in autumn or spring, it seems almost impossible to bring this larva to maturity. The only way in which it can, so far as I know, be reared, is by confining it upon growing plants of heath or heather in the open air. This can be managed by using a large flower pot and covering the whole plant with gauze. Mr. Gregson says, "you should keep them separate as much as possible. On no account let them crowd one another. Cut a very large sod of peat with heather growing on it and get it brought home in a sack. Always sprinkle the food with water—many larvæ are lost when full-fed for want of a drink of water. The larvæ of this species are almost the most sluggish things I know; often they will remain on one twig for two or three days."

PUPA undescribed—probably hardly known.

The moth is never seen in the daytime; doubtless it conceals itself on the ground among heather. It flies at dusk, usually at rather late dusk, and settles upon the blossoms of heather (*Calluna vulgaris*). It has, I believe, been taken at sugar, but very rarely, and no other blossom except that of heather seems to have any attraction for it, not even those of the two heaths, *Erica tetralix* and *cinerea*. When flying at dusk about its favourite plant it may partially be discriminated among the commoner species by its very dark appearance, arising from the darkness of its hind wings. Its flight is very short, and the best method of obtaining it is to search the great masses of heather-bloom with a lantern. Sometimes it seems to prefer the shelter of trees, more especially Scotch fir.

Almost wholly confined to sandy heaths, though there is a single record of its capture at Whittlesea Mere, and it is still found rarely in the Cambridge fen and chalk districts,

as near Ely and Newmarket. Not very scarce on the heaths of Surrey, Kent, Hants, Dorset, Berks, Bucks, Devon, Suffolk and Norfolk; rare in Sussex, and in Warwickshire, Derbyshire and Nottinghamshire; also found in Cheshire, Lancashire, Yorkshire, Westmoreland and Cumberland; in Wales near Saundersfoot in the South, and Dolgelly in the North. Much commoner and more widely distributed in Scotland, and even abundant on the heathery hills of Morayshire and Perthshire, and probably in all similar localities, since it is found even in the Orkneys and Hebrides. In Ireland also rather widely distributed, though very uncertain in numbers; occurring at Howth near Dublin, in the hilly district of Wicklow, in Galway, and in the North in the neighbourhood of Londonderry. Abroad its range seems to be comparatively restricted, being apparently confined to France, Belgium and Germany; but it surely *must* exist in Scandinavia.

16. **A. porphyrea**, *Hüb.*; **strigula**, *Staud. Cat.*—
Expanse $1\frac{1}{4}$ inch. Fore wings purplish-red with white longitudinal lines; transverse lines and stigmata also edged with white; hind wings grey.

Antennæ of the male strongly notched with saw-like teeth, each with a minute tuft of bristles at its apex, but terminating beyond the middle, leaving the apical portion of the antennæ simple; ciliated throughout, purplish-brown. Palpi and head densely tufted, bright purple-brown; collar very pretty, barred successively with fulvous, dark purple-brown, and white, and having behind it another white bar across the thorax, which, with the raised shoulder-lappets, is rich purple-brown dusted and edged with white, the crests on the top and back also tipped with white. Fascicles yellowish-brown; abdomen purplish-brown, with the lateral and anal tufts more brightly coloured. Fore wings narrow and rather truncate; costal margin very faintly curved; dorsal margin straight; apex bluntly angu-

lated; hind margin very slightly curved and but little oblique; colour rich purple dusted with blackish; nervures white, or dusted with white; basal line incomplete, deeply indented, black, broadly edged outside with white; first line perpendicular, black, very deeply indented, edged inwardly with white, which joins upon the subcostal nervure the white edging of the basal line; second line much curved and composed of small purple-black crescents, broadly edged outside with white; subterminal line a succession of irregular, ill-defined, cloudy-white spots, partially edged inside with black spots; costal margin streaked with black and spotted with white; orbicular stigma small, round, white, ringed with black; reniform stigma also small, white, edged with black and enclosing a purplish cloud; claviform stigma purplish or whitish, completely edged with black, sometimes even enclosed in a black cloudy streak from the first to the second line; extreme hind margin alternately spotted with black and white; cilia shining purplish-brown. Hind wings grey-brown with a golden gloss; nervures rather darker; cilia whitish. Antennæ of the female threadlike, abdomen stouter, otherwise quite similar.

Underside of the fore wings shining smoky-brown, tinged at the margins with purple or red; hind wings white with brown nervures, and the costal margin broadly reddish. Body and legs purple-brown. Slightly variable in the depth of the purple ground colour, in the amount of white upon the nervures, and in the distinctness of the white markings, most of which in some individuals become obscured, or more rarely obliterated, except that the orbicular stigma is constant and conspicuously white. There is, however, a strong tendency to climatic alteration in colour, which in the south of Scotland becomes a darker purple, and in the mountain districts dark purple-brown or purple-grey with a smoky hue. Those from the Shetland Isles are often much suffused with dark colouring and their markings obscured. Similar dark forms are found in mountain districts in Germany.

In its colour and peculiar white markings this species presents a curious and deceptive resemblance to a spike of blossom of *Erica cinerea*, and a still closer mimicry of a purple-brown shoot.

On the wing in June and July.

LARVA stout, cylindrical, head smaller. General colour pale reddish-brown or umbreous; dorsal line of the ground colour, enclosed between two black longitudinal lines, so curved on each segment as to form a series of long loops, one on each, from the second to the twelfth; on the thirteenth are two black spots at the same level; subdorsal lines slender, greyish, forming the upper edge of a broad stripe of the ground colour or of white, which is edged below with another grey longitudinal line, along which lies a series of black, or blackish, oblong spots. Spiracular line slender, blackish; below it is a pale or whitish stripe; spiracles black. Legs and undersurface pale brown; head shining, pale reddish, barred with grey. Other specimens are paler brown, almost drab, the dorsal line white and edged with black blotches; and other strong black spots along the spiracular region. Another variety has the ground colour reddish, the dorsal stripe yellow, and bright red subdorsal streaks. All, but the last more particularly, bear a close resemblance to twigs and spikes of buds of the food plants. Larvæ furnished by Mr. C. S. Gregson.

August to May on *Calluna vulgaris* and *Erica cinerea*, feeding only at night, but apparently hiding during the day only among dead leaves and twigs on the ground.

PUPA of ordinary form, extremely glossy and polished, rather cylindrical except the abdominal segments, which are short and rapidly tapering; anal segment terminated by a triangular projection and two parallel straight spines; very dark red-brown. In a slight cocoon on the surface of the ground or immediately beneath it.

The moth hides during the day among heather, probably

sitting in the thick tufts, but if the sun is hot may often be disturbed, when it flies swiftly away; or in some cases it may be found flying voluntarily in the sunshine, and visiting the heath blossoms. Its natural flight, however, is at dusk and in the night, and it is extremely fond of the flowers of *Erica cinerea*, the only species of heath which is in bloom at the usual time of its existence in the winged state. Except perhaps wood-sage, no other flowers seem to attract it, and it usually appears to regard sugar with contempt, though there is a record in Scotland of its capture at that bait.

Found almost wholly upon sandy heaths, and in such situations abundant in most of the Eastern and Southern counties of England, but scarce in Cornwall; very scarce in the Eastern midland district and apparently absent from the fens; but found on heaths throughout the Midlands and in Herefordshire, Cheshire, Lancashire, Yorkshire, Westmoreland and Cumberland. Probably common in Wales except in the extreme south-west, where it is scarce. Very generally distributed and common in suitable places in Scotland from Roxburghshire and Arran to Ross, and in the Hebrides and Shetland Isles. In Ireland also plentiful and widely distributed, occurring wherever its food plants abound. Abroad it ranges throughout Central Europe and all the more temperate portions of Northern Europe, and is also found in North Italy.

17. *A. præcox*, L.—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings narrow, shining glaucous-green with black lines, white stigmata and spots, and a purple stripe near the hind margin; hind wings greyish.

Antennæ almost threadlike, but for a short distance from the base pairs of small tufts of fine bristles suggest pectinations; whole length ciliated; dark brown, hairs whitish. Palpi small, white, dusted with grey; apical joint white; head velvety-white; collar broadly white, dusted and very faintly barred with grey atoms; shoulder-lappets rather raised,

mixed grey and white, with slender blackish lines, and black spots at the edges; remainder of thorax grey mixed with white, crested with three pairs of tufts which are barred and tipped with blackish; fascicles spreading, smoky-white; abdomen decidedly flattened, dark grey, with an abundant covering of smoky-grey scales, more whitish toward the base; these long scales are raised on the back into broad tufts, imitating abdominal crests; lateral and anal tufts small, smoky grey. Fore wings long and narrow; costa very faintly curved; dorsal margin straight; apex rounded; hind margin also rounded and full but very short, and hardly oblique; colour a peculiar, almost glaucous, green, dusted with white; basal line incomplete, consisting of two or three short black curves edged with white; first line black, perpendicular, but scalloped and undulated and edged inwardly with white; second line far beyond the middle of the wing, more oblique, black, composed wholly of crescents between nervures, edged outside with two whitish parallel shades; a white, or greenish-white blotch occupies the apex, and from it arises a slender whitish subterminal line which is bordered inside by a purple stripe, outwardly by small blackish clouds along the hind margin; costa spotted with black and white; orbicular stigma large, white, ringed with black and having a purplish central cloud; reniform stigma also large and white, usually containing two smaller greyish clouds with purplish centres joined by a fine line; claviform stigma broad, white, faintly edged with black; extreme hind margin edged with deep black lunules; cilia white, spotted with purplish-grey. Hind wings broad and ample; grey-brown, with a golden gloss; along the hind margin is an irregular whitish stripe which is edged by a dark brown line; central spot obscure, elongated, blackish; cilia white. Antennæ of the female more strictly threadlike; otherwise extremely similar.

Underside of the fore wings pale bluish-grey, with a large smoky-grey cloud in the middle; beyond is an angulated

slender blackish transverse stripe, and before the apex a blackish costal triangle. Hind wings shining yellowish-white; costal margin broadly dusted with bluish and ashy-grey; central crescent, and a transverse stripe beyond it, blackish; and a black line at the hind margin. Body silvery-grey; legs brown, barred with white; leg tufts greyish-white.

Extremely constant in colour and markings; but I have seen a specimen from the North of Ireland in which the subcostal, median, and subdorsal nervures of the fore wings are darkly coloured, so that three very straight, nearly parallel lines extend almost the whole length of the wings. Mr. F. N. Pierce has an exquisitely lovely variety taken near Liverpool, pale green throughout, with but faint traces of the usual markings.

On the wing in August and the beginning of September.

LARVA plump, cylindrical, but with the segmental divisions rather well marked; head a little smaller, pale brown, with a V-shaped mark in the front of the face; body variable in colour, the ground colour being usually some shade of slate-grey, dark or pale; dorsal line usually very pale grey or white, swelling out on the back of each segment of the body so as to form a chain of spindle-shaped markings joined at their ends, and edged on each side by a slender, undulating brown or blackish line; adjoining this is the subdorsal stripe, broad, red-brown, light red, or dull brown, edged below with a fine blackish line and a slender yellowish or whitish stripe, which again is followed by a broad lateral stripe of blue-grey, or slate-grey, or even pale lilac-grey, at the lower margin of which are the black spiracles. Sometimes this lateral stripe is dusted with darker atoms. Legs and under-surface very pale grey, the sub-spiracular stripe sometimes of that colour, in other cases yellowish. Sometimes the dorsal line is bluish-grey and all the stripes of full colouring; in other cases, and especially when quite full fed, all the colouring is paler. Usually the second segment is paler

than the rest of the body, and often it has a whiter patch on each side.

September to June, or even July, on the dwarf sallows which grow so closely to the ground on some sandhills, or on fine grasses, chickweed, and probably other low-growing sandhill plants, since it is not confined to those sandhills on which are patches of sallow. In confinement it will eat willow and osier. Feeding at night. Dr. Ellis says that it has the habit of eating right through a sallow leaf so as to separate a portion, which it then holds between its anterior feet and proceeds to devour. During the day it hides beneath the surface of the sand, and is said to be readily discoverable by its track on the sand and the tiny hillock under which it lies concealed. When dug out it, at first, seems stiff and sluggish, but after a few minutes it relaxes, and is then sufficiently active. It is said that those keen foragers, the sea-gulls, have learned to recognise the little hillock of sand under which it hides in the daytime, and dig it out for their own consumption.

PUPA apparently undescribed.

The moth hides by day among tangled grass roots under overhanging edges of sandhills, or among dense herbage on the sand. If shaken out of its place of refuge it rolls down quite inert and with its wings clasped, almost rolled, tightly down, has a curious cylindrical appearance, something like a piece of the large bark-like sheath of the root of *Ammophila*. It flies at late dusk, and soon settles down to feed on the rather strong-smelling blossoms of the common ragwort, or on the spikes of the Marram-grass; and is readily attracted by light, or by the blossoms of heather, where this grows near the coast. Its home is the heaped-up waste of sand produced on every sandy coast by the constant drifting of this loose material before the wind; and in such localities it may be found on many portions of our littoral. Before this special habitat was discovered it was supposed to be one of our rarest

species, and it received the common name of the Portland Moth, not from the Isle of Portland, where it is very scarce, but from the circumstance that it formed one of the principal treasures of the collection of the Duchess of Portland, who seems to have been the first to rear it in this country. Although rare at Portland, it is found more freely in suitable places elsewhere on the Dorset coast, and on the north and south coast of Devon; also, I believe, on Hayling Island, Hants, but records appear to be wanting elsewhere in the extreme south of this country. It is not rare on the coast of Norfolk and Suffolk and is even rather common on those of Yorkshire, Lancashire, Cheshire, and the Isle of Man. In Wales it has been taken on the Towyn Sands, Merionethshire, near Neath, and at Tenby. On the Breck-sands of Norfolk and Suffolk it seems still to survive, though in extremely small numbers, but this *may* not be a survival of an ancient race, since the species seems to have an occasional habit of making rather long flights at night. Thus in the neighbourhood of King's Lynn an occasional specimen is found at heather bloom several miles from the sea; very rarely examples have been met with near Stowmarket, Suffolk; and once it has even been taken at light at Cambridge. In North Wales too a specimen was taken quite recently by Colonel Partridge, at light, on the hills fully six miles from the sea. In Scotland the only record in the south-west appears to be at Ardrossan on the Frith of Clyde, northward in Sutherlandshire, and on the east it extends as far north as the Culbin Sands, Morayshire. On the Irish coast more widely distributed and probably to be found in every extensive waste of sandhills; it is recorded from various parts of the Dublin coast, Wicklow, Wexford, Waterford, Kerry, Sligo, Donegal, Londonderry, Antrim, and Down. Abroad it is said to be widely distributed in Central Europe, and to be found in Livonia and Siberia.

18. **A. Saucia**, *Hüb.*—Expanse $1\frac{3}{4}$ to 2 inches. Fore

wings much elongated, narrow at the base, broader behind; reddish-brown or greyish-brown; hind wings shining pearly white, with dark brown nervures.

Antennæ of the male simple, ciliated, dark brown; palpi small, strongly tufted, brown; head purplish-brown; collar rather raised, pale brown with two cross-bars of purplish-brown, the lower very slender; shoulder-lappets long and large, pale brown edged with darker brown; remainder of the thorax brown dusted with whitish, with a long divided and tufted crest from the collar to the back of the thorax; fascicles grey, long and dense, hiding the base of the abdomen; the latter is pale brown, covered with long loose shining grey scales; lateral and anal tufts brown. Fore wings long, rather narrow at the base; costal margin straight to near the apex, where it is gently curved; apex rather suddenly and bluntly rounded, almost angulated; hind margin very oblique, slightly rounded; dorsal margin nearly straight; colour pale brown or red-brown, thickly dusted below the subcostal nervure with dark brown and reddish, so that a broad stripe of the paler ground colour lies along the costal margin; basal line almost limited to two black costal dots; first line double, indistinct, reddish-brown, broken into rough crescents and placed nearly perpendicularly; second line only indicated by a faint curved series of cloudy brown dots; subterminal line pale brown, edged inwardly with reddish-brown clouds, outwardly by a long smoky-brown cloud which occupies the hind-marginal space; orbicular stigma large, rather ovate, often pale brown partially margined with red-brown, but also often only indicated by the red-brown edging; reniform stigma obscure, slenderly edged with dark brown or red-brown, and usually almost filled up with smoky-grey or blackish, the lower portion especially with a blackish cloud; claviform stigma, when visible, of the ground colour, slenderly edged with a dark brown line, and divided down the middle by a still more slender one; costal margin dotted with black, and beyond

the stigmata with yellowish; upon it just before the apex is a short oblique blackish wedge-shaped spot; extreme hind margin edged with slender black lunules; cilia shining pale brown, divided by a darker line. Hind wings broad and ample, with a rounded but rather sinuous hind margin; shining whitish with a strong pearly-bluish lustre; nervures sharply dark brown; hind margin clouded with smoky-brown; cilia white, shining, divided by a brownish line. Female similar, stouter, the nervures and shading of the hind wings of a deeper brown.

Underside glossy leaden-grey, paler toward the dorsal margin, dusted with blackish beyond the middle; nervures raised into ridges and edged with ashy-grey; discal cell fully occupied by long fluffy raised scales; reniform stigma smoky-black; hind wings pearly white; costal region and nervures dusted with brown; central streak triangular, blackish. Body whitish-brown; legs brown, barred with paler; leg tufts smoky-brown.

The above description applies to the more common form of the species, which, however, is always and everywhere variable in the degree of red-brown, umbreous or smoky-brown dusting or clouding below the subcostal nervure; or the whole surface is of one of these shades. But in some individuals the dark clouding is absent, the fore wings being of the pale brown ground colour, with all the markings more distinct, though the stripe along the costal region is usually paler. In other cases this stripe, with a large portion of the fore wings, is of a smooth red-brown or purple-red colouring; while in another series of forms the costa is broadly shaded with smoky-black, softening off to umbreous in the middle area, and with the orbicular and reniform stigmata deeper black. These variations seem to occur equally in both sexes, and are accompanied by every possible phase of intermediate colouring. Aberrations seem to be rare, but in the collection of Mr. S. Stevens is a very pretty and curious specimen—small, pale drab, with the margins dark.

On the wing, very rarely in May and June, far more frequently in July, August, September, and October.

LARVA large and stout, more than two inches long; not quite cylindrical but very slightly stoutest behind, and tapering a little in front, the head being the smallest segment; rounded and of a shining pale grey or pale brown, with a blackish stripe down each lobe; general colour of the upper portion of the body reddish-grey or reddish-brown; dorsal line rather paler, narrow, dotted with whitish at the incisions, passing between a series of short brown or blackish shaded longitudinal lines, which sometimes are united so as to form a chain of lozenge-shaped markings; sub-dorsal line slender, interrupted and undulating, dark brown; spiracles black, sometimes in a grey ring, or inside the curves of a slender undulating pair of lateral greyish lines; back portion of the anal segment ornamented with a large pale yellowish blotch, in which are two pairs of grey dots; this blotch is edged in front by a black cross-bar joining black streaks; under surface and legs pale grey, the space above the abdominal prolegs sometimes having three grey dots, which then are also found in the preceding and following segments. When younger rather darker in colour, with the head more yellow and the yellowish patch on the anal segment more triangular.

June and July and again in September, October, and November, in two generations; but there is strong reason to believe that the winter in these islands is fatal to the vast majority of its later larvæ and its pupæ. On plantain, clover, dock, grass, spinach, cabbage, rape, and apparently on almost any low-growing herbaceous plant, even to the marigolds in the gardens. Mr. W. E. Nicholson states that the very young larvæ feed at all times most ravenously, but after the second moult they feed mainly at night, hiding themselves during the day on the underside of the leaves of their food plants; and that from the time when they are

about half grown till full growth they feed at night only, and bury themselves during the day under the surface of the earth. These larvæ were the produce of eggs laid by captured females in September, the eggs hatching in from ten days to a fortnight; in the protection of a greenhouse the larvæ throve and fed up vigorously and rapidly, the whole course from egg to imago occupying but two months; while those larvæ which were kept in a cold situation fed very slowly, and appeared disposed to pass the winter as small larvæ, but succumbed to the climate. The double broodedness of this species seems to have been first established about the year 1845. At the end of October of that year the late Dr. R. C. R. Jordan obtained eggs the larvæ from which fed on till the third week of January, when severe frost destroyed their food, and all but two died. The remaining two produced moths in March and April. A pupa dug up in April produced the moth on May 1st. In the year 1865 the late Rev. J. Hellins of Exeter obtained a large batch of eggs, laid by a captured female at the end of September, and found that, the weather being warm, they hatched *in three days*, and that others obtained by a friend hatched in five days. The larvæ fed vigorously at once, but the winter came too soon upon them and many died. Some which had been sent to Mr. W. Buckler, and kept in a greenhouse, however, fed up and emerged in May. A year or two later Dr. Hearder obtained a female moth which had been captured at light on May 25th; it deposited eggs which hatched in about a fortnight, the larvæ feeding up at the middle of August, and producing moths at the end of that month. These details are of interest, exemplifying the struggle constantly made by this species to maintain itself in a climate unsuited to its constitution.

PUPA of ordinary form; red-brown; in the earth.

The moth doubtless hides itself among herbage during the day; apparently it is scarcely ever found at that time;

at night it flies vigorously, comes occasionally to light, and is strongly attracted by sugar and ivy-blossom, on either of which it settles down, and is captured with perfect ease. Most uncertain in its times of appearance, usually scarce except perhaps on the extreme South coast, but in certain (or rather uncertain) years appearing in large numbers in the autumn and extending its range very widely. The early—May or June—brood is very rarely taken in this country, and for this reason I have furnished, above, full evidence of its existence, but the number of eggs laid by the female is so large—approaching one thousand in number—and the larva feeds so vigorously and rapidly in warm weather that the produce of a very small number of specimens in the early summer is sufficient to furnish a respectable emergence in the autumn. Yet there can be little doubt that our native produce is reinforced at times by a strong contingent from the Continent of Europe. It is a swift and powerful insect and possessed of a migratory instinct, which would naturally bring it to us when at all crowded in its more congenial localities.

In the years 1856–7–8 it suddenly became common in the Southern counties and very widely distributed, occurring even in the suburbs of London; after that it was again scarce for a number of years, but in 1867–9 again appeared in such profusion as to be found in hundreds at Brighton and Deal, and to extend into Scotland; and similar fluctuations have taken place in subsequent years. On the South coast from Kent to Devon, Cornwall, and the Scilly Isles it may be taken annually, and when abundant *there*, is apt to be so in Berks, Somerset, Gloucestershire, Surrey, Oxfordshire, Essex and elsewhere in the southern counties; far more scarce in the Cambridgeshire fen district; found casually in Leicestershire, Staffordshire, and Derbyshire; more frequently in the East coast counties from Suffolk to Yorkshire, and in the West in Herefordshire, Cheshire, and Lancashire; indeed, its spread seems to take place more particularly along the coast. Apparently very local in Wales, though it has occurred

in Carmarthenshire, Glamorganshire, and Pembrokeshire. In Scotland Mr. Adam Elliot has found it in Roxburghshire; and in the West it has extended as far as Troon, Ayrshire; in 1867 it was at Perth and Rannoch; and on the East coast it has been found in several localities, extending even to the Shetland Isles. In Ireland even more generally distributed—Dublin, Wicklow, Cork, Connemara, Mayo, Westmeath, Louth, Galway, Armagh, and Derry.

Abroad its range is immense; Central, Southern, and Western Europe; the Canaries; Madeira, abundant; Northern Africa—Mr. J. J. Walker says that at Tangier and also at Gibraltar it seems to be found almost throughout the year—Asia Minor, Canada, the United States of America, Mexico, Venezuela, Brazil, and Chili—but in these last under the name of *semifusca*. In the United States it is at times so abundant as to become a serious pest to the farmers. Professor Smith in his "Catalogue of the Noctuæ of North America" mentions it as occurring in April and May in California, in Canada in July and August, in New York and Illinois in August and September, and in the latter months and October in the district of Columbia. Doubtless he refers to two generations at least.

[**A. fennica**, *Tauscher*.—In the year 1850 the late Mr. H. Doubleday recorded, in the *Zoologist*, the occurrence of an example of this species in Derbyshire, but without mentioning the name of the captor. The insect had become the property of the late Mr. T. H. Allis, of York. Some years later this gentleman stated in the *Entomologist's Weekly Intelligencer* that he had no doubt that the specimen was taken by John Beresford, of Chesterfield, but that the species had never been properly looked for since. John Beresford appears to have been a miner. No suspicion seems to attach to him, and the only reasonable explanation of this extraordinary occurrence is that of casual migration or accidental introduction. There is no reason whatever to

suppose that the insect has any home in these Islands or that any other individual of the species has been taken here. It is an insect of peculiar appearance, having very long narrow fore wings, black brown, with the dorsal margin whitish, shaded with reddish, and the orbicular and reniform stigmata yellow or edged with yellow and placed far apart; hind wings pale brown. The female is devoid of the reddish colour along the dorsal margin; its ground colour is greyer and stigmata whitish. Its home appears to be in Western Siberia, whence it has been obtained in some numbers by the Rev. N. F. Dobree, and its larva discovered feeding by day upon *Corydalis gigantea* and *Epilobium*. Elsewhere it seems to be always rare, or at any rate scarce; yet is found in Finland, Lapland, Northern Russia, Tartary, and widely distributed in North America.]

19. **A. pyrophila**, *Fab.*; **simulans**, *Staud. Cat.*—
 Expanse, $1\frac{3}{4}$ inch. Fore wings narrow at the base, grey-brown slightly mottled with darker; markings obscure, mainly consisting of black dots on the costal margin and on the transverse lines; hind wings grey brown.

Antennæ of the male ciliated throughout, the bristles forming fine and delicate tufts from the base to beyond the middle; colour brown. Palpi short, reddish brown; head greyish brown, paler at the sides; collar upraised, light brown behind the head; upper portion, with the remainder of the thorax, brown dusted with dark grey; at the back of the thorax is a long flat divided crest having two small points; fascicles broad, smoky-white; abdomen rather long, light brown or grey-brown with a golden gloss, lateral and anal tufts paler. Fore wings elongated, rather narrow at the base; costal margin very faintly curved; dorsal margin straight; apex and hind margin decidedly rounded, the latter full and very little oblique; colour pale brown, dusted with blackish; basal line indicated by two pairs of blackish streaks; first line very obscure, perpendicular, broken into a

series of slender blackish curves, faintly duplicated inwardly; second line also obscure, oblique, blackish, consisting of a series of long loops attached to a row of black dots; beyond is a row of obscure blackish wedge-shaped spots, forming the inner edge of a barely visible paler subterminal line; costal and hind margin dotted with black; orbicular and reniform stigmata indicated by obscure blackish margins, and the latter clouded with dark grey; all the markings very obscure and minute, producing the effect of a series of faint dotted lines; cilia pale brown. Hind wings ample, the margin rounded except below the apical angle, where it is rather hollowed out; smoky-brown, darkest at the hind margin; nervures darker brown; cilia yellowish, shading off to white, and intersected by a brown line. Antennæ of the female threadlike; general colour slightly darker, but extremely similar.

Underside of the fore wings pale ashy-grey, with the margins yellowish and the whole surface shining with a golden gloss; beyond the middle is an obscure dark grey transverse stripe; of hind wings pale grey with a smoky black central spot, followed by a slender transverse dark grey stripe; costal region broadly yellowish; body whitey brown; legs brown, barred with yellowish; leg tufts pale greyish-brown.

Hardly variable in any one locality, but subject to regular gradations of colouring in accordance with latitude. On the South coast its colour is brownish-grey, or even pale brown; as it occurs further North the colour becomes darker, till in the North of Scotland the insect is of a unicolorous grey-black.

On the wing in July and August, or in the extreme North and West in September.

LARVA. Head shining brown; dorsal plate triangular, brownish-black; on each side of it a brownish-black mark; dorsal line inconspicuous, extremely narrow, light brown with

a darker line on each side, and a double series of brownish-black, medio-dorsal, V-shaped markings, the tips of the V's directed forwards. Subdorsal area light brownish flesh-colour, with a few very small brownish dots; a series of very distinct black marks in the second and fifth to twelfth segments, dividing the lateral white stripe which lies below the spiracles from the subdorsal area. Each segment emits a number of short bristles, and in some specimens the dark brownish medio-dorsal stripes are decidedly tinged with green. (W. Reid.) This description is made from well-grown larvæ early in the winter. Mr. Reid goes on to say that in the spring, after moulting again, the larvæ have changed colour and the markings are very much brighter. Of the young larvæ he says: "When newly hatched they are dark greenish-brown, with the faintest trace of a lighter line below the spiracles, and a few scattered bristles. They are extremely sluggish and appear to be constantly sitting about, holding on to the withered grass with the last three pairs of claspers, the fore part of the body thrown back and the head tucked in after the manner of a *Sphinx* larva. They grew so slowly that it was several weeks before I saw much difference in them. At last they moulted, and although this did not improve their size, it made a great difference to their appearance. Dorsal and subdorsal area brownish; a lateral series of wedge-shaped spots from the fifth to the twelfth segment just above the spiracular line, the apex pointing forward and only crossing the anterior half of each segment; below the spiracles is a broad white line; posture and habits the same as before, but they are not so sluggish. After the second moult they may be said to assume the colouring and markings, in miniature, of the adult larva. The larva rolls itself into a ring when annoyed and falls off its food plant, but soon unrolls and seeks shelter at a great rate." As this larva is so little known I have quoted Mr. Reid's remarks rather fully.

September to May or June, on grasses, dandelion, dock, knot-grass, groundsel, and other low-growing plants. Feeding at night, hiding in the daytime at the roots of grass.

PUPA undescribed.

The moth hides itself in the daytime at the roots of grass or under any convenient shelter, and is said to enter houses where they exist in its favourite localities. The late Mr. G. Norman captured many specimens at Forres in the North-east of Scotland as they were trying to escape through the windows of a house just after dusk. Mr. Reid says that it has a curious habit, when disturbed at night, of crawling under loose bark and planks, on palings or outhouses. It comes readily to sugar and to the blossoms of ragwort, thistle, wood-sage, heather, tansy, dock, reed, yellow flag, and in gardens to sweet-william. It is very local, principally frequenting sea cliffs and hills inland, and is found on the South coast of England at Portland, Charmouth, and rarely elsewhere in Dorsetshire. It is difficult to understand how it can be absent from the sea cliffs of Devon and Cornwall, but I can find no record of its presence. Inland it has been found on the Cotswolds in Gloucestershire. Further northward it is more frequent, being found in Derbyshire, Cheshire, Lancashire, Yorkshire, Westmoreland and Cumberland, also at the Isle of Man, and in North Wales in Flintshire and Denbighshire. Much more widely distributed in Scotland, being found in the Tweed and Forth districts, in Ayrshire, Morayshire, and generally in Aberdeenshire and Kincardineshire; also in Argyleshire, and in the Hebrides and Orkneys. In Ireland, so far as I know, only two specimens have been obtained, both near Sligo; these are in the collection of Mr. F. J. Hanbury. Abroad it is very widely distributed over the Continent of Europe and is found in Siberia.

[**A. helvetina**, *Bdv.*—This Alpine species, of which the fore wings are long and rather pointed, and of a uniform olive brown, or lead-brown colour, with brown hind wings, was recorded as British in the *Entomologist's Monthly Magazine*,

1872, three (so-called) specimens having been taken in Derbyshire. By some extraordinary fatality of error, these specimens were afterwards said to belong to a variety of *Noctua neglecta*, Hüb. One of them, now the property of Dr. P. B. Mason, of Burton-on-Trent, is before me. It is evidently a curious unicolorous form of *Noctua augur*, the shape of its fore wings differing greatly from that in *A. helvetina* and in a less degree from *N. neglecta*, but agreeing accurately with *N. augur*. A second specimen is at Burton-on-Trent in the collection of Mr. G. Baker, and is identical with this. Dr. Mason fully agrees with me as to the species to which they actually belong. The third specimen seems to have disappeared. The true *A. helvetina* is found in France, Germany, Switzerland, Piedmont, and the whole Alpine region of the Continent of Europe; but there is no reason to suppose that it has ever occurred in these Islands.]

20. **A. Ashworthii**, *Dbl.*—Expanse $1\frac{1}{2}$ inch. Fore wings rather truncate, pale slate-grey, with dark grey lines and central shade; stigmata indistinct; hind wings pale grey.

Antennæ of the male minutely notched toward the base and finely ciliated throughout; pale grey, browner in front. Palpi short, with broad oblique tufts, black at the sides, hoary-grey in front; head hoary-grey, darker above; entire thorax light slate-grey, minutely dusted with darker; doubly crested at the back, and the tufts tipped with dark grey; fascicles broad, smoky-white; abdomen smoky-white, dusted with grey; lateral and anal tufts rather greyer. Fore wings rather narrow at the base; costal and dorsal margins slightly rounded; apex bluntly angulated; hind margin gently curved and slightly hollowed above the anal angle; colour slate-grey with a bluish tint, finely dusted with black; basal line abbreviated, doubly curved, deep black; first line nearly perpendicular, much indented, deep black; second line also black, more slender, deeply zigzagged throughout and with black dots at the angles; subterminal line undulating and

indented, obscurely paler, strongly edged on the inner side with dark grey. Each transverse black line originates from a large black costal spot, and the dark edging of the sub-terminal line arises from a large triangular blackish spot before the apex; orbicular stigma distinctly ringed with black and bordered on each side by a rather squared blackish blotch; reniform stigma very obscure, edged only at the back with black; no claviform stigma; central shade conspicuous, dark smoky-grey; cilia crenulated, slate-grey, rather dashed with darker. Hind wings pale smoky-grey, shading to whitish toward the base, to darker toward the hind margin and around the apex; sometimes also with a rather darker central transverse cloudy stripe; nervures dark grey; cilia white. Female with threadlike antennæ, and sometimes the general colour rather more smoky, but hardly differing from the male except in the stouter body.

Underside of the fore wings very pale slate-grey, the middle area smoky-grey; beyond the middle are two blackish costal blotches, from which arise obscure smoky-black transverse stripes, the second incomplete; hind wings white, dusted with grey, and with a slender transverse grey stripe beyond the middle. Body and leg-tufts hoary-grey, the latter more smoky-grey toward the front; legs blackish, barred with grey.

An exceedingly pretty species when fresh, and hardly variable except in the depth of ground-colour and central shading, but the soft bluish-slate colour fades in time and becomes of a smoky-grey, or even brownish-grey. My description has been made from exquisitely fresh and beautiful specimens reared last year by Mr. C. S. Gregson, and provided for the purpose. A variety is on record entirely suffused with blackish-grey, and another having a broad blackish central band. They have not come under my observation.

On the wing in July and August.

LARVA plump, active, rather stoutest behind and tapering

a little toward the head, which is of a bright chestnut colour, rounded, and very glossy; body uniformly sooty-black, except two subdorsal rows of deep velvety-black spots, each spot nearly as long as the segment, rounded in front, squared behind; legs pale chestnut; prolegs and under-surface sooty-black.

The larvæ from which this description is taken were forwarded for the purpose by Mr. C. S. Gregson of Liverpool. Probably there is some variation in colour which these examples do not indicate, since Mr. Buckler's figures have the ground-colour in one case dark green, in the other dark purple. When very young they are green, with the subdorsal blotches indicated but paler; when half grown bright green, with the blotches darker, but indistinct, and the head dark-brown.

September to May, hybernating. Mr. Gregson says that three to five young larvæ may be found together in old webs left by another species on the flowering spikes of *Solidago virgaurea*. Doubtless any suitable protection is made use of. Throughout the winter on grass, *Helianthemum* (rock-rose or sun-cistus), wild thyme, burnet, sallow, heather, golden-rod, *Hieracium*, *Galium*, *Campanula rotundifolia*, and almost any low-growing hill plants. In captivity it willingly eats the blossoms of primrose, and rejoices in sallow-catkins. Unlike the majority of its allies, it is not exclusively a night feeder. On the contrary, the local collectors search for it regularly by day. Mr. F. C. Woodforde writes me this spring: "Nearly all the larvæ are taken in the daytime; it would be next to impossible to work at night where it is most numerous, on account of the danger. Of course, it does feed at night, and I have found it at that time by the aid of a lamp, but I found more in the daytime. On warm days, when the sun is not *too* hot, it comes out and feeds, stretched at full length on its food plant, chiefly between noon and 1 P.M., and between 3 and 4 P.M. It is most frequently found on very steep and bare ground, where wild thyme with cistus and

burnet grow in small isolated patches. It is conspicuous stretched out upon a shoot, and its markings with the paler dorsal line look curiously like the leaves upon a spray of thyme. On cold days searching is almost useless. In captivity also it eats a great deal in the daytime, though some keep concealed beneath the soil." This supports Mr. Gregson's statement, made more than twenty years ago, that he had found the larva in every hour of the day from 5 A.M. to 2 P.M.

PUPA of the usual rounded form, with a minute tubercle covering the points of the palpi; whole surface very glossy; wing and limb cases closely appressed; abdominal segments rounded and deeply separated; anal segment finished off with a broad flattened black projection, on which are two short points or spikes; below this the anal structure is visible. General colour bright red-brown; wing covers less strongly coloured and semi-transparent, showing internal structure; spiracles black; anal points deep black. In a chamber of earth underground, or under stones or moss on the rocks.

The moth sits in the daytime on limestone rocks, or hides among loose stones. In appearance it closely resembles the blue limestone, and it has the sagacity to hide itself in chinks and crevices, where this resemblance greatly assists in its concealment. In very hot sunshine, however, it becomes excitable and may be disturbed. At night it comes forth and sits on the rocks or on grass stems, and flies vigorously rather late, coming eagerly to sugar sprinkled upon plants in its favourite haunts. These are exclusively limestone rocks, and usually at considerable elevations. The tops of the hills and portions of mountains throughout North Wales, but especially in the counties of Denbigh and Flint, are composed of carboniferous limestone, forming in some of them successive escarpments and plentiful rock faces and masses of fallen stone, and here is the home of the present species.—Llangollen, Penmaenmawr, Snowdon, and doubtless in all

similar places in that district. Colonel Partridge has found it at Dolgelly; and there is a record of its capture in Anglesea. Outside this particular district of mountain limestone it does not seem to have been observed. It was first taken in the year 1853 at Llangollen, by Mr. Joseph Ashworth, and was recorded and described in the *Zoologist*, 1855, by Mr. H. Doubleday, who named it after its discoverer. He, however, very judiciously remarked that it is closely allied to *A. decora*. In 1862 Dr. Herrich-Schäffer in the course of some remarks, in the same magazine, upon British insects, compared it in some respects to a much larger species—*A. candelisequa* (*candellarum*)—and, presumably for this reason, the suggestion has since been repeatedly made that it might be a local variety of *A. candelisequa*, Hüb., a species widely distributed in central and eastern Europe. For this I can see no grounds. The two species bear no resemblance to each other; they differ in size, colour, markings (so far as *A. candelisequa* can be said to have markings), and in shape, and are, in fact, not closely allied. But *A. decora* is unquestionably very nearly related to *A. Ashworthii*; and in all probability *A. Simplonia*, an inhabitant of some of the higher portions of the Alps and Pyrenees, is identical with it, if indeed both are not local forms of *A. decora*. If these forms are distinct species our insect is, to all appearance, exclusively confined to its mountainous haunt in North Wales.

21. **A. ravida**, Hüb.; **obscura**, Staud. Cat. Expanse, to $1\frac{3}{4}$ inch. Fore wings broad behind, glossy grey-brown, with a broadly reddish tinge along the costal region; markings very obscure; hind wings greyish-white.

Antennæ of the male threadlike, very faintly ciliated, reddish-brown. Palpi and head densely tufted with rich purple-brown scales. Collar similar, thickly scaled, erect; shoulder lappets long and loose, purple-brown; back of thorax browner, more thinly scaled, and with the scales very prostrate, except a small divided back crest; fascicles smoky-

grey; abdomen glossy pale purplish-brown, much flattened; lateral and anal tufts inconspicuous. Fore wings rather narrow at the base, broad behind, and rather expanded at the anal angle; costa rounded; dorsal margin rather hollowed; apex and hind margin rounded, the latter hardly oblique; colour light umbreous dusted with darker, with the costal region, so far as the median nervure, suffused with purplish-red, and a gloss of purplish over the whole surface; basal line blackish, curved, very slender; outside it is a short, deep black, longitudinal streak lying below the median nervure; first line indistinct, nearly perpendicular, composed of detached blackish curves; second line obscure, not very oblique, mainly composed of blackish crescents, from the points of which blackish streaks run along the nervures; subterminal line undulating, faintly yellowish; orbicular and reniform stigmata dull yellowish, edged with black; claviform stigma scarcely indicated; on the costal margin are two pairs of black spots, followed by three or four yellowish dots; cilia purplish-brown. Hind wings whitish, with brown nervures, clouded at the base and hind margin with greyish-brown, and wholly suffused with a golden gloss; cilia white. Female similar, or else more suffused with reddish, purplish, or smoky-brown, and with the markings even more obscured; hind wings slightly darker.

Underside of the fore wings shining smoky-white, broadly tinged with reddish-grey along the costa and hind margin; reniform stigma indicated by a cloudy blackish spot; beyond it is a distinct, transverse, curved, smoky-black stripe. Hind wings white, with the costal region broadly dusted with reddish; central spot grey, obscure; beyond it is a smoky-black transverse stripe, most distinct toward the costa, and fading out in the white area.

There is some variation in the ground colour, the red costal colouring in some specimens suffusing the greater portion of the fore wings, or in others becoming hardly perceptible, leaving the whole surface dark brown, or grey-brown, or even

blackish-brown. In some specimens in each shade of colouring there is a darkening of the space between the orbicular and reniform stigmata. There is nothing clearly defined in these variations; all melt imperceptibly into each other. In Mr. F. J. Hanbury's collection is a very curious specimen, remarkably resembling one of the forms of *A. nigricans*, and hardly larger than that species.

On the wing during the latter half of July and in August.

LARVA cylindrical, almost uniform in thickness, but slightly tapering toward the head, which is grey, mottled and streaked on the lobes and face with dusky brown; on the second segment is a dull brown plate, with slight indications of dorsal and subdorsal faint lines through it. General colour yellowish-brown, with a slender, slightly paler dorsal line, which passes through a dusky V-like streak at the end of each segment after the fourth. At the commencement of the fourth segment, on each side and close to the division, is a subdorsal ochreous-yellow spot, which is repeated on the fifth to the eleventh segments, and on them has an almost confluent, yellow, wavy, curved streak extending along two-thirds of the segment, the curves diminishing toward the eleventh segment; on the twelfth the lines are straight and slightly converging, and are margined above with dusky-brown wedge-shaped streaks, which point forward; on the previous segments the yellow curved streaks are edged more faintly with dusky brown. Sides and under surface, with the legs, brownish-grey; spiracles minute, dirty white, in a dusky blotch from which an oblique dusky streak points forward; beneath is a pale grey spiracular line. Anal segment plain dingy brown.

Another variety has the dorsal region ochreous-brown, but behind the fourth segment the paler dorsal line is only visible at the divisions; the V-like streaks are longer and darker; the yellow spots are separated from the yellow

streaks by a broad dark brown edging to the latter, extending to its full length, and on the twelfth segment to the end thereof, the yellow streaks being, on the fifth to the twelfth, broad and straight, but curved and unmarginated on the third and fourth.

A third variety is dingy ochreous-brown on the back, with the dorsal line as in the last; the ochreous spot and streak, commencing on the fifth segment, become confluent on the eighth and three following, while on the twelfth only the streak is visible; each of the yellow curved streaks is edged above with a thin black streak extending two-thirds down each segment, the spaces on the middle of the back between the streaks being filled up with dark brown and containing two minute dusky spots edged with paler. The curved yellow streaks are slightly indicated on the second, third, and fourth segments, and the yellow spot also on the latter. (Condensed from Mr. Buckler's descriptions.)

September to May, on dandelion, dock, and other low-growing plants. Feeding at night, and hiding by day in the earth at the roots of plants, chiefly at those of dandelion and thistle. From this preference it has been supposed to feed on the roots, but of this I can find no evidence. Mr. Buckler found that his larvæ feed freely on succulent leaves of dandelion (*Leontodon taraxacum*).

PUPA apparently undescribed. In a loose cocoon of earth and a little silk, under the surface of the ground.

The moth hides in the daytime in old thatch or among herbage on the ground. It flies at dusk and comes readily to sugar, at which it settles down quietly and is captured without difficulty. Of very uncertain occurrence, and sometimes hardly observed for years. From 1868 to 1872 it was common in some of its haunts; by 1891 it had come to be looked upon as a very rare insect; it then reappeared, and for the last four years has, in some districts, been common. Found throughout the Southern Counties, and in Kent and

Waits sometimes commonly, as also in the Reading district of Berkshire; rare in Devon and apparently not noticed in Cornwall. In Essex abundant in 1894, and found also in Suffolk and Norfolk; generally distributed over the fen and chalk districts of Cambridgeshire and the adjoining counties, and there also plentiful in its favoured seasons, when indeed it has been known to occur in the suburbs of London; taken occasionally on the Cotswolds, Gloucestershire, in Leicestershire, Derbyshire, Herefordshire, and rarely in Lancashire and Yorkshire; more frequently in Lincolnshire and Durham. In Scotland it is very rare. Mr. Cameron has recorded it in Ayrshire, and Dr. White in the Clyde, Solway, and Forth districts. The only record in Ireland seems to have been doubtful and has not been confirmed.

Abroad its range is exceedingly wide; Central Europe and all the temperate portions of the northern part of the Continent, Northern Spain, Northern Italy, Southern Russia, Siberia, Tartary, India, China, Japan, North Africa, Canada, and even Greenland.

22. **A. lucernea**, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings rather short, narrow at base, broad behind; smoky slate-grey, dusted with whitish; with broad darker transverse clouds; hind wings dark grey with white cilia.

ANTENNÆ of the male strongly ciliated, the basal half with small tufts of fine bristles, which thin out beyond the middle; dark brown. Palpi short with the apical joint thickly tufted, smoky-grey; head grey-brown or dark grey; collar rather raised, and, with the rest of the thorax, dusky grey, loosely scaled, and with a very faint indication of a crest at the back; fascicles pale grey; abdomen dark grey with a purplish gloss; lateral and anal tufts small, slate-grey. Fore wings rather short and truncate, narrow at the base; costal and dorsal margins nearly straight; apex bluntly angulated; hind margin below it straight and nearly perpendicular, but rounded off at the anal angle; smoky-

grey with a gloss of slate-grey, and appearing of a thick texture; markings very obscure, but when visible a faint, irregular, darker grey basal line, edged with paler; first line perpendicular, much indented, dark grey, obscurely edged inside with pale clouds; second line obscurely dark grey, indented and curved but not very oblique, faintly edged outside with paler clouds; orbicular and reniform stigmata merely indicated by obscure pale clouds; between them a darker grey transverse central shade; subterminal line, when visible, merely a broken irregular edge of darker clouding; cilia smoky-grey. Hind wings rather short, dull brownish-grey, darkest, and appearing smoky, toward the hind margin; central lunule faintly blackish; cilia snowy white. Female with threadlike, ciliated antennæ; in general colour hardly differing from the male, except that often there is a smoky clouding over the hinder area of the fore wings.

Underside much paler than the upper; margins of the fore wings yellowish-white or whitish, remainder grey-brown, shining; hind wings ashy-white with a broad dark grey hind-marginal band, or with the entire surface grey-brown, except the costal region. Body and leg tufts ashy-white; legs dark grey barred with yellowish-white.

Variation in this species appears to be mainly local or climatal, and exists principally in the intensity of the colour. On the south coast of England, and especially at Portland, the general tint is pale smoky-grey, much darker toward the hind margin, and with the markings moderately distinct; inland mountainous districts, especially in North Wales, produce a still paler form; coast districts in the West and North a decidedly darker; and in the far West, as in Kerry, some specimens are actually slate-black, without more than the faintest trace of markings. The Isle of Wight produces deep slate-coloured specimens, darker than those from the Isle of Man, which are brown-grey. Shetland specimens are large and dark, even to glossy blue-black.

On the wing in July and August, and in its northern and western range, in September.

LARVA stout, each segment thickened and rather wrinkled at the sides; head small, shining black-brown, rather lighter brown at the sides; general colour dusky olive-green, mottled all over with small black streaks and dapplings; each segment of the body having a faintly indicated pale olive-green spot on each subdorsal region, below which, on each side, is an oblique shading of blackish-green; legs pale brown tipped with darker; prolegs and under surface pale olive-green. (From larvæ sent for description by Mr. C. S. Gregson.) Mr. Logan's description (1846) from larvæ found near Edinburgh indicates some variation: "The general colour greenish or greyish-black, suffused in some individuals with a faint purplish bloom; along the back are two rows of whitish or yellowish spots, each spot bounded anteriorly by a darker shade of black. These spots become indistinct toward the head, and disappear entirely on the third segment; they are much more fully developed in some individuals than in others; the general colour is also variable." One of Mr. Buckler's figures is of a dark purple-grey, and has behind each pale subdorsal spot a black wedge-shaped streak; the other is more as is above described.

August to May on *Campanula rotundifolia*, *Sedum acre*, saxifrage, cowslip, chickweed, and various grasses, especially *Festuca ovina*. Usually found in stony or rocky places, and fond of reposing at night, and sometimes in the sunshine, on the rocks, especially where these are grey with lichen and afford protection from similarity of colour. Mr. F. C. Woodforde tells me that, of a considerable number found by himself and Mr. E. W. H. Blagg, not one was upon the plants, all were on the smooth faces of perpendicular rocks, at night, exactly as though feeding on the microscopic lichens. They, however, showed no disposition to devour lichen when in confinement, and this exposure seems to be in some degree preparatory to spinning up.

PUPA exceedingly smooth and shining, limb-cases hardly perceptibly raised, but the wing-covers thickened and very perceptibly fuller than the rest of the body, also so transparent that the segments of the internal portions of the segmental rings are visible through them; palpi-covers projecting in front in a bent down knob. Colour bright chestnut, segments of the abdomen rather redder; divisions well marked, dark brown; anal segment rather swollen, fully rounded, terminating in a blunt point from which arise two slender parallel spikes. In a brittle cocoon of earth at the surface of the ground, or spun up in moss among stones or in chinks of rock.

The moth hides by day among rough stones, in crevices of rocks, and under any convenient shelter in its savage haunts; but the male is readily induced, by hot sunshine, to fly vigorously in the middle of the day, over rocks, rough shingle, or the *débris* of mines; and to feast at flowers. At dusk both sexes fly wildly and twist and wind about, among stones, in such a manner as to render their capture difficult enough. This is, however, easily effected at sugar, to which both sexes come freely, as well as to blossoms of wood sage, ragwort, and heather. It is also strongly attracted by light. Where the ground is rocky, inland hills and mountains are frequented by it equally with the coast. It has been taken in Kent near Deal and Folkestone, though not commonly; sometimes plentifully at the Isle of Wight and at Portland; more rarely at Swanage in Dorset, Plymouth and Torquay in Devon, and Whitsand Bay, Cornwall; but there is no reason to suppose it absent from any rocky portion of that coast. In Gloucestershire it is said to be rare, as also in Lancashire and Yorkshire, though in 1895 it became so common in the hilly parts of the last-named county as to stray into Mr. Porritt's garden, a few miles out of Huddersfield. In Salop it is found commonly on some rough hills near Church Stretton; and in Westmoreland in similar localities near Keswick. Doubtless if looked for it will be found in suitable places all over the

Lake District. In Wales also this certainly appears to be the case, since it is plentiful on the rocky hills and mountains of the Snowdon district, and around Llangollen, also on the South coast near Swansea, and in Pembrokeshire. In Scotland very generally distributed; fifty years ago it was plentiful on Arthur's Seat close to Edinburgh, and thirty years ago was still found at Salisbury Crags. It is said to be scarce in the Rannoch district of Perthshire and at Moncrieffe Hill, yet plentiful at Dunkeld; also found in Stirlingshire, Clydesdale, Kincardineshire, and probably in all suitable places from the Tweed and Solway to Moray; certainly in the Hebrides and at Unst, Shetland. Also widely distributed in Ireland, but mainly upon the coast—Howth near Dublin, Waterford, Cork, Kerry, Galway, Sligo, Londonderry, Antrim, and Down. Abroad it is an inhabitant of the higher Alps and Pyrenees, Sweden, and Finland.

ADDITIONS AND CORRECTIONS.

Gastropacha ilicifolia (Page 49).—A single male specimen was captured in the spring of the present year (1896) on Cannock Chase by Dr. R. Freer. The species is not, therefore, yet extinct in this country.

Cerura vinula (Page 97).—With reference to the pupæ found spun-up on *Tamarix*, it has since been discovered by Colonel Partridge that a stump of poplar, still producing living shoots, exists among the tamarisk bushes. Here, doubtless, the larvæ in question had found their subsistence, and tamarisk must not be admitted as a probable food-plant.

Petasia cassinea (Page 157).—I have now seen a fine male of this species which was taken by the Rev. W. W. Flemyng in the County Waterford, Ireland, and have been informed of the capture of others. Mr. Kane has taken it in Westmeath.

Agrotis exclamationis (Page 309).—An extraordinary variety taken at Ashford, Kent, by Mr. W. R. Jeffrey, has just been forwarded by him. Its fore wings are of a very pale yellowish-brown, almost devoid of markings, except the first and second transverse lines which are black, the latter most beautifully disposed in crescents throughout. The only indications of the usually conspicuous stigmata are in very faint clouds of rusty brown.



INDEX.

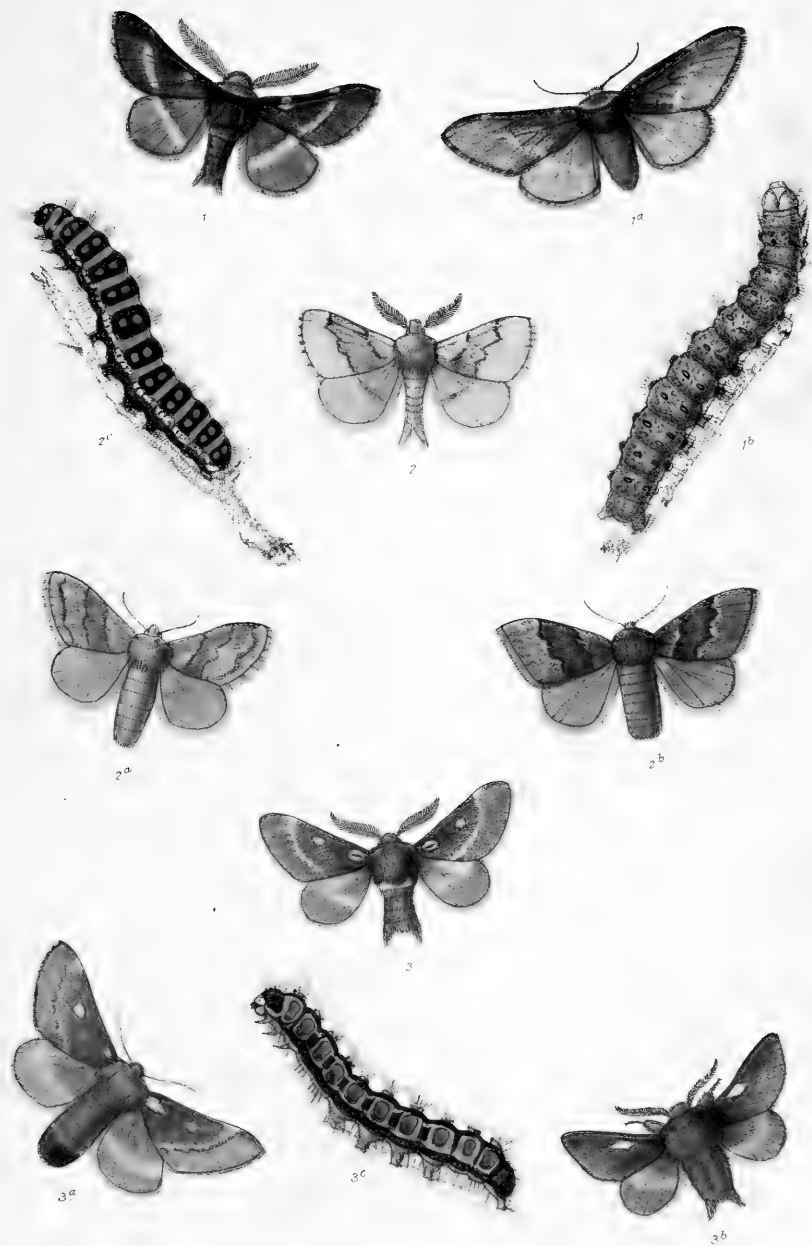
	PAGE		PAGE		PAGE
Acronycta . . .	219	(subgothica) . . .	351	dodonæa . . .	133
aceris . . .	229	tritici . . .	336	Endromis . . .	50
alni . . .	236	valligera . . .	278	versicolora . . .	50
auricoma . . .	257	Arsilonche . . .	274	Eriogaster . . .	8
(cuspis) . . .	253	venosa . . .	274	lanestris . . .	9
euphorbiæ . . .	261	Asphalia . . .	204	(Eutricha) . . .	49
leporina . . .	224	diluta . . .	204	(pini) . . .	49
ligustri . . .	270	flavicornis . . .	207	Gastropacha . . .	42
megacephala . . .	233	ridens . . .	211	ilicifolia . . .	46
menyanthidis . . .	253	Cerura . . .	82	quercifolia . . .	42
psi . . .	250	bicuspis . . .	83	Gluphisia . . .	152
rumicis . . .	265	bifida . . .	90	crenata . . .	152
strigosa . . .	241	furcula . . .	86	Gonophora . . .	186
tridens . . .	245	vinula . . .	93	derasa . . .	186
Agrotis . . .	277	Cilix . . .	79	Lasiocampa . . .	21
agathina . . .	357	spinula . . .	79	quercûs . . .	25
aquilina . . .	347	Clisiocampa . . .	13	rubi . . .	32
Ashworthii . . .	380	castrensis . . .	17	trifolii . . .	21
cinerea . . .	298	neustria . . .	13	Lophopteryx . . .	136
corticea . . .	293	Clostera . . .	166	camelina . . .	139
(crassa) . . .	287	anachoreta . . .	169	carmelita . . .	136
cursoria . . .	324	curtula . . .	166	cucullina . . .	142
exclamationis . . .	306	reclusa . . .	172	Notodonta . . .	105
(fennica) . . .	375	Cymatophora . . .	193	bicolora . . .	127
(helvetina) . . .	379	duplaris . . .	193	dictæa . . .	105
lucernea . . .	388	fluctuosa . . .	196	dictæoides . . .	108
lunigera . . .	313	ocularis . . .	201	dromedarius . . .	123
nigricans . . .	331	or . . .	198	trepida . . .	118
obelisca . . .	353	Diloba . . .	175	tritophus . . .	115
porphyrea . . .	362	cæruleocephala . . .	175	torva . . .	121
præcox . . .	365	Diphthera . . .	214	ziczac . . .	111
puta . . .	301	Orion . . .	214	Odonestis . . .	37
pyrophila . . .	376	Drepana . . .	63	potatoria . . .	37
ravida . . .	384	falcataria . . .	63	Petasia . . .	155
ripæ . . .	319	hamula . . .	70	cassinea . . .	155
saucia . . .	369	sicula . . .	67	nubeculosa . . .	158
segetum . . .	288	unguicula . . .	73	Platypteryx . . .	76
(spinifera) . . .	318	Drymonia . . .	130	lacertinaria . . .	76
suffusa . . .	283	chaonia . . .	130	Pæcilocampa . . .	1

	PAGE		PAGE		PAGE
populi . . .	2	Pygæra . . .	161	fagi . . .	99
Pterostoma . . .	145	bucephala . . .	161	Thyatira . . .	189
palpina . . .	145	Saturnia . . .	57	batis . . .	190
Ptilophora . . .	149	carpini . . .	57	Trichiura . . .	5
plumigera . . .	149	Stauropus . . .	98	crategi . . .	5



PLATE LXXXVII.

- FIG. 1. *Pocilocampa populi*, male.
1*a.* " " female.
1*b.* " " larva.
2. *Trichiura crataegi*, male.
2*a.* " " female.
2*b.* " " " var.
2*c.* " " larva.
3. *Eriogaster lanestris*, male.
3*a.* " " female.
3*b.* " " male, var.
3*c.* " " larva.



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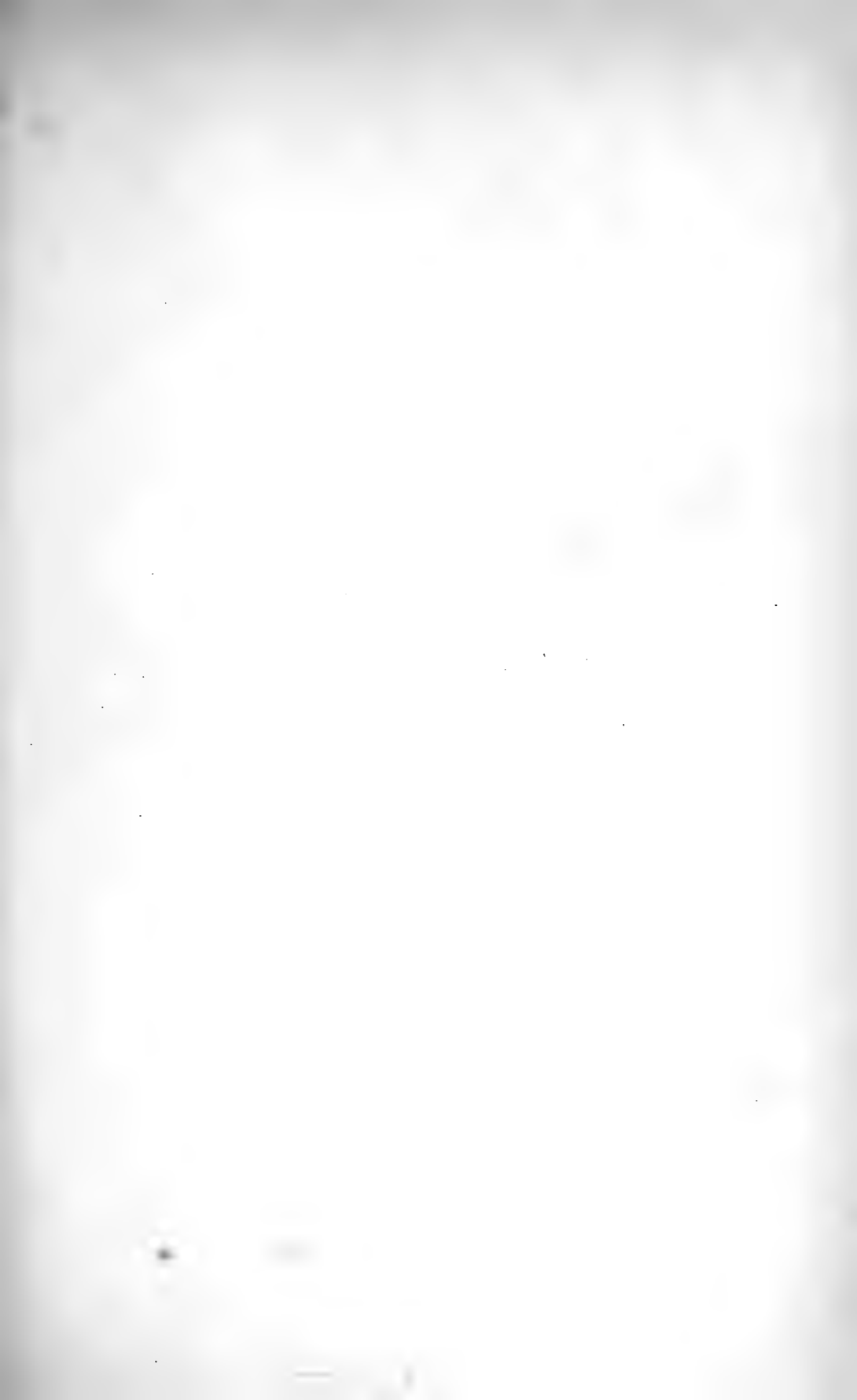


PLATE LXXXVIII.

FIG. 1. *Clisiocampa neustria*, male.

- | | | | |
|-------------|---|---|---------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var. |
| 1 <i>c.</i> | „ | „ | „ „ |
| 1 <i>d.</i> | „ | „ | „ „ |
| 1 <i>e.</i> | „ | „ | female, var. |
| 1 <i>f.</i> | „ | „ | „ „ |
| 1 <i>g.</i> | „ | „ | larva, Mr. G. C. Bignell. |



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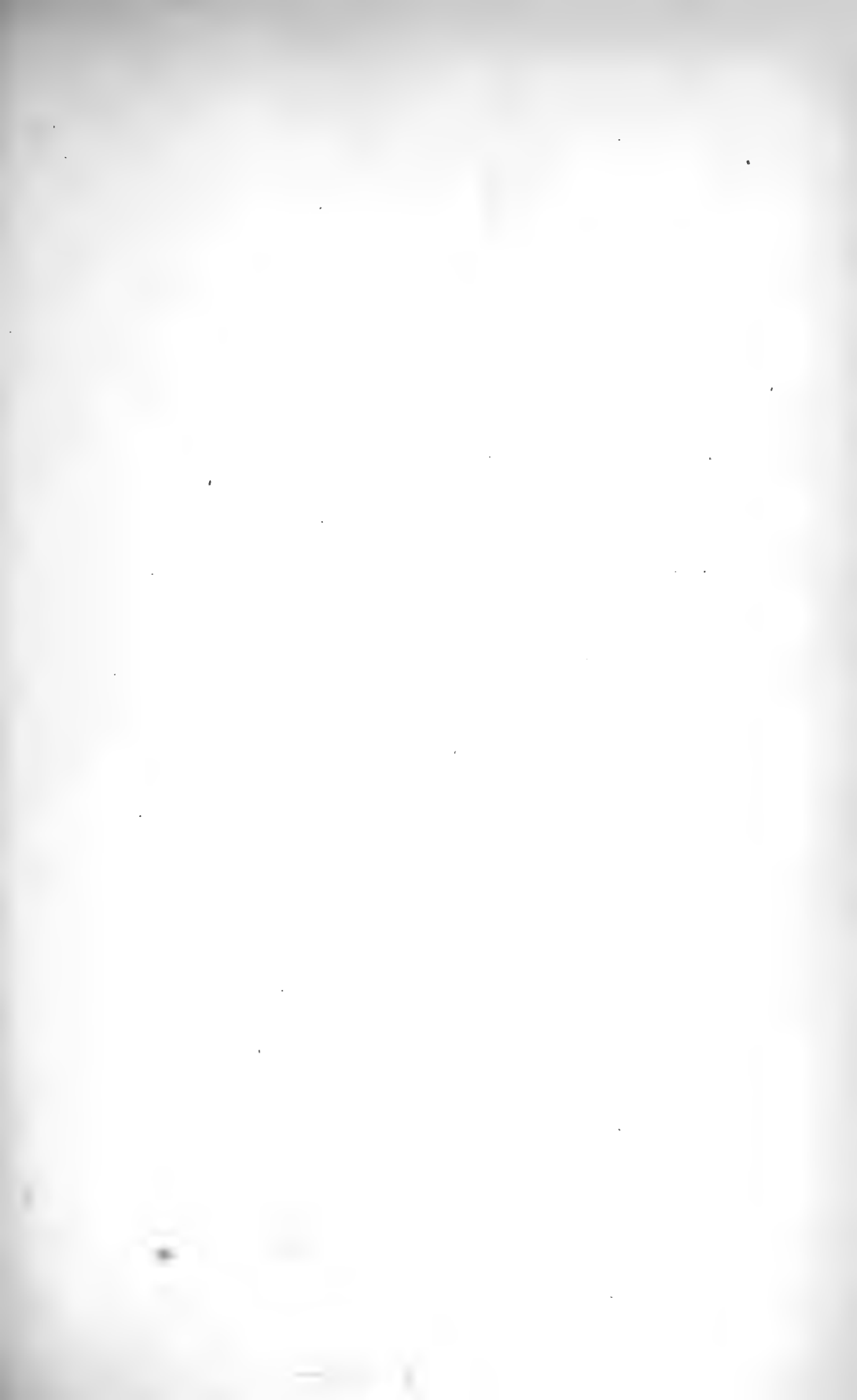


PLATE LXXXIX.

FIG. 1. *Clisiocampa castrensis*, male.

1 <i>a.</i>	”	”	female.
1 <i>b.</i>	”	”	male, var., Mr. S. Webb.
1 <i>c.</i>	”	”	” ”
1 <i>d.</i>	”	”	” ”
1 <i>e.</i>	”	”	” ”
1 <i>f.</i>	”	”	” ”
1 <i>g.</i>	”	”	female, var.
1 <i>h.</i>	”	”	” ”
1 <i>i.</i>	”	”	larva.



1



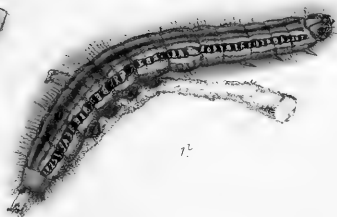
7a



7b



7c



7d



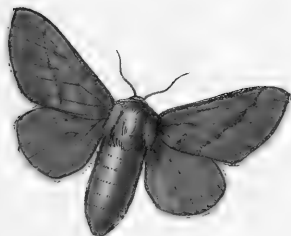
7e



7e



7f



7g



7h

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PLATE XC.

FIG. 1. *Lasiocampa trifolii*, male.

- | | | | |
|-----|---|---|---------------------------|
| 1a. | „ | „ | female. |
| 1b. | „ | „ | male var., Lancashire. |
| 1c. | „ | „ | „ „ Kent, Mr. S. Webb. |
| 1d. | „ | „ | „ „ Lancashire. |
| 1e. | „ | „ | female, var., Lancashire. |
| 1f. | „ | „ | „ „ „ |
| 1g. | „ | „ | larva, Mr. G. C. Bignell. |

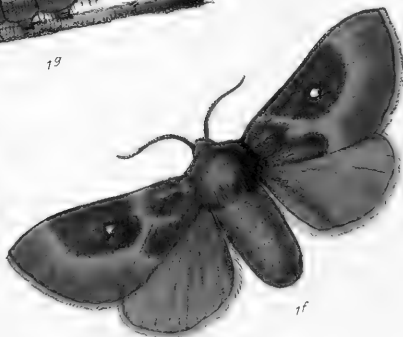
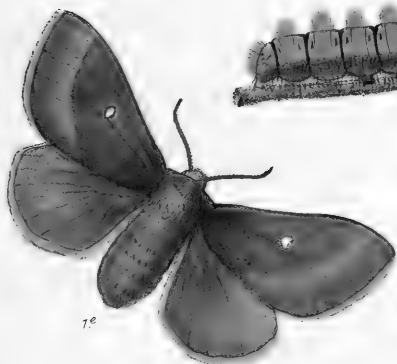
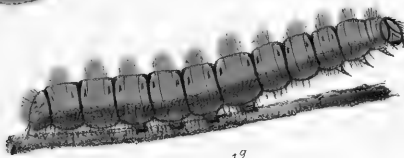
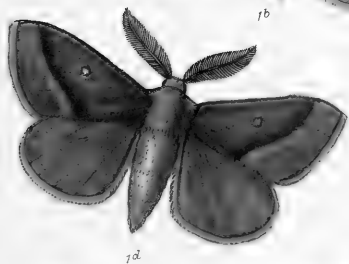
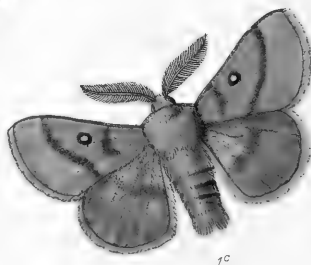
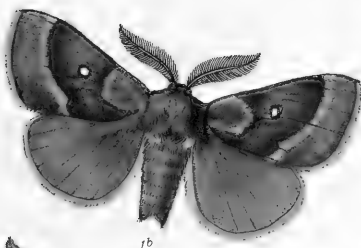
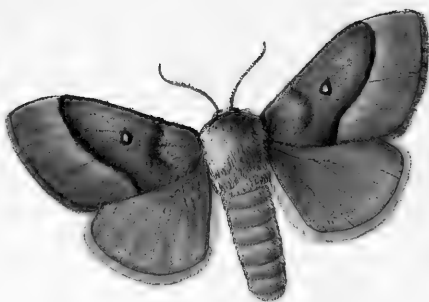
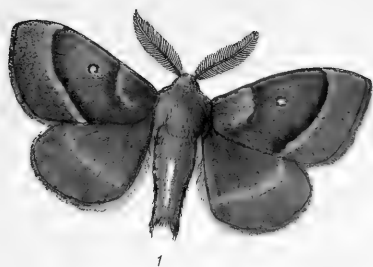
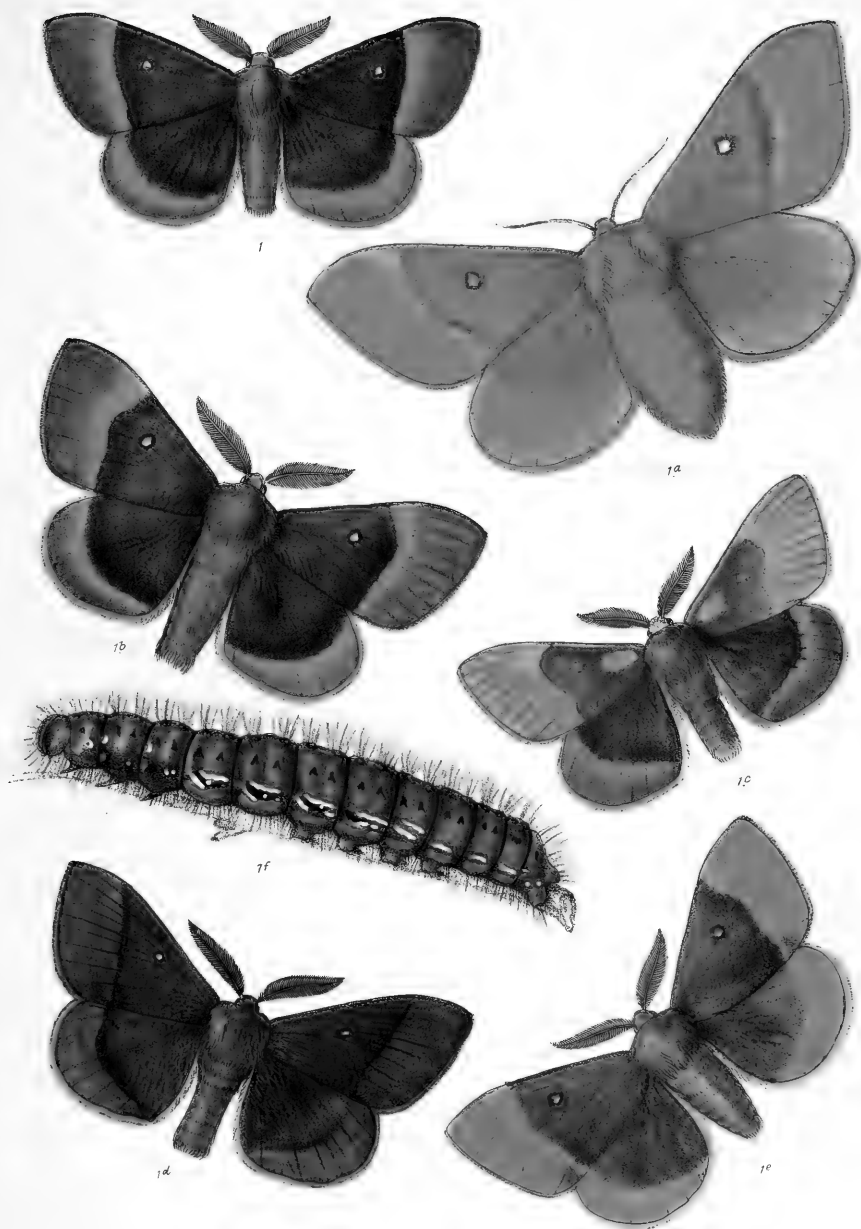




PLATE XCI.

FIG. 1. *Lasiocampa quercûs*, male, South of England.

1 <i>a</i> .	,,	,,	female,	,,
1 <i>b</i> .	,,	,,	male, var.	..
1 <i>c</i> .	,,	,,	,,	var. Pembroke.
1 <i>d</i> .	,,	,,	,,	,, Yorkshire, Mr. G. T. Porritt.
1 <i>e</i>	,,	,, Dr. Mason.
1 <i>f</i> .	,,	,,	larva.	



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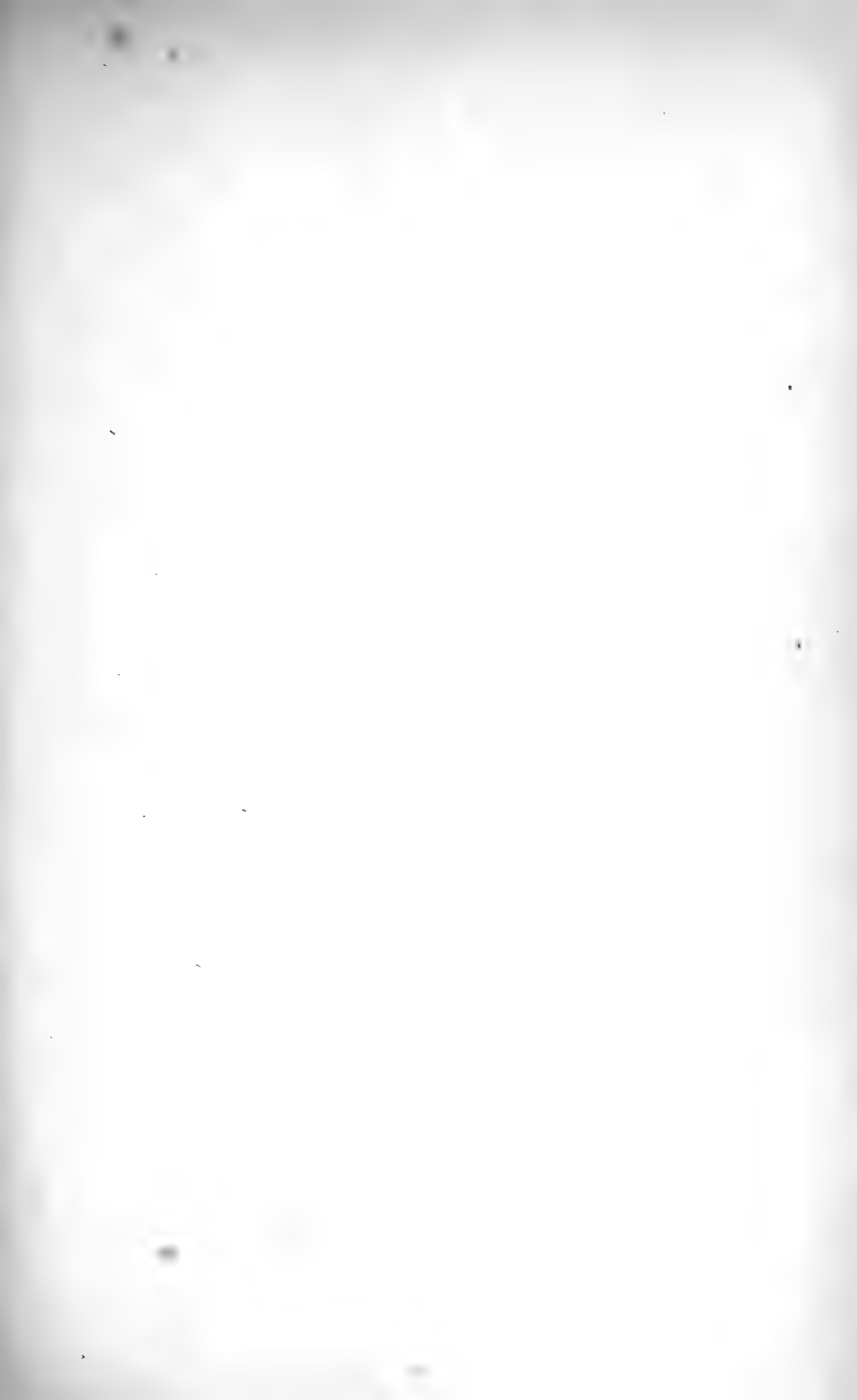
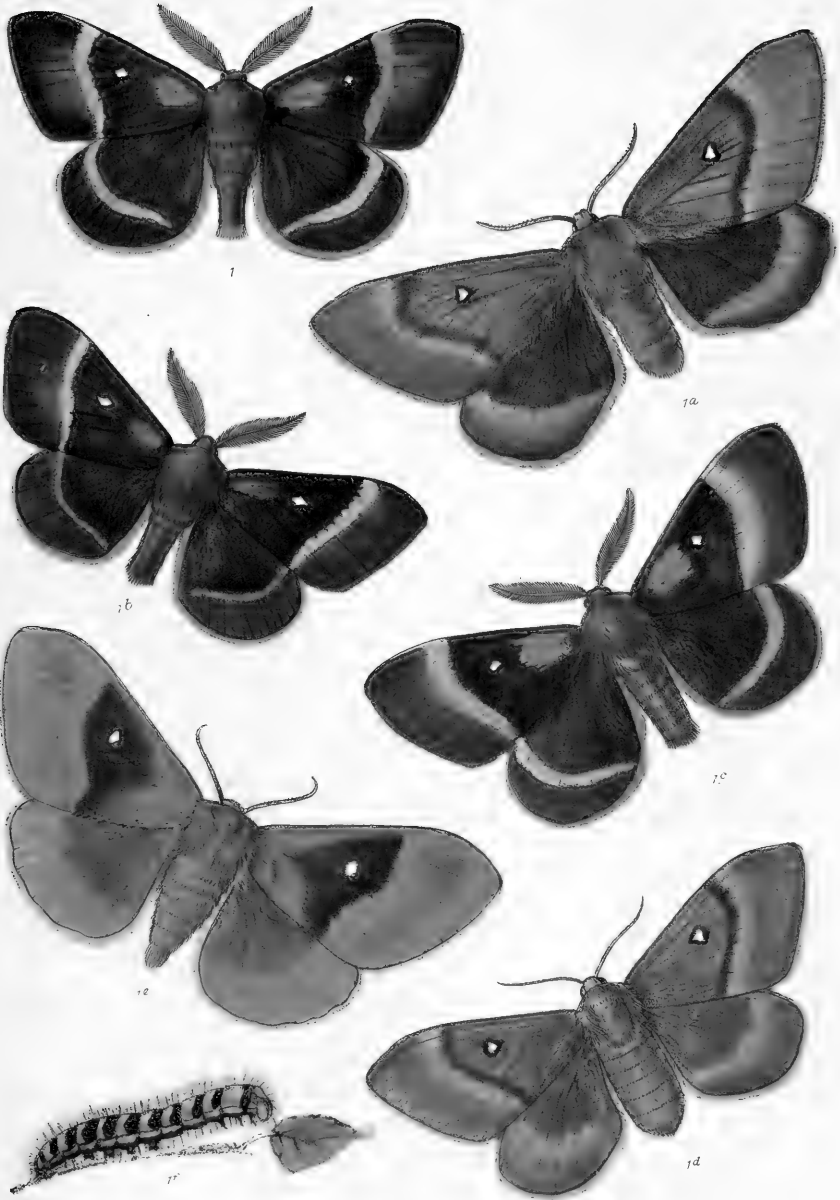


PLATE XCII.

FIG. 1. *Lasiocampa quercûs*, var. *callunæ*, male.

1 <i>a</i> .	„	„	„	„	female.
1 <i>b</i> .	„	„	„	„	male.
1 <i>c</i> .	„	„	„	„	„ Dr. Mason.
1 <i>d</i> .	„	„	„	„	female.
1 <i>e</i> .	„	„	„	„	„
1 <i>f</i> .	„	„	„	„	young larva, Mr. W. Buckler.



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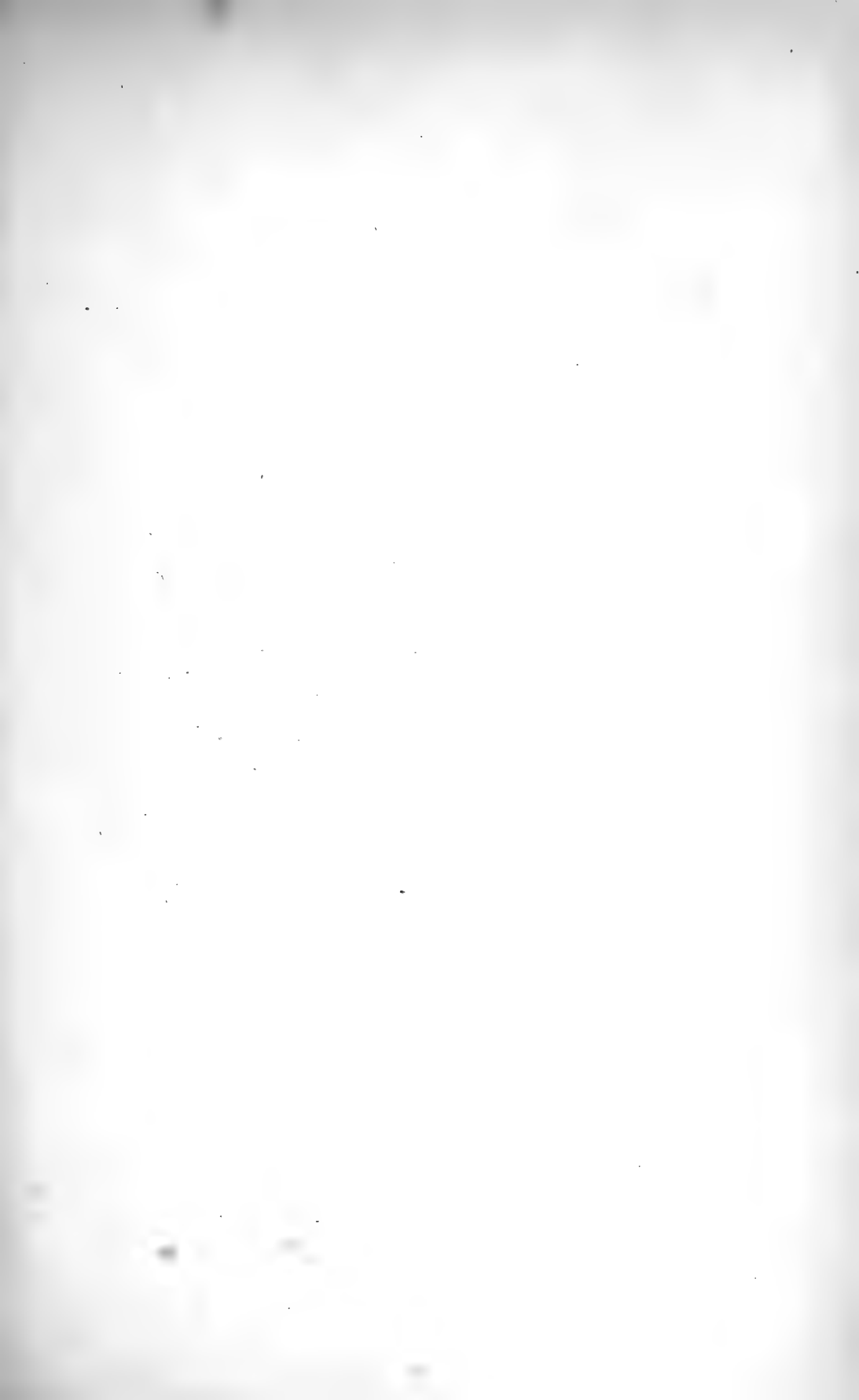
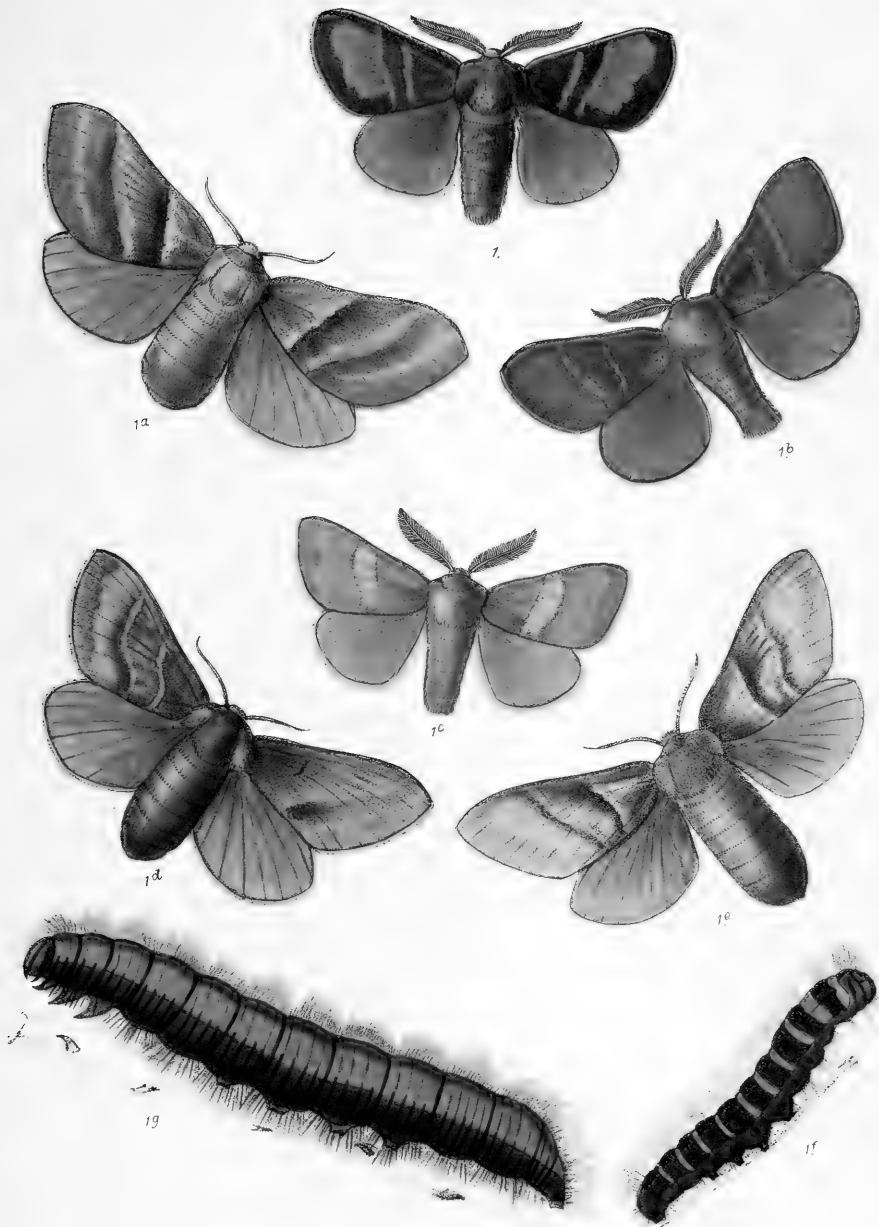


PLATE XCIII

FIG. 1. *Lasiocampa rubi*, male.

- | | | | |
|-------------|----|----|---------------------------------|
| 1 <i>a.</i> | .. | .. | female. |
| 1 <i>b.</i> | .. | .. | male, var. |
| 1 <i>c.</i> | .. | .. | Mr. S. J. Capper. |
| 1 <i>d.</i> | .. | .. | female, var., North of Ireland. |
| 1 <i>e.</i> | .. | .. | North of England. |
| 1 <i>f.</i> | .. | .. | larva, Mr. G. C. Bignell. |
| 1 <i>g.</i> | .. | .. | young larva, Mr. W. Buckler. |



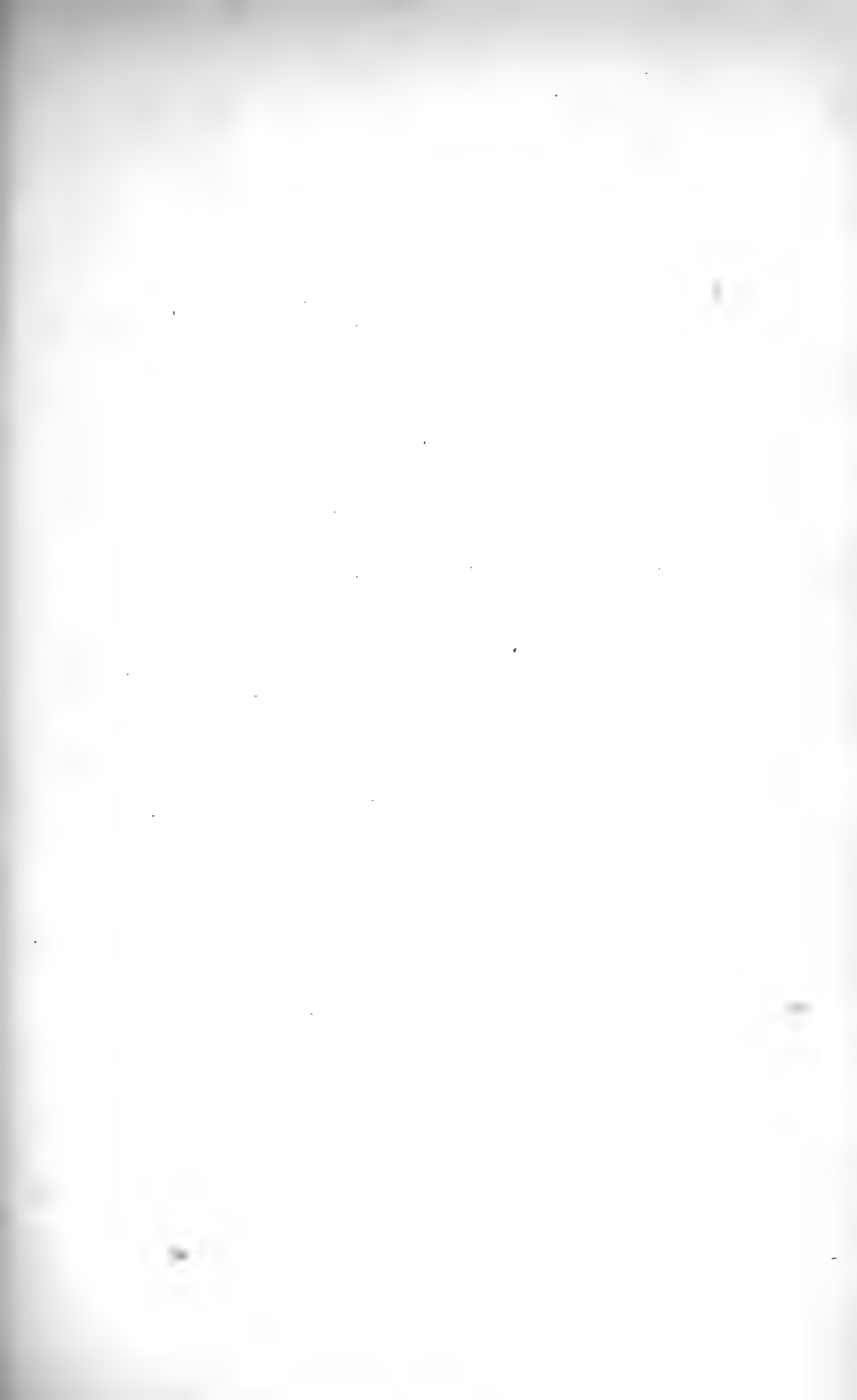


PLATE XCIV.

FIG. 1. *Odonestis potatoria*, male.

- | | | | |
|-------------|---|---|----------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male var., Cambridgeshire. |
| 1 <i>c.</i> | „ | „ | „ „ Pembrokeshire. |
| 1 <i>d.</i> | „ | „ | „ „ Mr. S. Webb. |
| 1 <i>e.</i> | „ | „ | female var., „ |
| 1 <i>f.</i> | „ | „ | larva, Mr. W. Buckler. |

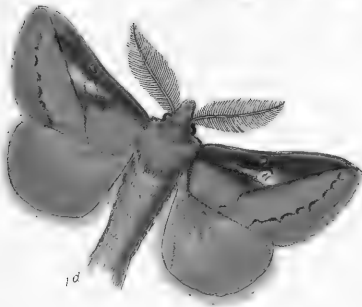
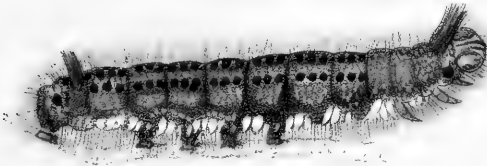
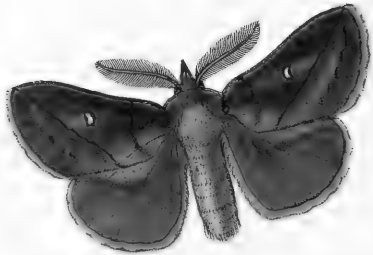
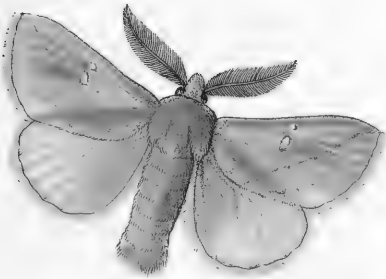
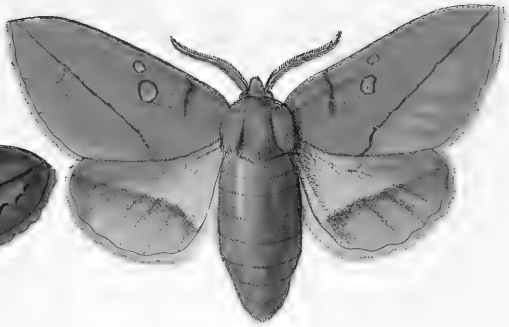
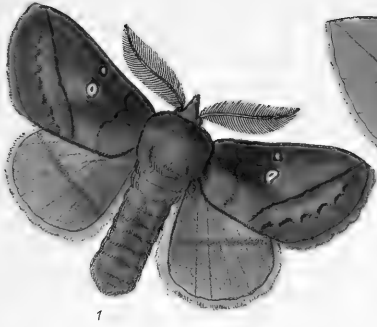




PLATE XCV.

FIG. 1. *Gastropacha quercifolia*, male.

- | | | | |
|-------------|---|---|---------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | „ var. |
| 1 <i>c.</i> | „ | „ | at rest, Mr. S. Webb. |
| 1 <i>d.</i> | „ | „ | larva, Mr. G. C. Bignell. |



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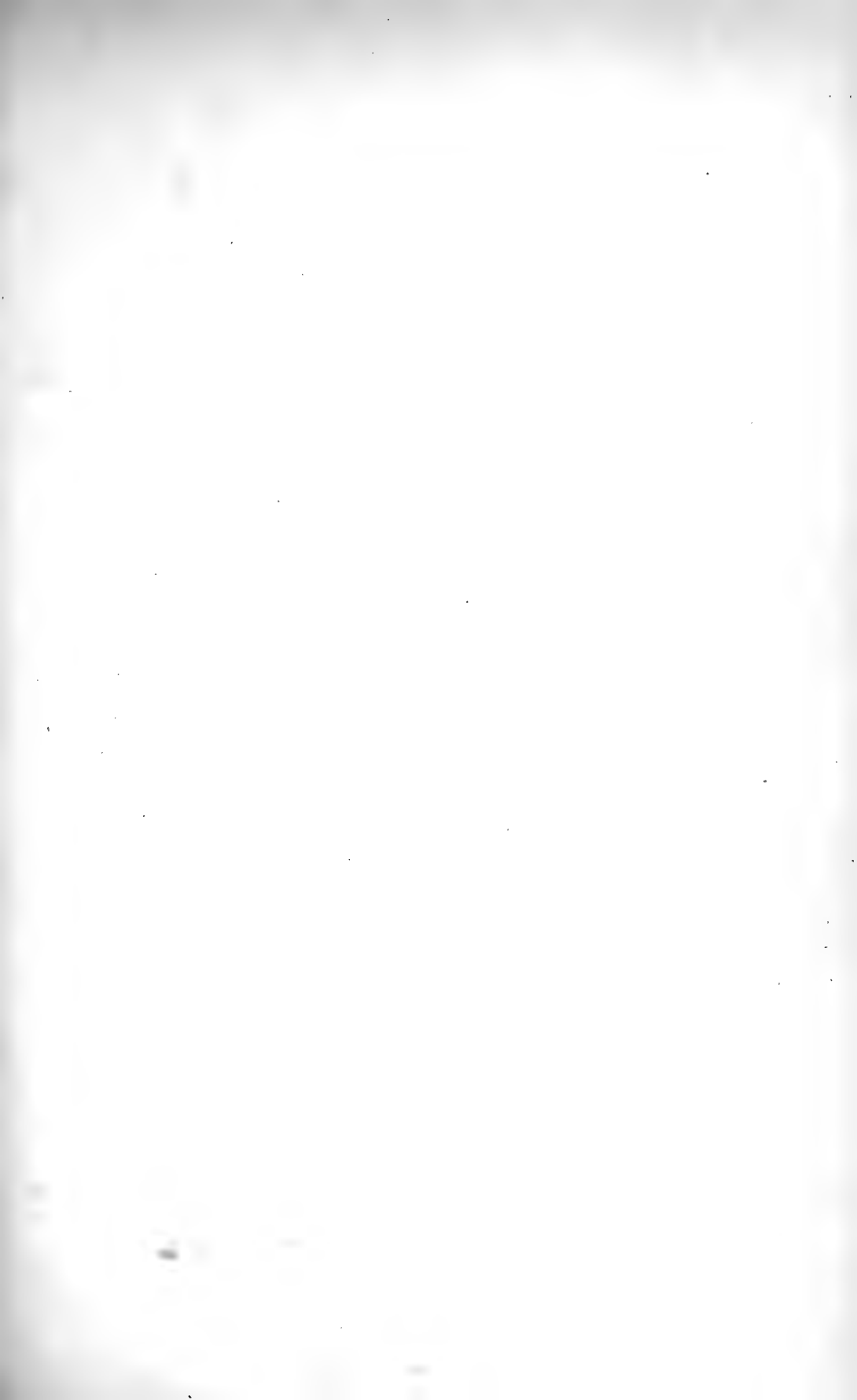
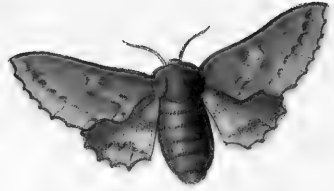


PLATE XCVI.

- FIG. 1. *Gastropacha ilicifolia*, male, Mr. S. Webb.
1*a.* ,, ,, female ,, ,,
1*b.* ,, ,, larva, Mr W. Buckler.
2. *Endromis versicolora*, male.
2*a.* ,, ,, female
2*b.* ,, ,, male, var.
2*c.* ,, ,, larva, Mr. W. Buckler.



1.



1a



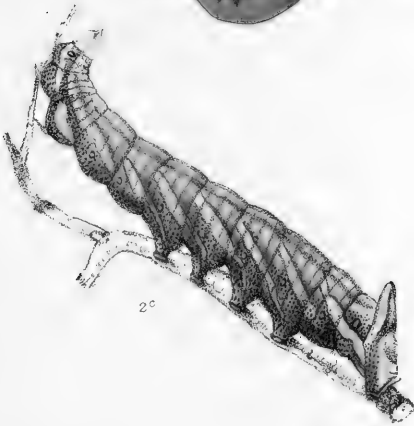
2a



2.



2b



2c



1b

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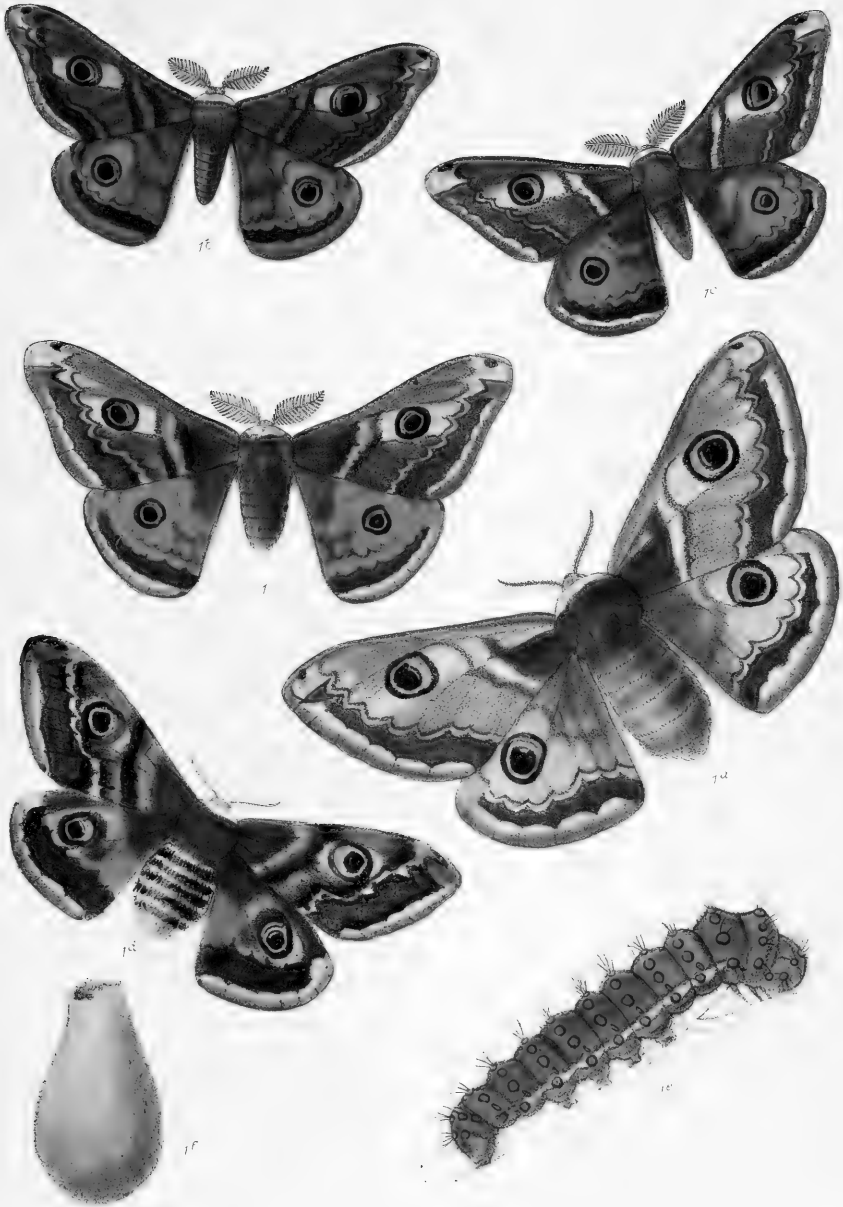




PLATE XCVII.

FIG. 1. *Saturnia carpini*, male.

- | | | | |
|-------------|---|---|--------------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, South of England. |
| 1 <i>c.</i> | „ | „ | „ Norfolk Fens. |
| 1 <i>d.</i> | „ | „ | female, var., Mr. R. Newstead. |
| 1 <i>e.</i> | „ | „ | larva, Mr. W. Buckler. |
| 1 <i>f.</i> | „ | „ | cocoon. |



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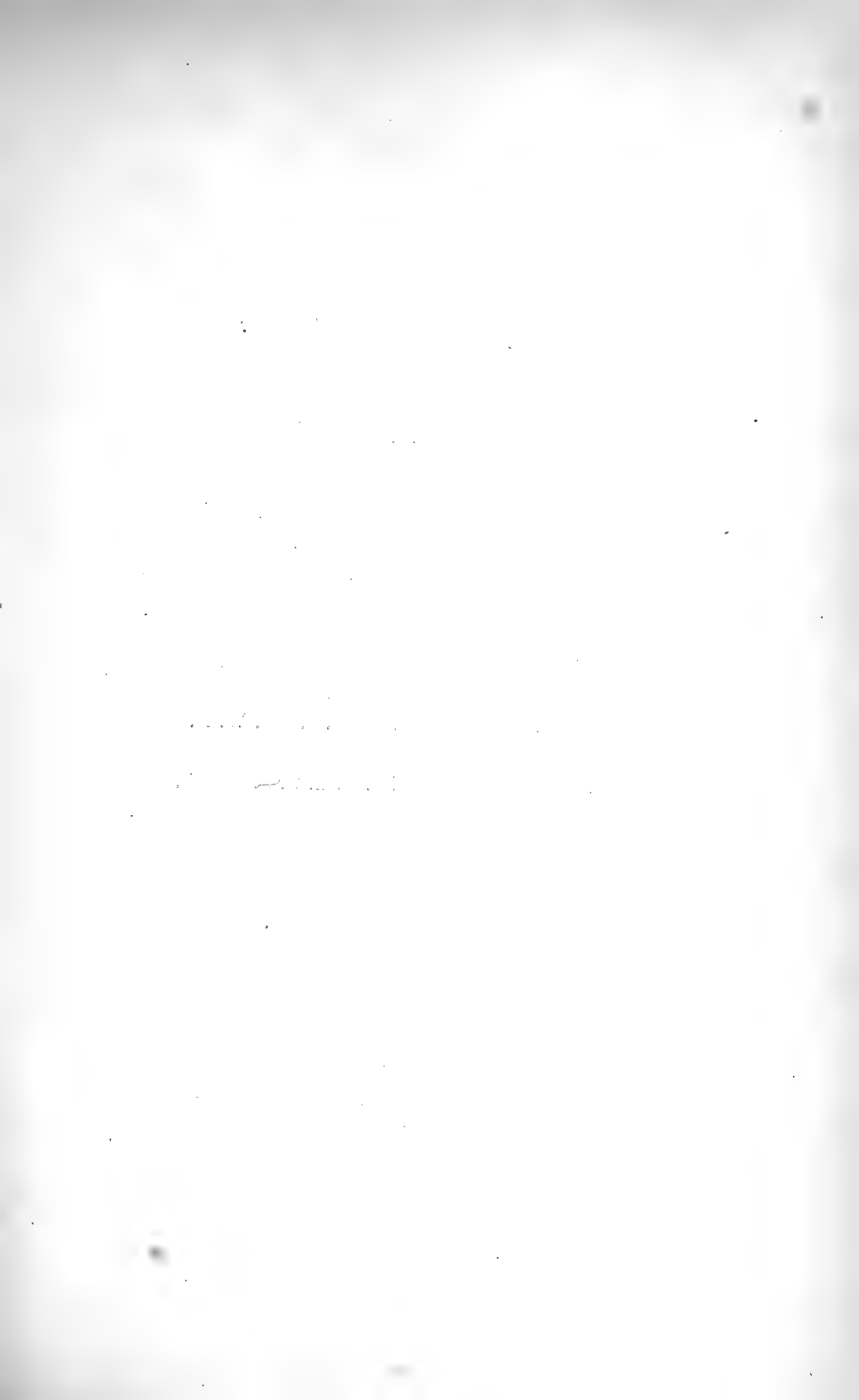


PLATE XCVIII.

- FIG. 1. *Saturnia carpini*, male, var., Mr. S. J. Capper.
1*a.* " " " " Mr. S. Webb.
1*b.* " " gynandrous, var., Dr. Mason.
2. *Drepana falcataria*, male.
2*a.* " " female.
2*b.* " " " var.
2*c.* " " male " Mr. W. H. B.
 Fletcher (Sutherlandshire).
2*d.* " " female var., Mr. W. H. B.
 Fletcher (Sutherlandshire).
2*e.* " " larva, Mr. G. C. Bignell.

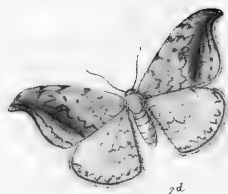
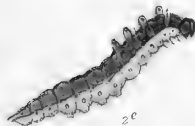
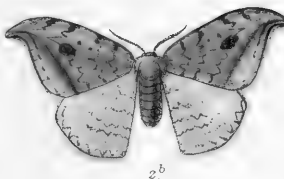
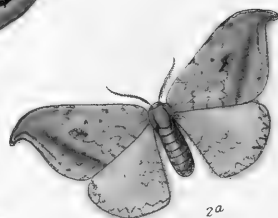




PLATE XCIX.

- FIG. 1. *Drepana sicula*, male.
- 1*a.* ,, ,, female.
 - 1*b.* ,, ,, larva, Mr. W. Buckler.
 - 2. ,, hamula, male.
 - 2*a.* ,, ,, female.
 - 2*b.* ,, ,, male, 2nd brood.
 - 2*c.* ,, ,, larva, Mr. G. C. Bignell.
 - 3. ,, unguicula, male.
 - 3*a.* ,, ,, female.
 - 3*b.* ,, ,, male, var.
 - 3*c.* ,, ,, larva, Mr. W. Buckler.

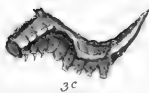
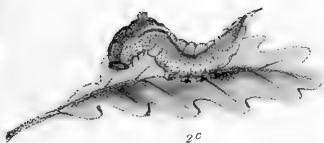
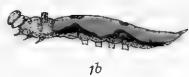
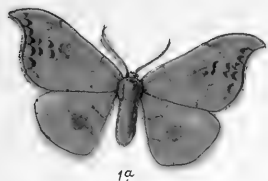


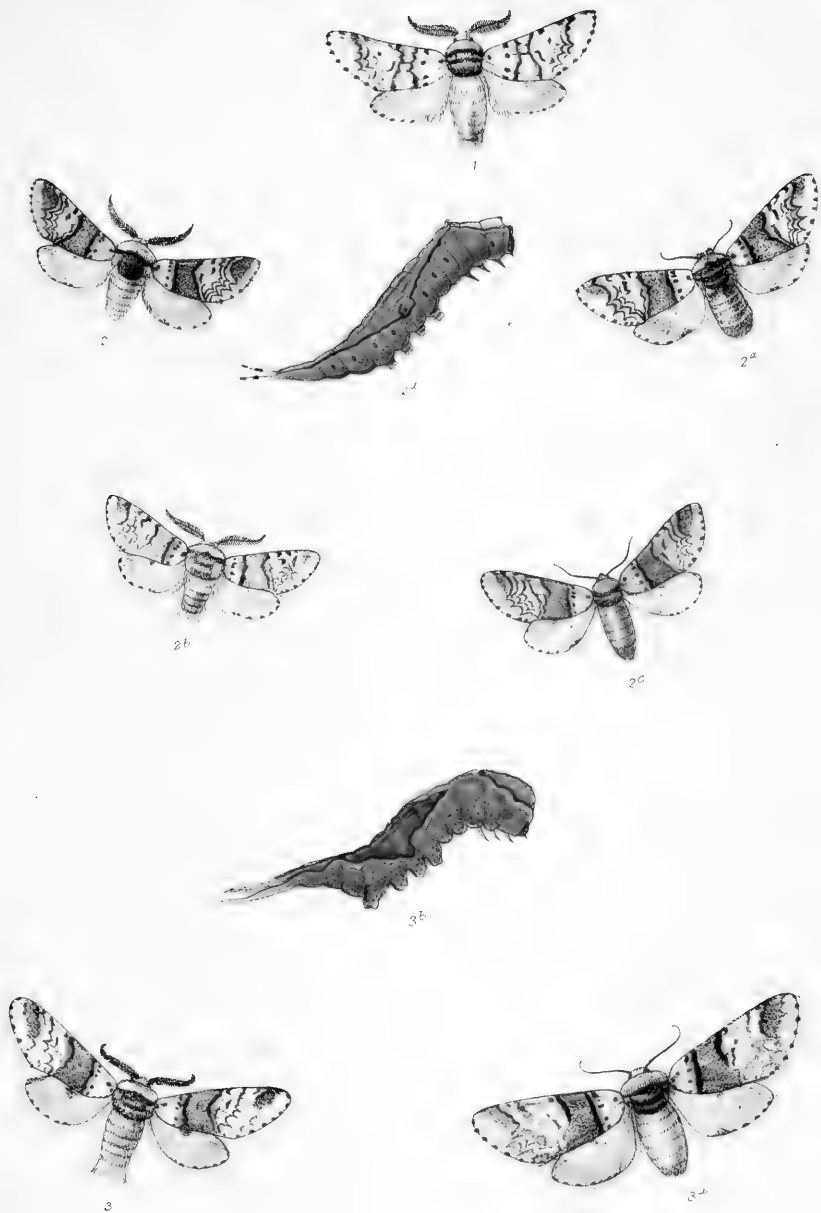






PLATE CI.

- FIG. 1. *Cerura bicuspis*, var., Mr. A. Robinson.
2. ,, *furcula*, male.
2*a.* ,, ,, female.
2*b.* ,, ,, male, var.
2*c.* ,, ,, female, var.
2*d.* ,, ,, larva, Mr. W. Buckler.
3. ,, *bifida*, male.
3*a.* ,, ,, female.
3*b.* ,, ,, larva, Mr. W. Buckler.



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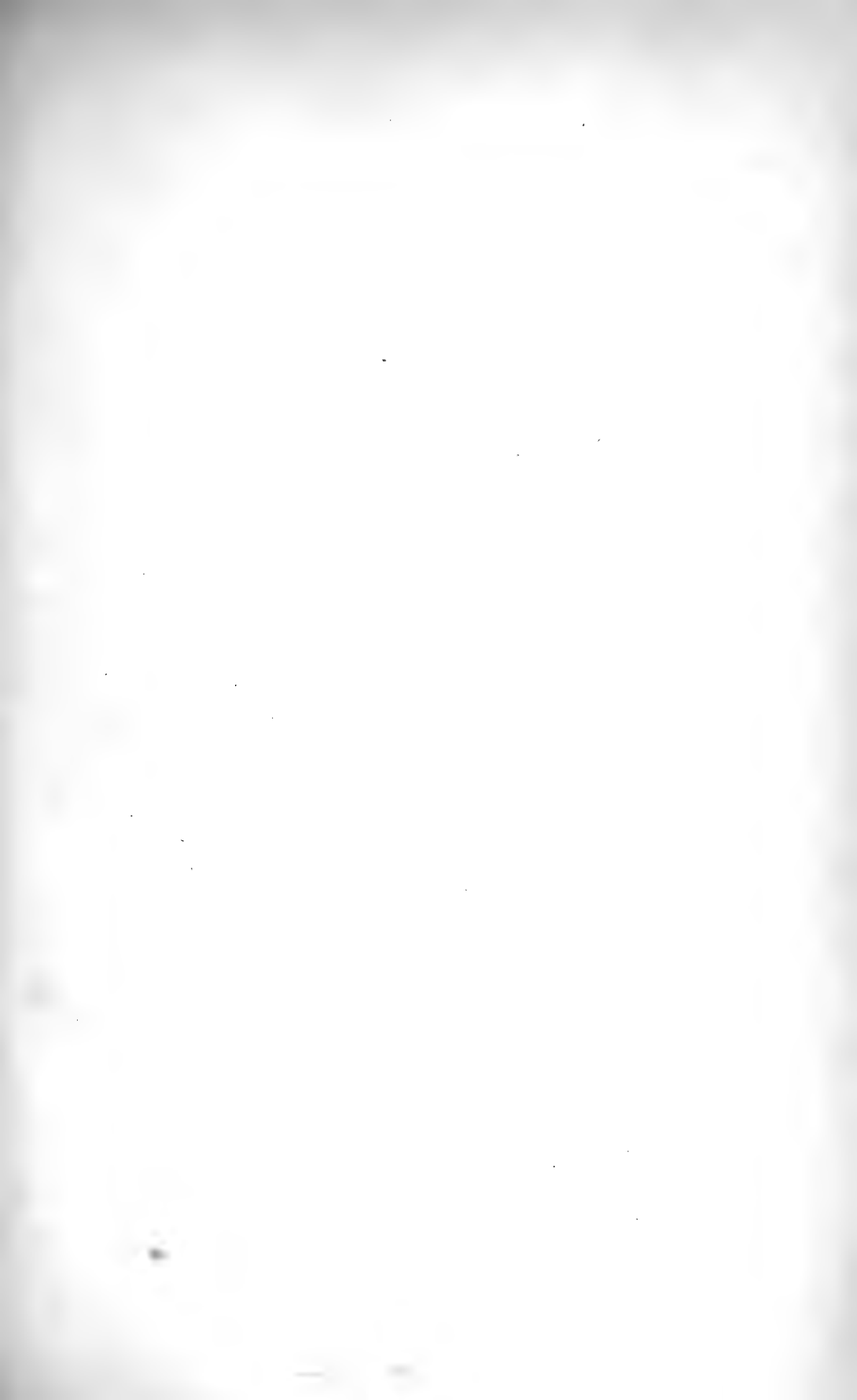
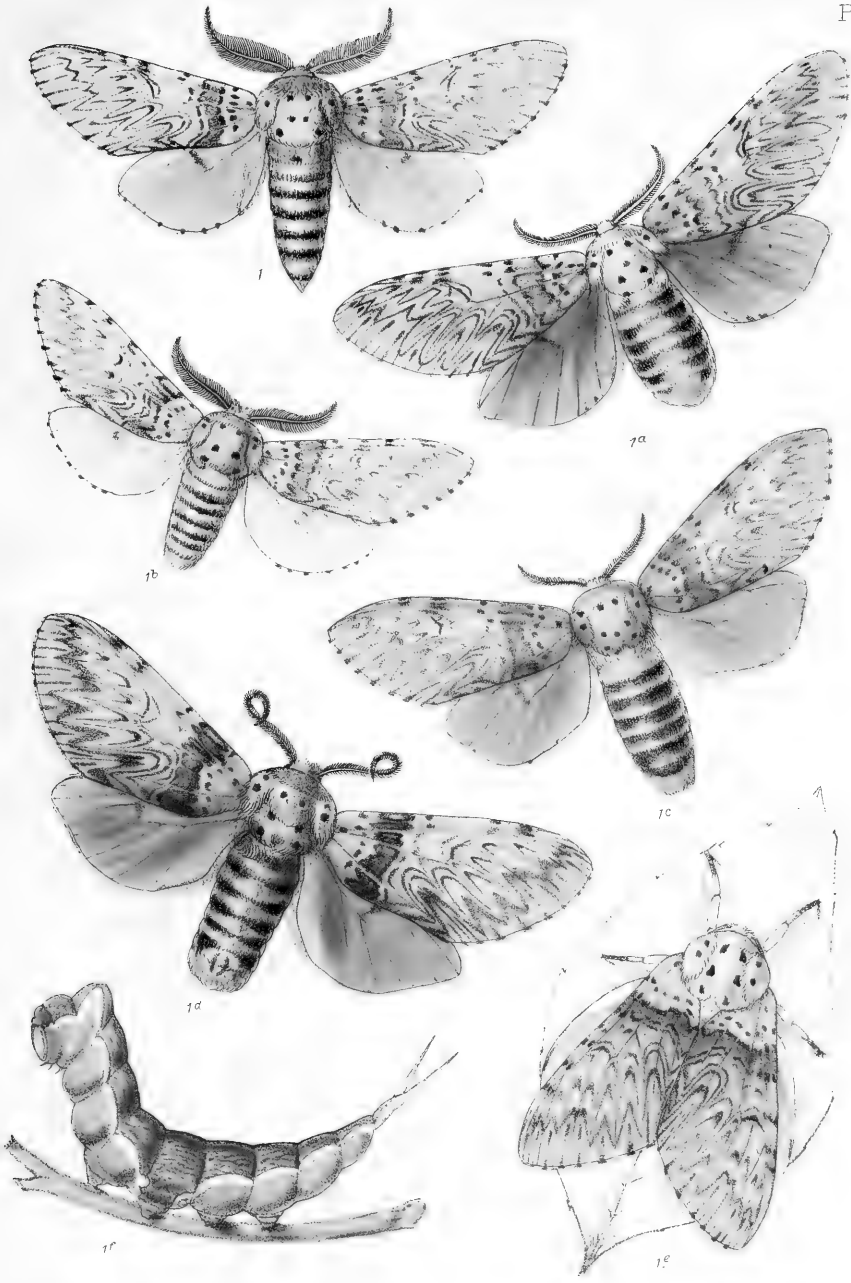


PLATE CII.

FIG. 1. *Cerura vinula*, male.

- | | | | |
|-------------|---|---|---------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var. |
| 1 <i>c.</i> | „ | „ | female, var. |
| 1 <i>d.</i> | „ | „ | „ „ Mr. S. Stevens. |
| 1 <i>e.</i> | „ | „ | at rest. |
| 1 <i>f.</i> | „ | „ | larva, Mr. G. C. Bignell. |



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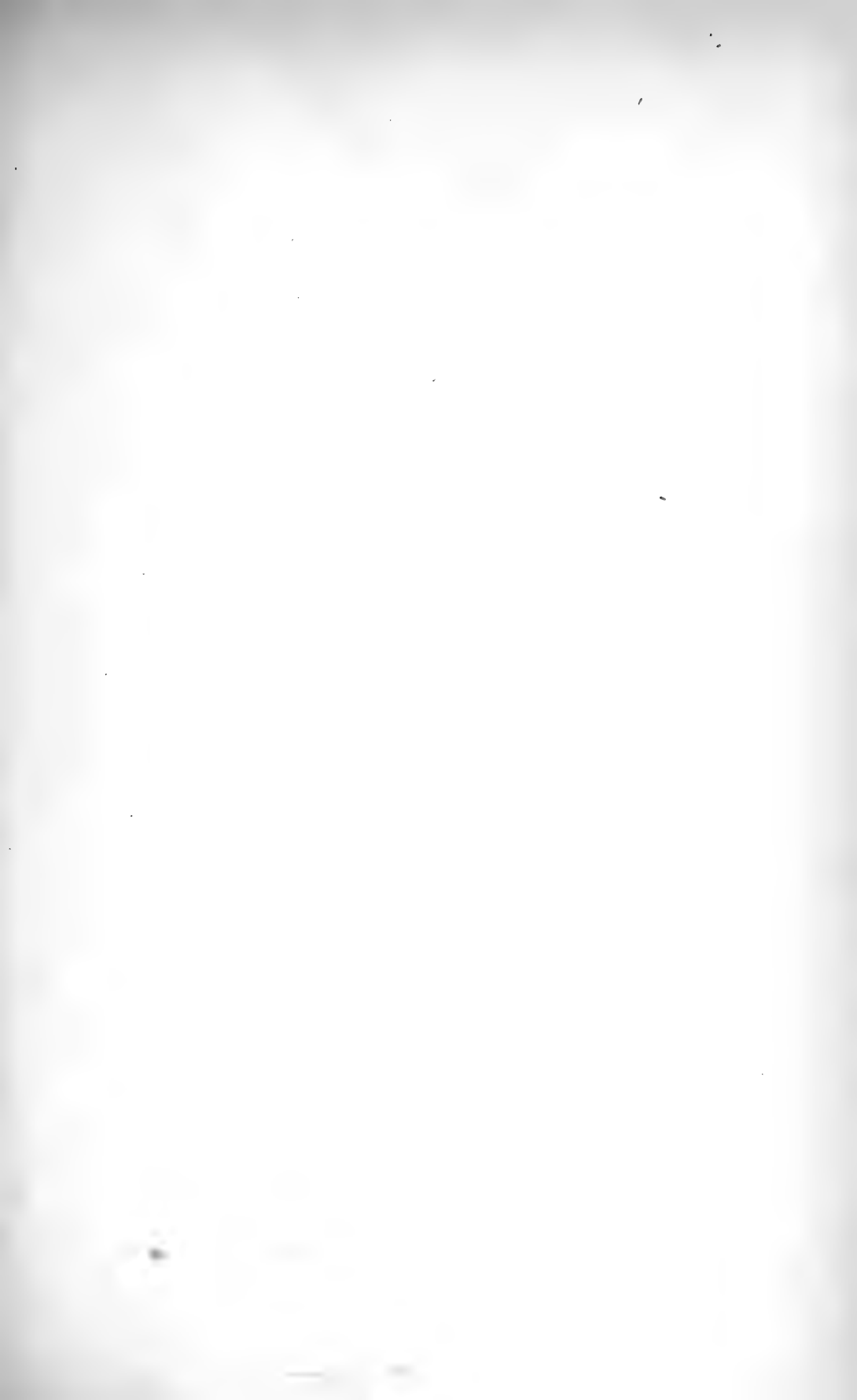
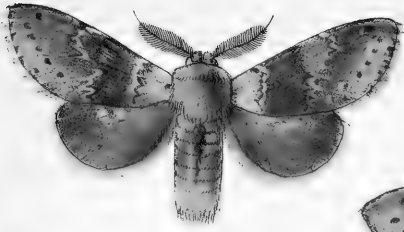


PLATE CIII.

FIG. 1. *Stauropus fagi*, male.

- | | | | | | | |
|-------------|---|---|-------------|-----------------|---|---|
| 1 <i>a.</i> | „ | „ | female. | | | |
| 1 <i>b.</i> | „ | „ | male, var., | Mr. W. Holland. | | |
| 1 <i>c.</i> | „ | „ | female. | „ | „ | „ |
| 1 <i>d.</i> | „ | „ | „ | „ | „ | „ |
| 1 <i>e.</i> | „ | „ | at rest, | „ | „ | „ |
| 1 <i>f.</i> | „ | „ | larva. | Mr. W. Buckler. | | |
| 1 <i>g.</i> | „ | „ | „ | „ | „ | „ |



7



7a



7b



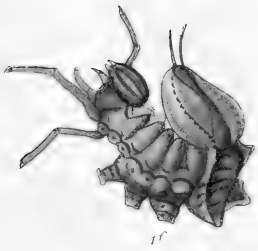
7c



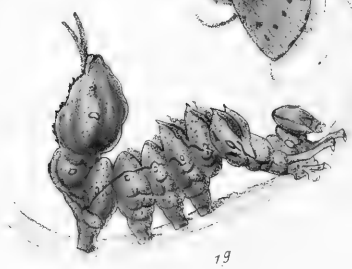
7c



7d



7f



7g



PLATE CIV.

FIG. 1. *Notodonta dictæa*, male.

- | | | | |
|-------------|---|---|--------------------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | var., Scotland, Mr. J. Ross. |
| 1 <i>c.</i> | „ | „ | var., Cannock, Dr. Freer. |
| 1 <i>d.</i> | „ | „ | larva, Mr. W. Buckler. |
| 1 <i>e.</i> | „ | „ | „ var. |
| 2. | „ | | <i>dictæoides</i> , male. |
| 2 <i>a.</i> | „ | „ | female. |
| 2 <i>b.</i> | „ | „ | „ var., Sherwood, Mr.
S. Stevens. |
| 2 <i>c.</i> | „ | „ | male, var., Cannock, Dr.
Freer. |
| 2 <i>d.</i> | „ | „ | larva, Mr. W. Buckler. |

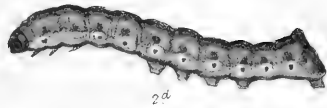
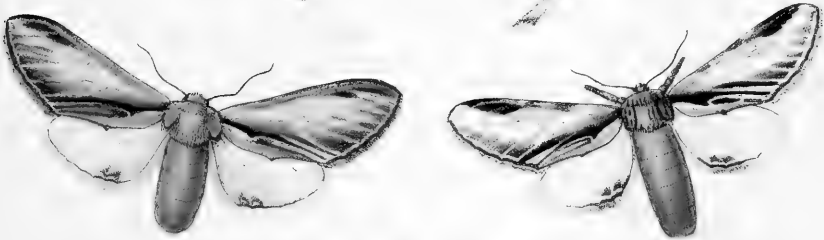
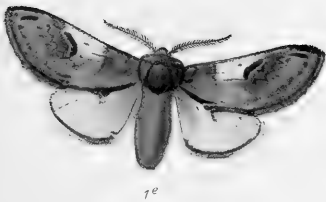
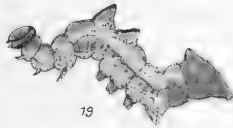
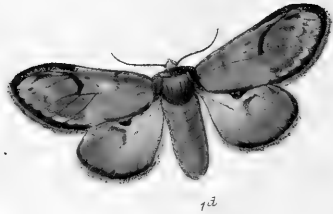
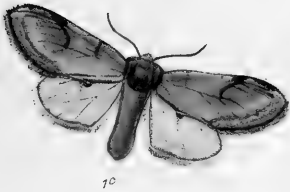
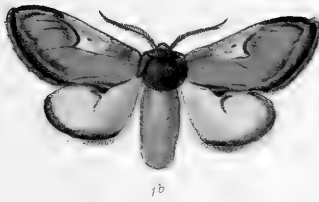
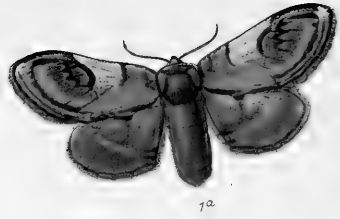




PLATE CV.

FIG. 1. *Notodonta ziczac*, male

- | | | | |
|-------------|----|----|---------------------------|
| 1 <i>a.</i> | .. | .. | female. |
| 1 <i>b.</i> | .. | .. | male, var. |
| 1 <i>c.</i> | .. | .. | female, var. |
| 1 <i>d.</i> | .. | .. | .. .. |
| 1 <i>e.</i> | .. | .. | male, var. Mr. S. Webb. |
| 1 <i>f.</i> | .. | .. | Mr. S. Stevens. |
| 1 <i>g.</i> | .. | .. | larva, Mr. G. C. Bignell. |



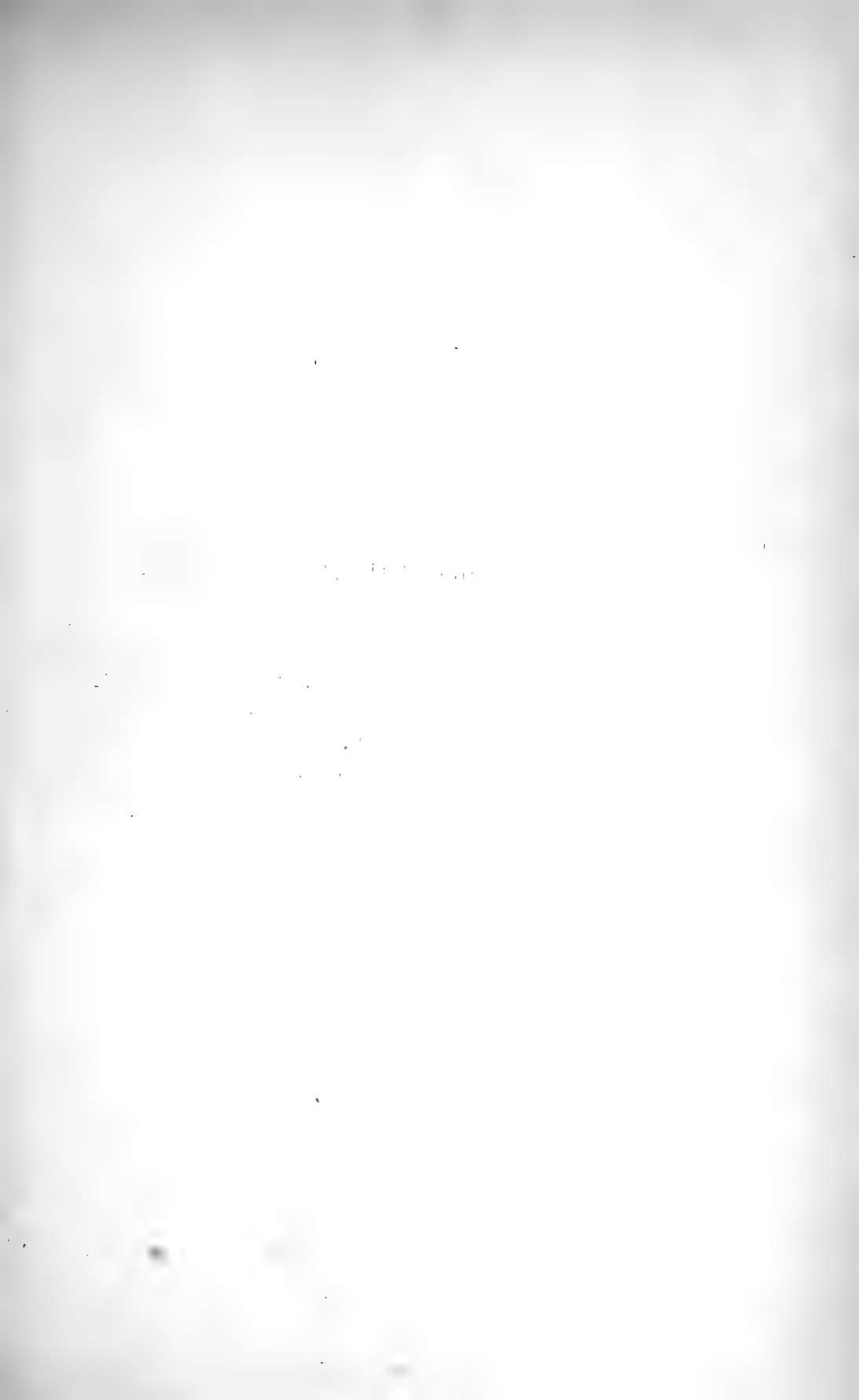


PLATE CVI.

FIG. 1. *Notodonta tritophus*, male, Dr. Mason.

- | | | | | |
|-------------|---|------------------|------------------------|---|
| 1 <i>a.</i> | „ | „ | female, | „ |
| 1 <i>b.</i> | „ | „ | larva, Mr. W. Buckler. | |
| 2. | „ | <i>trepida</i> , | male. | |
| 2 <i>a.</i> | „ | „ | female. | |
| 2 <i>b.</i> | „ | „ | larva, Mr. W. Buckler. | |

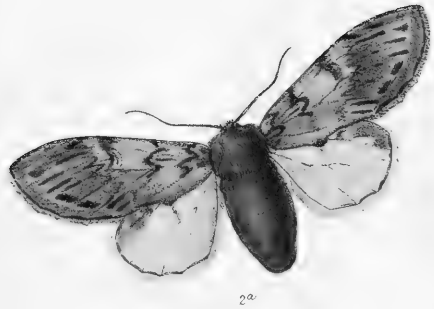
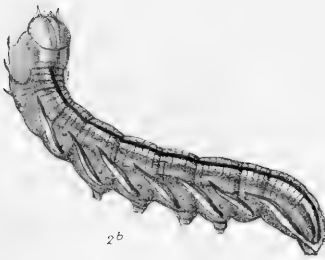


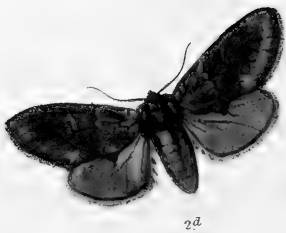
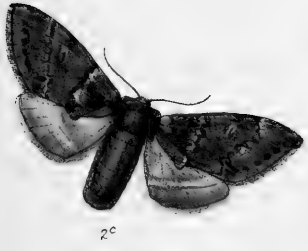
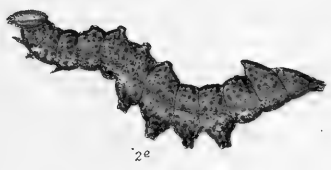
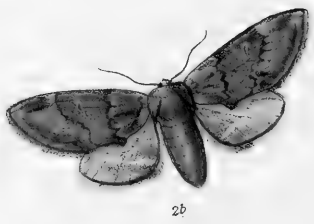
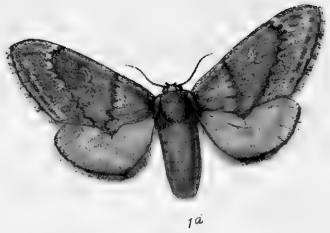




PLATE CVII.

FIG. 1. *Notodonta torva*, male.

- | | | | |
|-------------|---|---|---------------------------|
| 1 <i>a.</i> | „ | „ | female, Mr. F. Norgate. |
| 2. | „ | | dromedarius, male. |
| 2 <i>a.</i> | „ | „ | female. |
| 2 <i>b.</i> | „ | „ | „ var. |
| 2 <i>c.</i> | „ | „ | „ „ <i>perfusca</i> . |
| 2 <i>d.</i> | „ | „ | „ „ |
| 2 <i>e.</i> | „ | „ | larva, Mr. G. C. Bignell. |



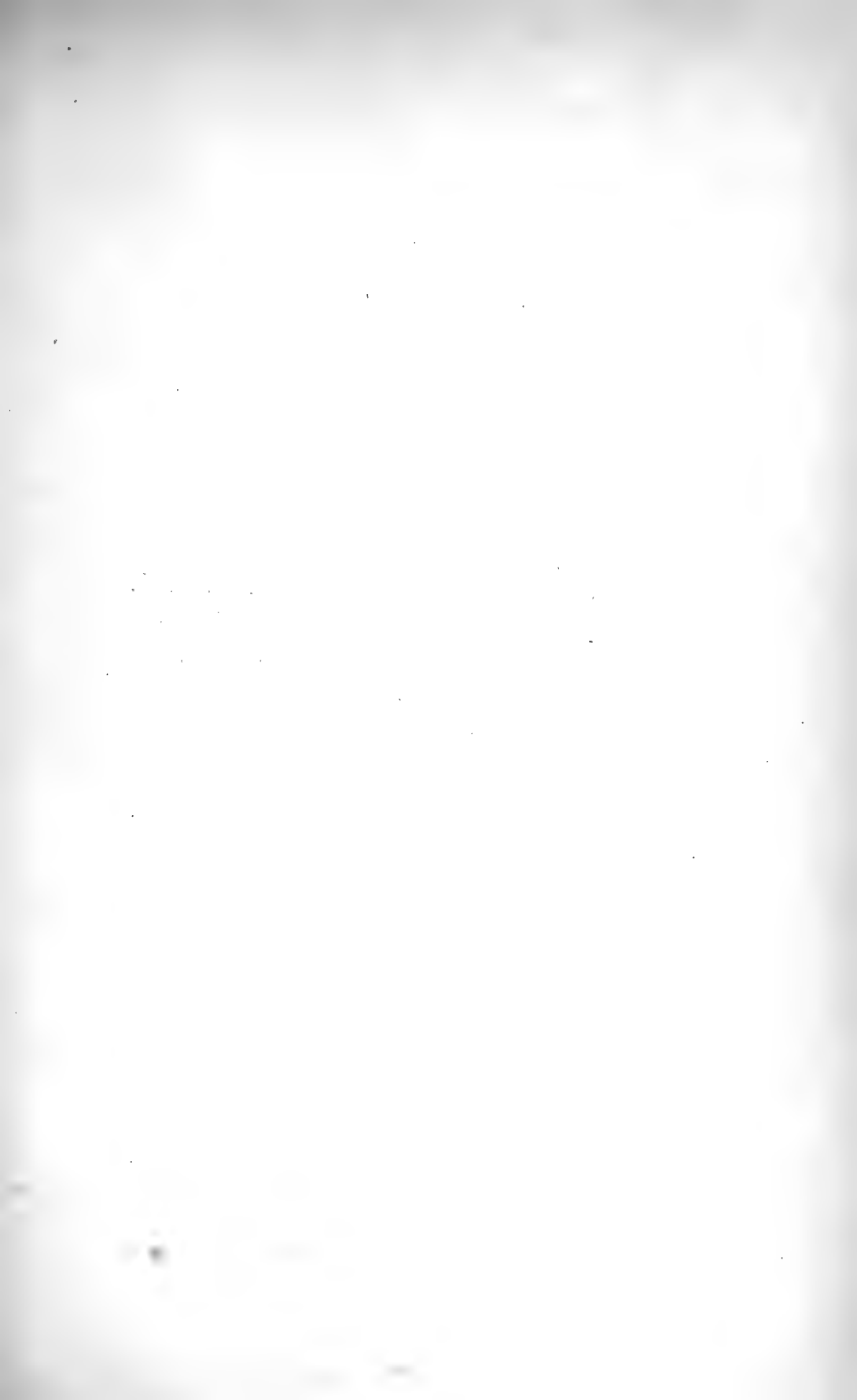


PLATE CVIII.

FIG. 1. *Notodonta bicolora*, Dr. Mason.

- | | | | | |
|-------------|----|----|---------|---------------------------------|
| 1 <i>a.</i> | ,, | ,, | larva, | Mr. W. Buckler. |
| 2. | | | | <i>Drymonia chaonia</i> , male. |
| 2 <i>a.</i> | ,, | ,, | female. | |
| 2 <i>b.</i> | ,, | ,, | var., | Mr. W. H. B.
Fletcher. |
| 2 <i>c.</i> | ,, | ,, | ,, | Dr. Mason. |
| 2 <i>d.</i> | ,, | ,, | ,, | ,, |
| 2 <i>e.</i> | ,, | ,, | male, | ,, |
| 2 <i>f.</i> | ,, | ,, | ,, | ,, |
| 2 <i>g.</i> | ,, | ,, | larva, | Mr. W. Buckler. |



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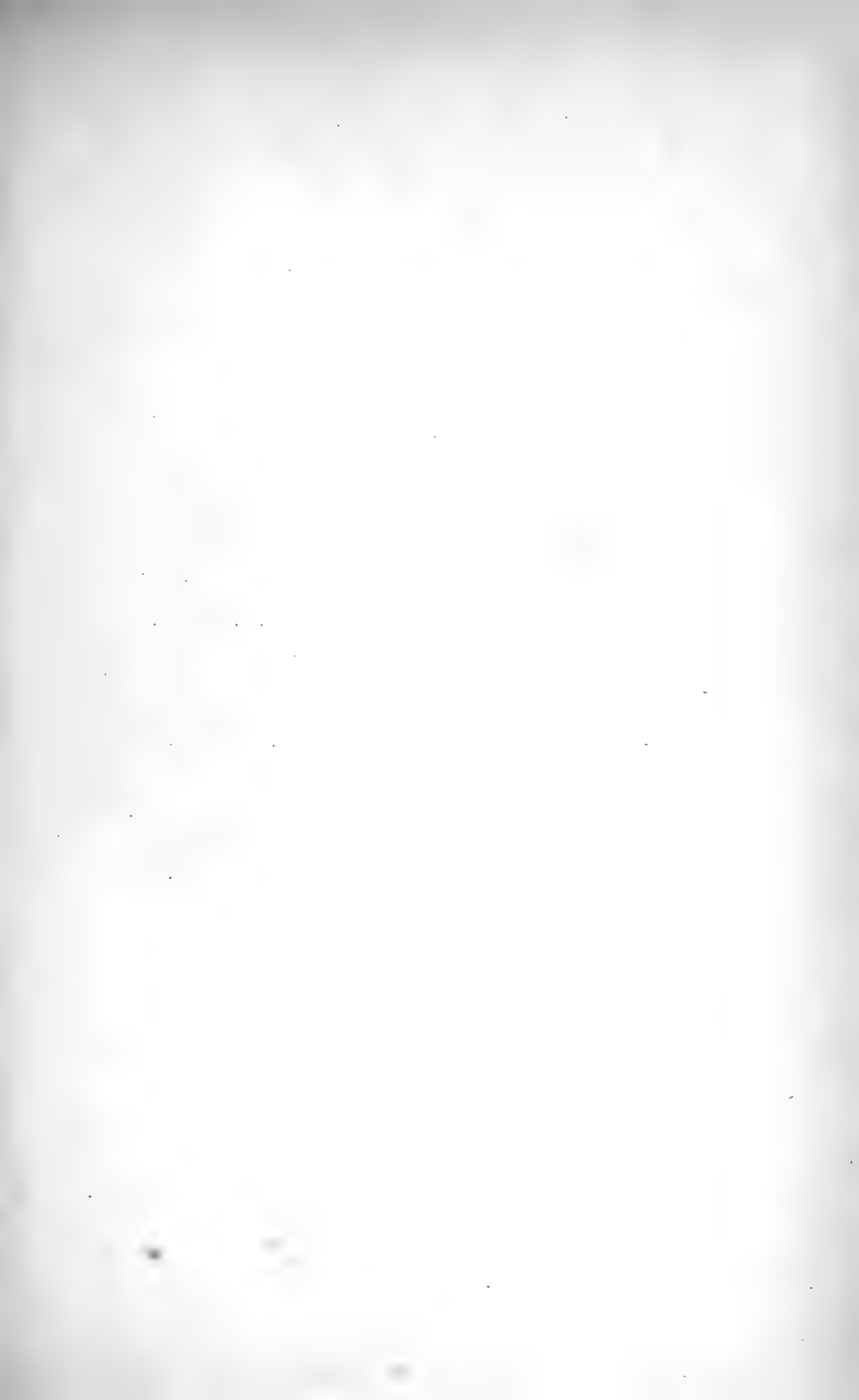


PLATE CIX.

- FIG. 1. *Drymonia dodonæa*, male.
1*a.* " " female.
1*b.* " " male, var., Mr. Sydney Webb.
1*c.* " " " " Mr. S. Stevens.
1*d.* " " female, Dr. P. B. Mason.
1*e.* " " " " "
1*f.* " " " " "
1*g.* " " larva, Mr. G. C. Bignell.
2. *Lophopteryx carmelita*, male.
2*a.* " " female.
2*b.* " " larva, Mr. G. C. Bignell.



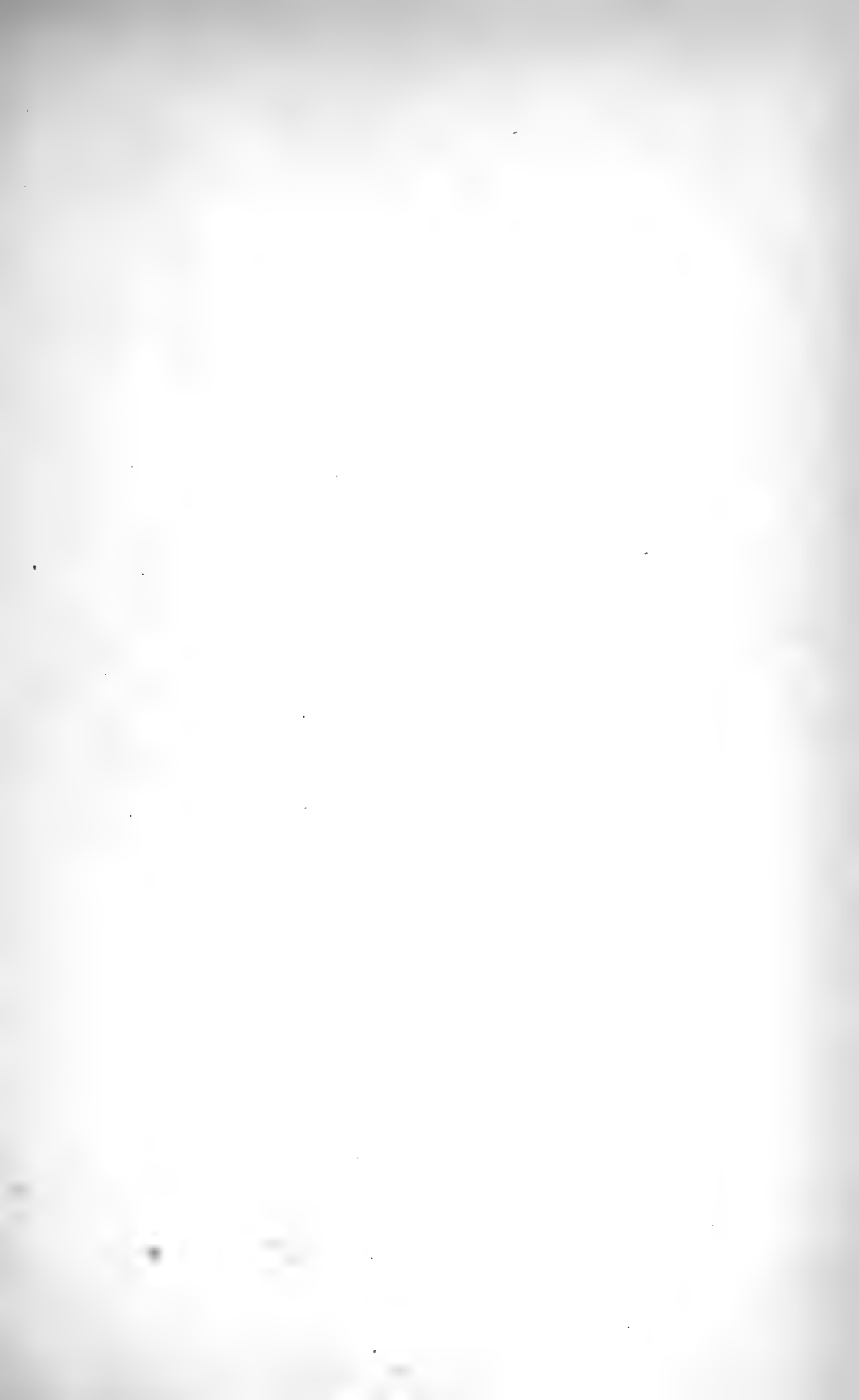


PLATE CX.

- FIG. 1. *Lophopteryx camelina*, male.
- | | | | |
|--------------|----|----|-------------------------------------|
| 1 <i>a</i> . | .. | .. | female. |
| 1 <i>b</i> . | .. | .. | male, South Wales. |
| 1 <i>c</i> . | .. | .. | .. Scotland. |
| 1 <i>d</i> . | .. | .. | .. Dartmoor, Devon,
Major Still. |
| 1 <i>e</i> . | .. | .. | female, Scotland. |
| 1 <i>f</i> . | .. | .. | male, var., Mr. Sydney
Webb. |
| 1 <i>g</i> . | .. | .. | larva, Mr. A. Sich. |
| 2. | .. | | cucullina, male. |
| 2 <i>a</i> . | .. | .. | female. |
| 2 <i>b</i> . | .. | .. | larva, Mr. W. Buckler. |

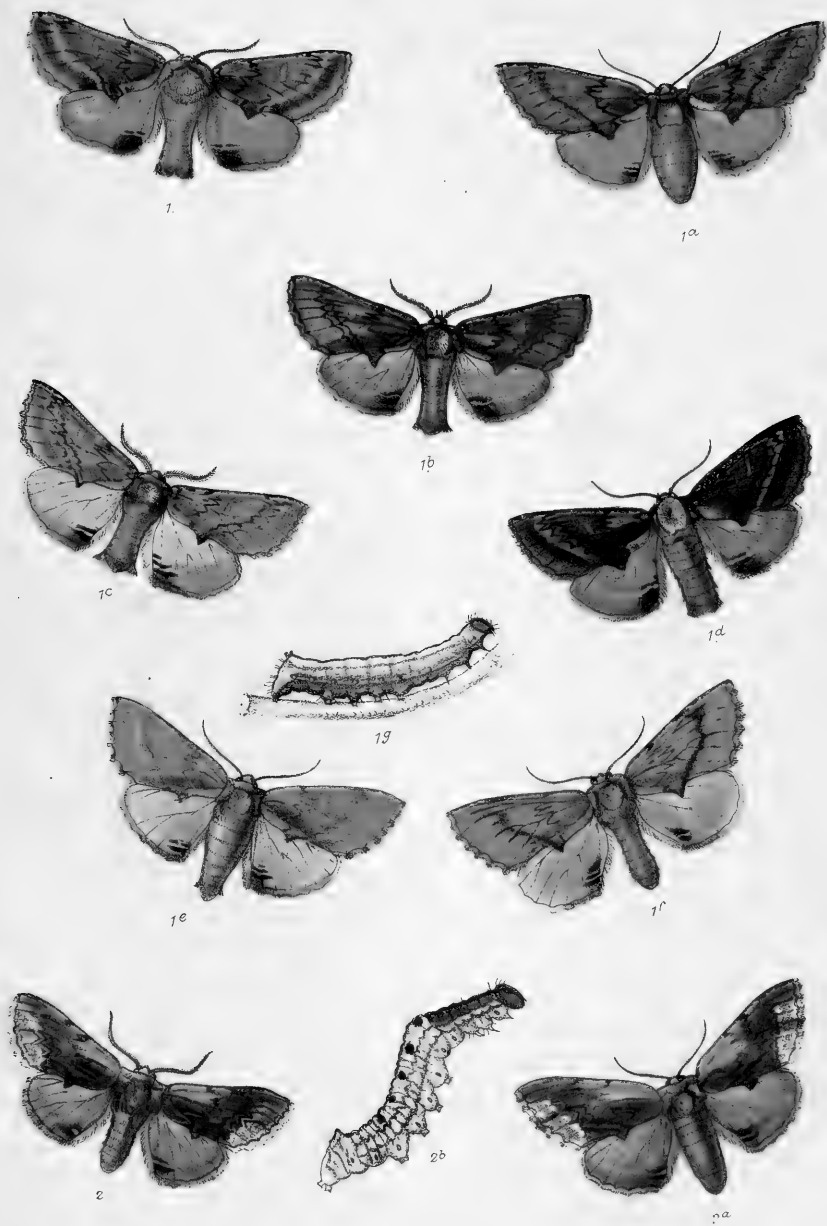
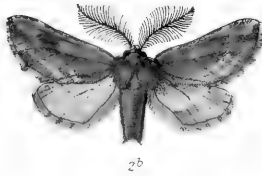
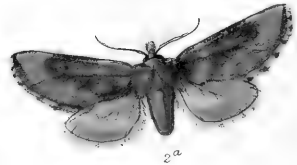
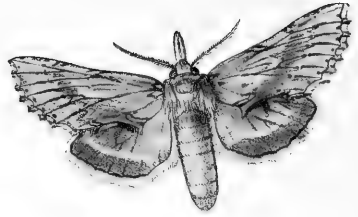




PLATE CXI.

- FIG. 1. *Pterostoma palpina*, male.
1*a.* " " female.
1*b.* " " male, var., Mr. S. Stevens.
1*c.* " " larva, Mr. A. Sich.
2. *Ptilophora plumigera*, male.
2*a.* " " female.
2*b.* " " male, var.
2*c.* " " " " Dr. P. B. Mason.
2*d.* " " female, var. " "
2*e.* " " larva, Mr. W. Buckler.



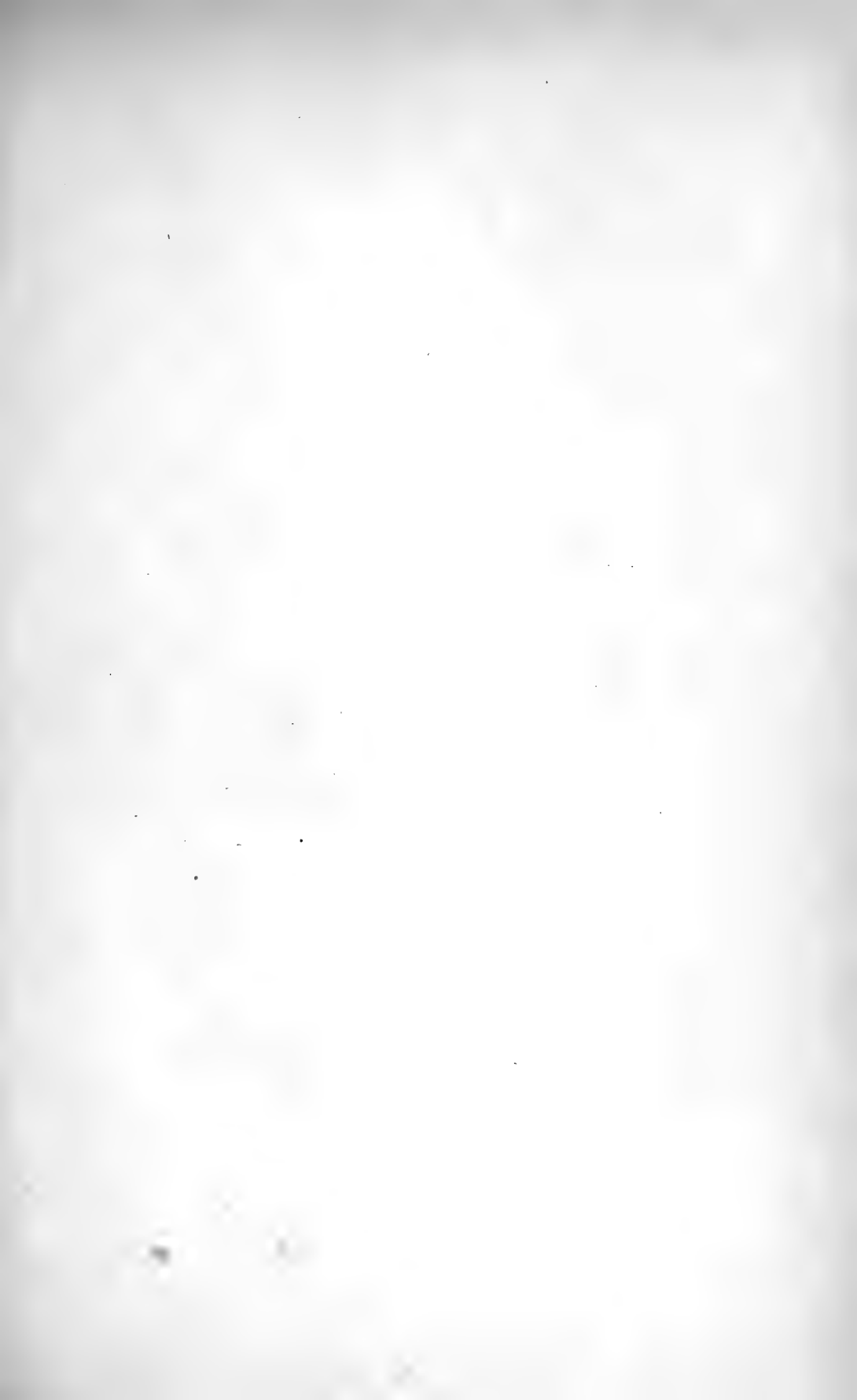


PLATE CXII.

- FIG. 1. *Gluphisia crenata*, male, Rev. J. Greene.
1*a.* " " female.
1*b.* " " larva.
2. *Petasia cassinea*, male.
2*a.* " " female.
2*b.* " " larva, Mr. G. C. Bignell.
3. " *nubeculosa*, male.
3*a.* " " female.
3*b.* " " larva, Mr. W. Buckler.



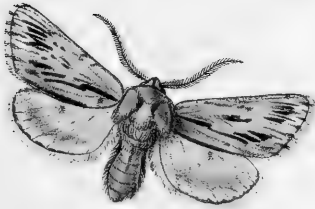
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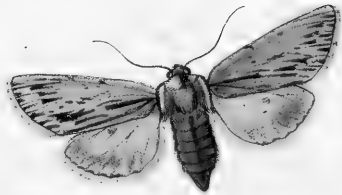
1a



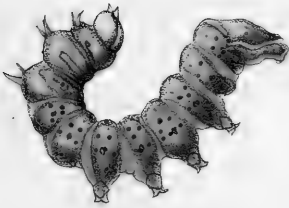
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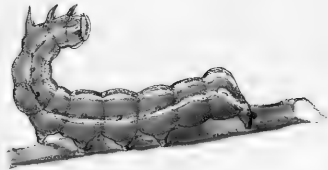
2



2a



3b



3b



3



3a



PLATE CXIII.

- FIG. 1. *Pygæra bucephala*, male.
- | | | | |
|-------------|---|---|--|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var., Yorkshire. |
| 1 <i>c.</i> | „ | „ | female, var., Cheshire. |
| 1 <i>d.</i> | „ | „ | „ „ Mr. S. Webb. |
| 1 <i>e.</i> | „ | „ | at rest. |
| 1 <i>f.</i> | „ | „ | larva, Mr. G. C. Bignell. |
| 1 <i>g.</i> | „ | „ | pupa destroyed by <i>Cordiceps</i>
<i>militaris</i> , Mr. E. W. Lifton. |

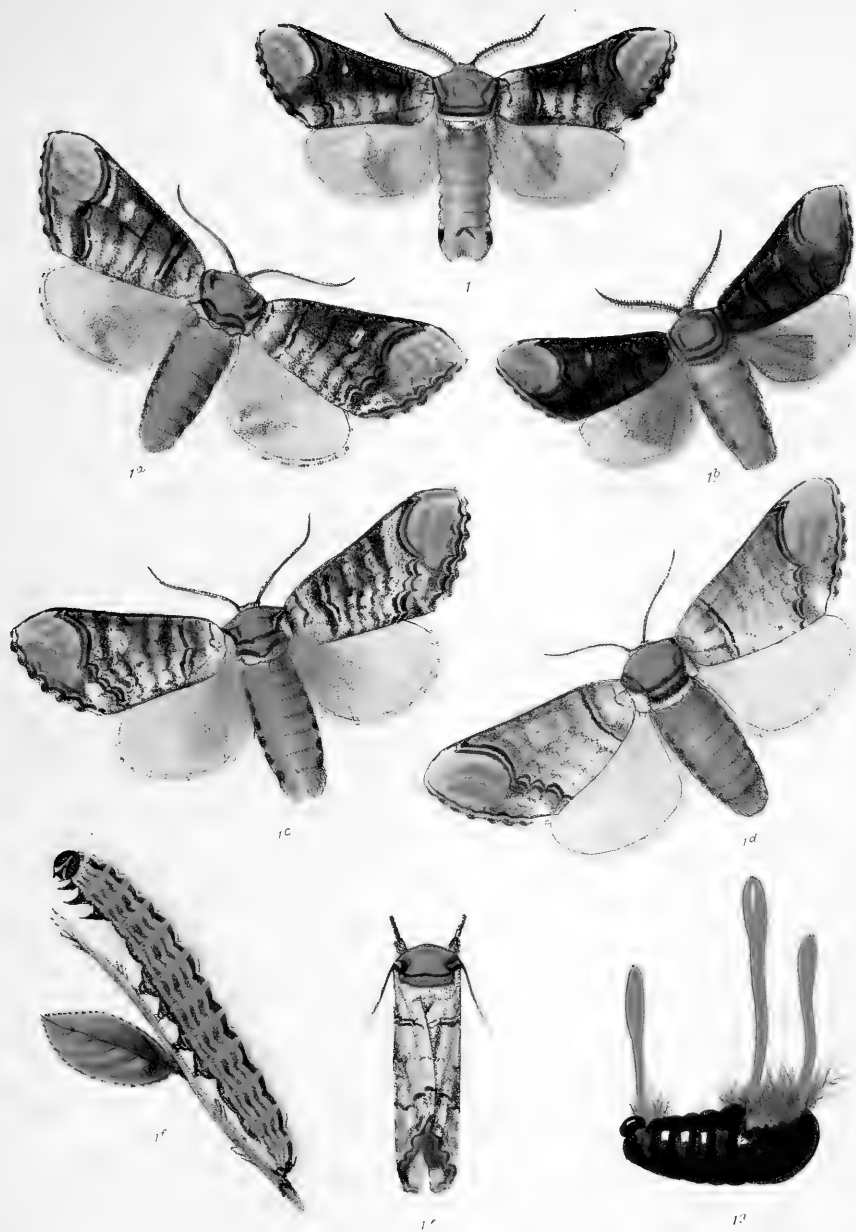
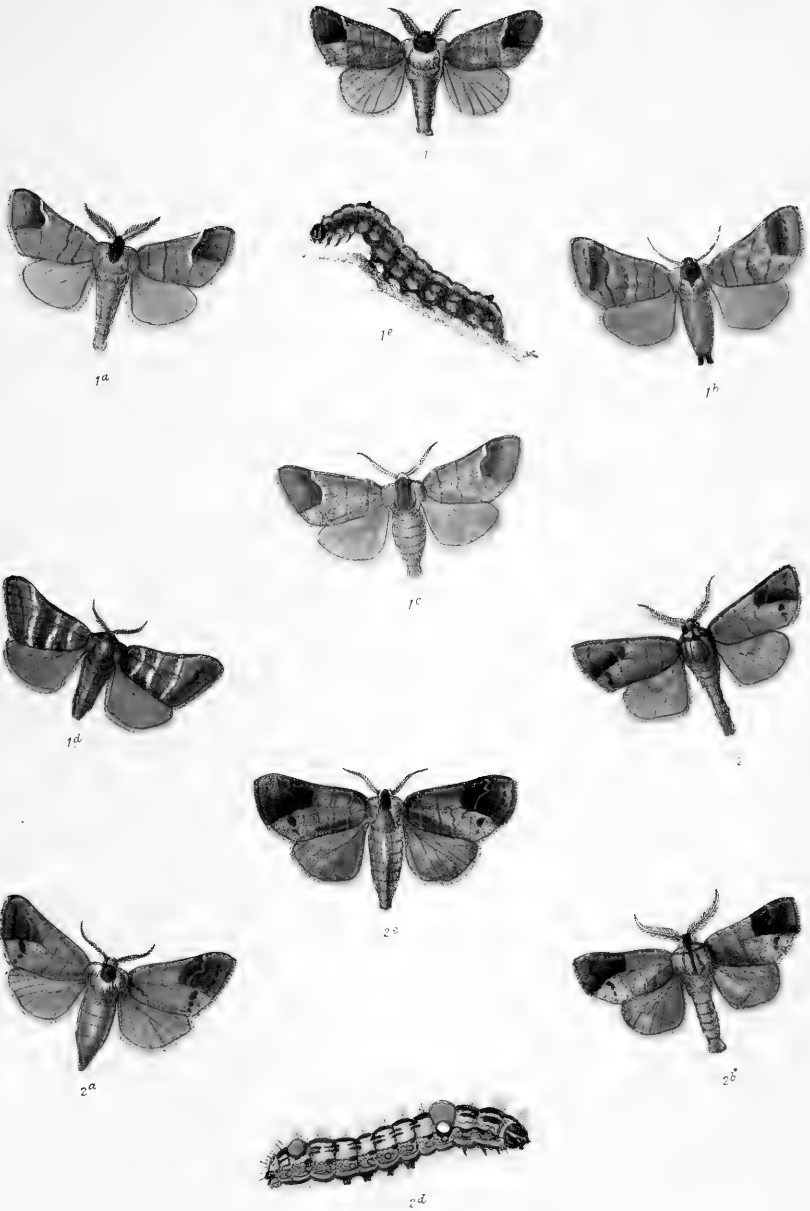




PLATE CXIV.

- FIG. 1. *Clostera curtula*, male, Spring form.
- | | | | | |
|-------------|----|---------------------------|-------------|---------------------------|
| 1 <i>a.</i> | ,, | ,, | ,, | Summer form. |
| 1 <i>b.</i> | ,, | ,, | female, | ,, ,, |
| 1 <i>c.</i> | ,, | ,, | ,, | Autumn form, Mr. S. Webb. |
| 1 <i>d.</i> | ,, | ,, | ,, | var., Mr. S. Webb. |
| 1 <i>e.</i> | ,, | ,, | larva, | Mr. G. C. Bignell. |
| 2. | ,, | <i>anachoreta</i> , male. | | |
| 2 <i>a.</i> | ,, | ,, | female. | |
| 2 <i>b.</i> | ,, | ,, | male, var., | Rev. E. N. Bloomfield. |
| 2 <i>c.</i> | ,, | ,, | female. | ,, ,, |
| 2 <i>d.</i> | ,, | ,, | larva, | Mr. W. Buckler. |



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PLATE CXV.

FIG. 1. *Clostera reclusa*, male.

- | | | | |
|-------------|---|---|---------------------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var. |
| 1 <i>c.</i> | „ | „ | female, var. |
| 1 <i>d.</i> | „ | „ | at rest, tail curled up. |
| 1 <i>e.</i> | „ | „ | larva, Mr. A. Sich. |
| 2. | | | <i>Diloba caeruleocephala</i> , male. |
| 2 <i>a.</i> | „ | „ | female. |
| 2 <i>b.</i> | „ | „ | var., Dr. R. Freer. |
| 2 <i>c.</i> | „ | „ | „ Mr. S. Stevens. |
| 2 <i>d.</i> | „ | „ | larva, Mr. W. Buckler. |

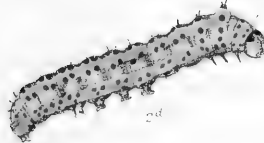
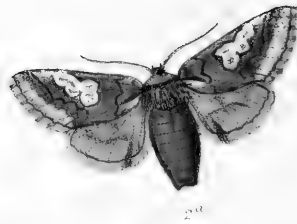
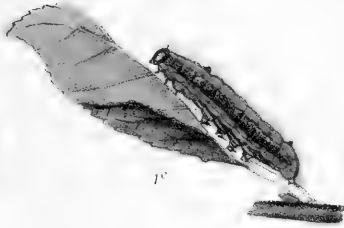




PLATE CXVI

- FIG. 1. *Gonophora derasa*, male.
1*a.* ,, ,, female.
1*b.* ,, ,, larva.
2. *Thyatira batis*, male.
2*a.* ,, ,, female.
2*b.* ,, ,, var., North of Ireland.
2*c.* ,, ,, larva, Mr. G. C. Bignell.
3. *Cymatophora duplaris*, male.
3*a.* ,, ,, female.
3*b.* ,, ,, var., Scotland.
3*c.* ,, ,, var., Cannock Chase.
3*d.* ,, ,, larva, Mr. W. Buckler.



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PLATE CXVII.

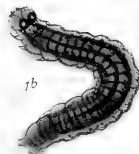
- FIG. 1. *Cymatophora fluctuosa*, male.
1*a.* " " female.
1*b.* " " larva, Mr. W. Buckler.
2. " or, South of England.
2*a.* " " Scotland.
2*b.* " " var. Dr. P. B. Mason.
2*c.* " " larva, Mr. W. Buckler.
3. " *ocularis*, male.
3*a.* " " female.
3*b.* " " larva, Mr. W. Buckler.
4. Hybrid between *C. or* and *C. ocularis*; reared by
 Mr. W. H. B. Fletcher.



1



1a



1b



2



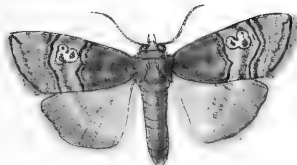
2a



2b



2c



3



3a



3a



4

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PLATE CXVIII.

FIG. 1. *Asphalia diluta*, male.

- | | | | |
|-----|---|---|--|
| 1a. | „ | „ | female. |
| 1b. | „ | „ | var. Yorks, Mr. S. J. Capper. |
| 1c. | „ | „ | „ „ „ „ „ „ |
| 1d. | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | | <i>flavicornis</i> , South of England. |
| 2a. | „ | „ | Yorkshire, Dr. H. H. Corbett. |
| 2b. | „ | „ | Cannock Chase, Dr. R. Freer. |
| 2c. | „ | „ | „ „ „ „ |
| 2d. | „ | „ | Scotland, Mr. S. J. Capper. |
| 2e. | „ | „ | larva, Mr. W. Buckler. |

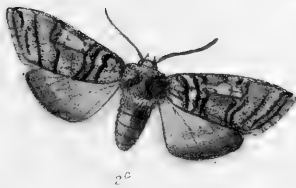
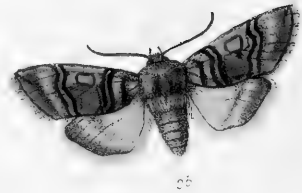
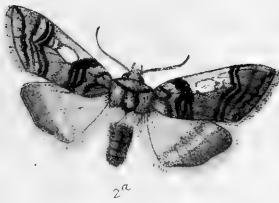
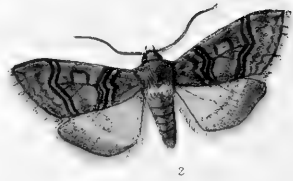
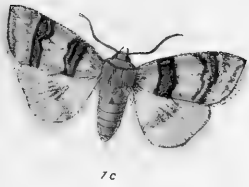
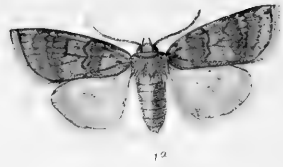
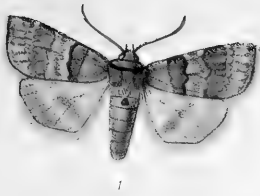




PLATE CXIX.

FIG. 1. *Asphalia ridens*.

1*a.* " " var.

1*b.* " " "

1*c.* " " "

1*d.* " " "

1*e.* " " " Mr. S. J. Capper.

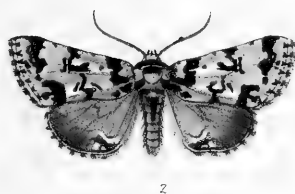
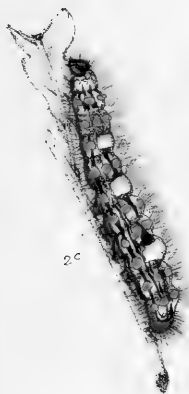
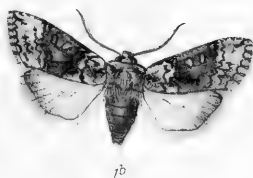
1*f.* " " larva, Mr. A. Sich.

2. *Diphthera Orion*.

2*a.* " " var. Dr. T. A. Chapman.

2*b.* " " " Mr. S. J. Capper.

2*c.* " " larva, Mr. W. Buckler.



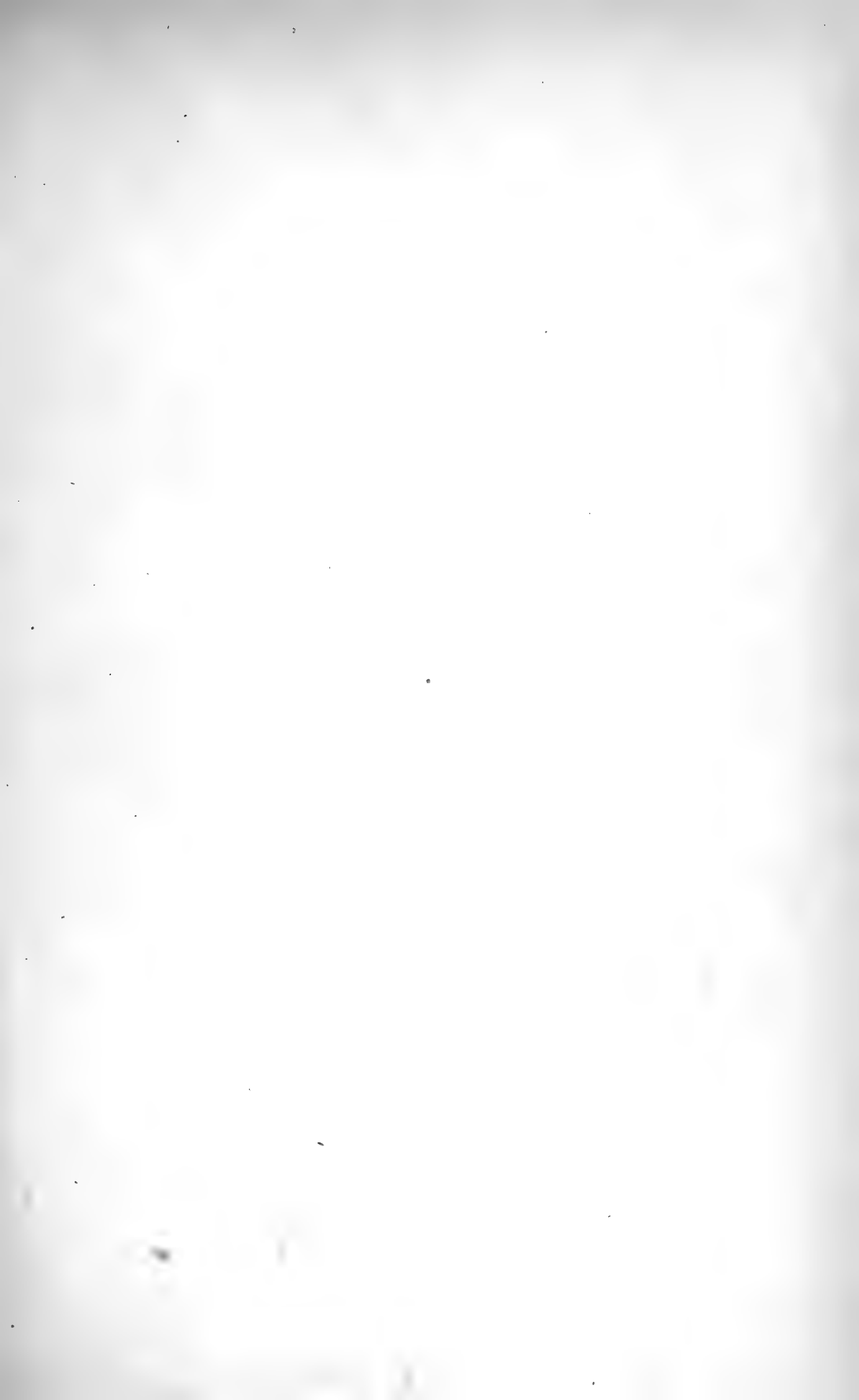


PLATE CXX.

FIG. 1. *Acronycta leporina*.

- | | | | |
|--------------|---|--------------|-------------------------------------|
| 1 <i>a</i> . | „ | „ | var. <i>bradyporina</i> . |
| 1 <i>b</i> . | „ | „ | intermediate, var. |
| 1 <i>c</i> . | „ | „ | „ „ |
| 1 <i>d</i> . | „ | „ | larva. |
| 2. | „ | aceris. | |
| 2 <i>a</i> . | „ | „ | *var. <i>infuscata</i> , Dr. Mason. |
| 2 <i>b</i> . | „ | „ | larva. |
| 2 <i>c</i> . | „ | „ | „ coiled. |
| 3. | „ | megacephala. | |
| 3 <i>a</i> . | „ | „ | var. |
| 3 <i>b</i> . | „ | „ | larva. |

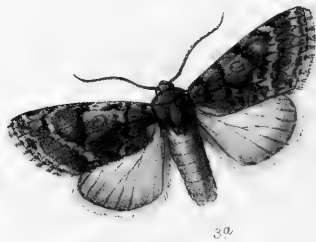
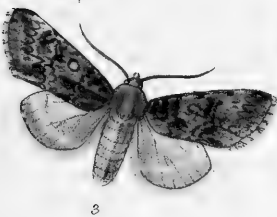
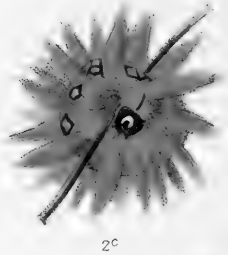
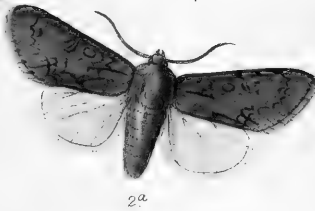
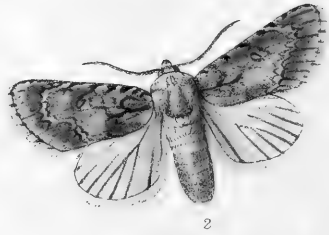
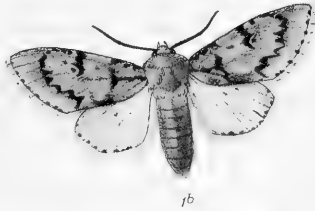
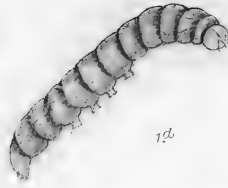
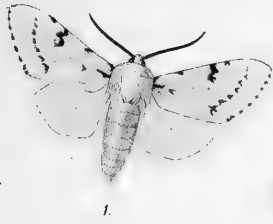




PLATE CXXI.

FIG. 1. *Acronycta alni*, male.

- 1a. ,, ,, female.
- 1b. ,, ,, var., Dr. P. B. Mason.
- 1c. ,, ,, larva, Mr. W. Buckler.
- 1d. ,, ,, young larva, Mr. G. C. Bignell.
- 2 ,, strigosa.
- 2a. ,, ,, larva.
- 3. ,, menyanthedis, male.
- 3a. ,, ,, female.
- 3b. ,, ,, var., Mr. S. J. Capper.
- 3c. ,, ,, larva.
- 4. ,, auricoma, male.
- 4a. ,, ,, female.
- 4b. ,, ,, larva, Mr. W. Buckler.

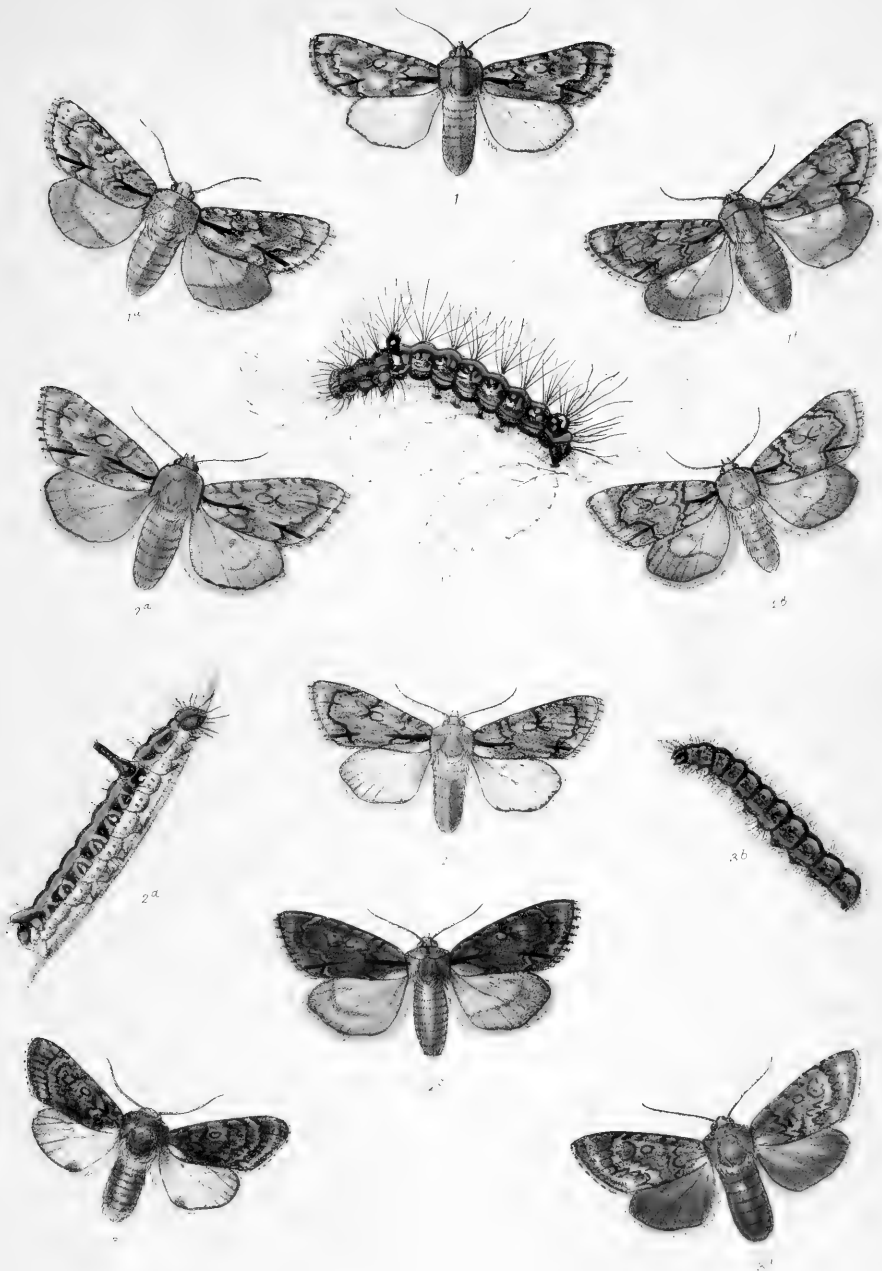




Handwritten text, likely bleed-through from the reverse side of the page. The text is extremely faint and illegible due to the quality of the scan. It appears to be organized into several lines or paragraphs, but no specific words or numbers can be discerned.

PLATE CXXII.

- FIG. 1. *Acronycta tridens*, male.
1*a.* „ „ female.
1*b.* „ „ var., Dr. T. A. Chapman.
1*c.* „ „ larva, Mr. A. Sich.
2. „ „ psi, male.
2*a.* „ „ female.
2*b.* „ „ var., Dr. T. A. Chapman.
2*c.* „ „ „ London suburbs.
2*d.* „ „ larva.
3. „ „ euphorbiæ, male.
3*a.* „ „ female.
3*b.* „ „ larva, Mr. G. C. Bignell.



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PLATE CXXIII.

- FIG. 1. *Acronycta rumicis*, male.
- | | | | |
|-----|----|-----------|----------------------------------|
| 1a. | .. | .. | female. |
| 1b. | .. | .. | var., <i>salicis</i> . |
| 1c. | .. | .. | .. Mr. F. J. Hanbury. |
| 1d. | .. | .. | .. larva, Mr. G. C. Bignell. |
| 2 | .. | ligustri. | |
| 2a. | .. | .. | var., Mr. G. T. Porritt. |
| 2b. | .. | .. | Yorks. |
| 2c. | .. | .. | .. |
| 2d. | .. | .. | larva, Mr. W. Buckler. |
| 3. | | | <i>Arsilonche venosa</i> , male. |
| 3a. | .. | .. | female. |
| 3b. | .. | .. | larva. |



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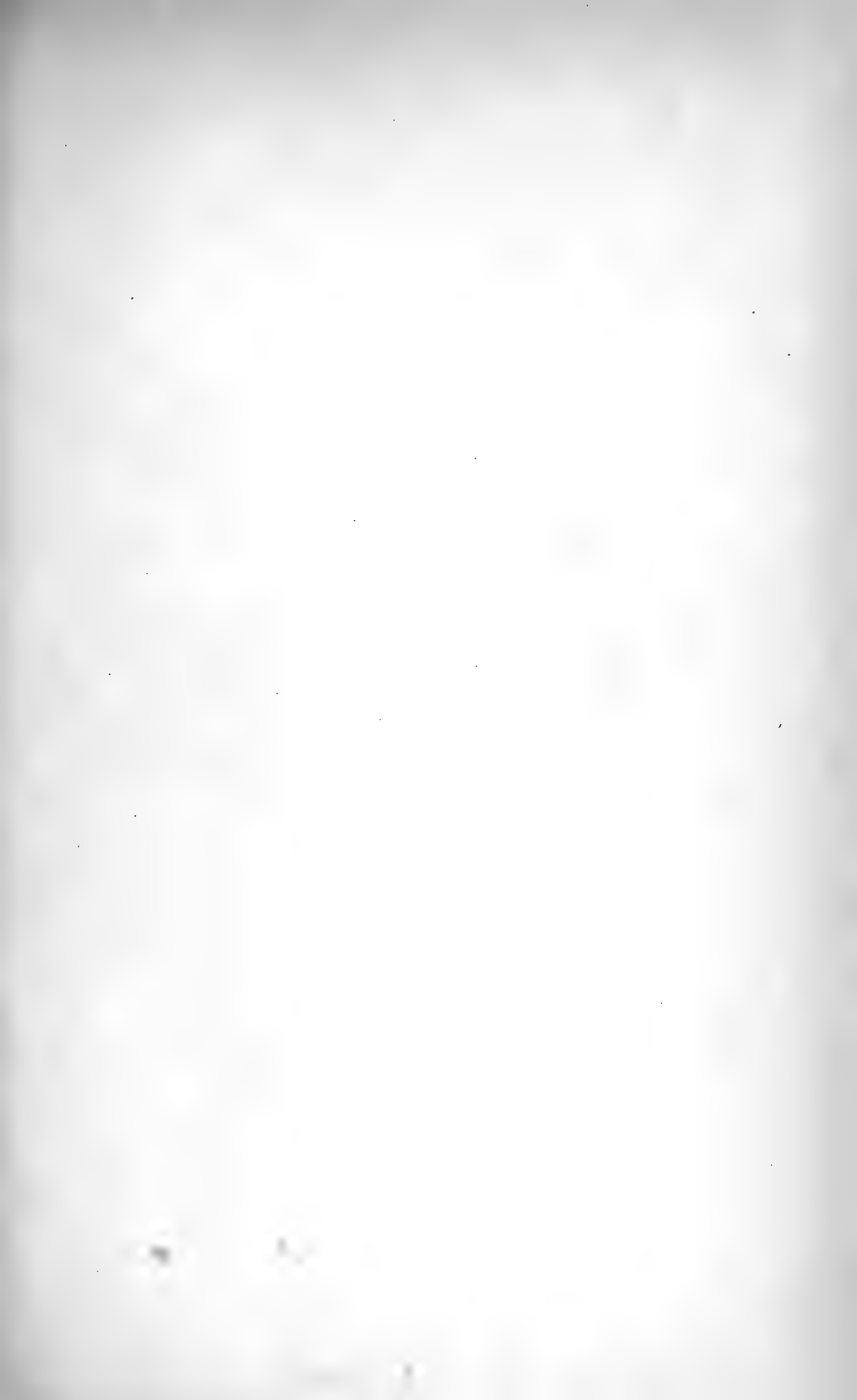
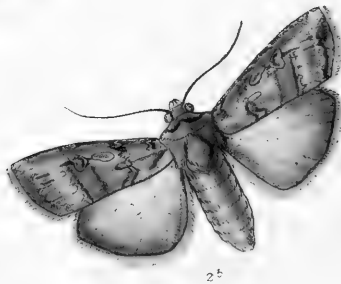
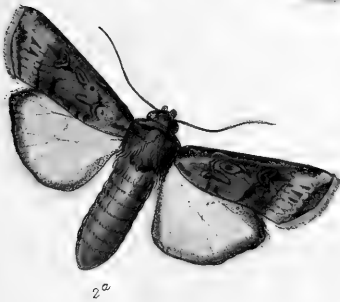
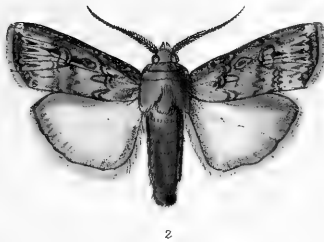
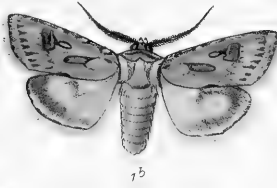
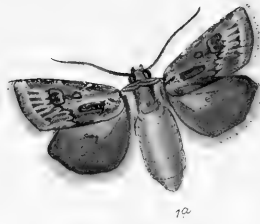


PLATE CXXIV.

FIG. 1. *Agrotis valligera*, male.

- | | | | |
|-------------|---|----------|------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var. |
| 1 <i>c.</i> | „ | „ | female, var. |
| 1 <i>d.</i> | „ | „ | „ „ |
| 1 <i>e.</i> | „ | „ | „ „ |
| 1 <i>f.</i> | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | suffusa, | male. |
| 2 <i>a.</i> | „ | „ | female. |
| 2 <i>b.</i> | „ | „ | male, var. |
| 2 <i>c.</i> | „ | „ | larva |



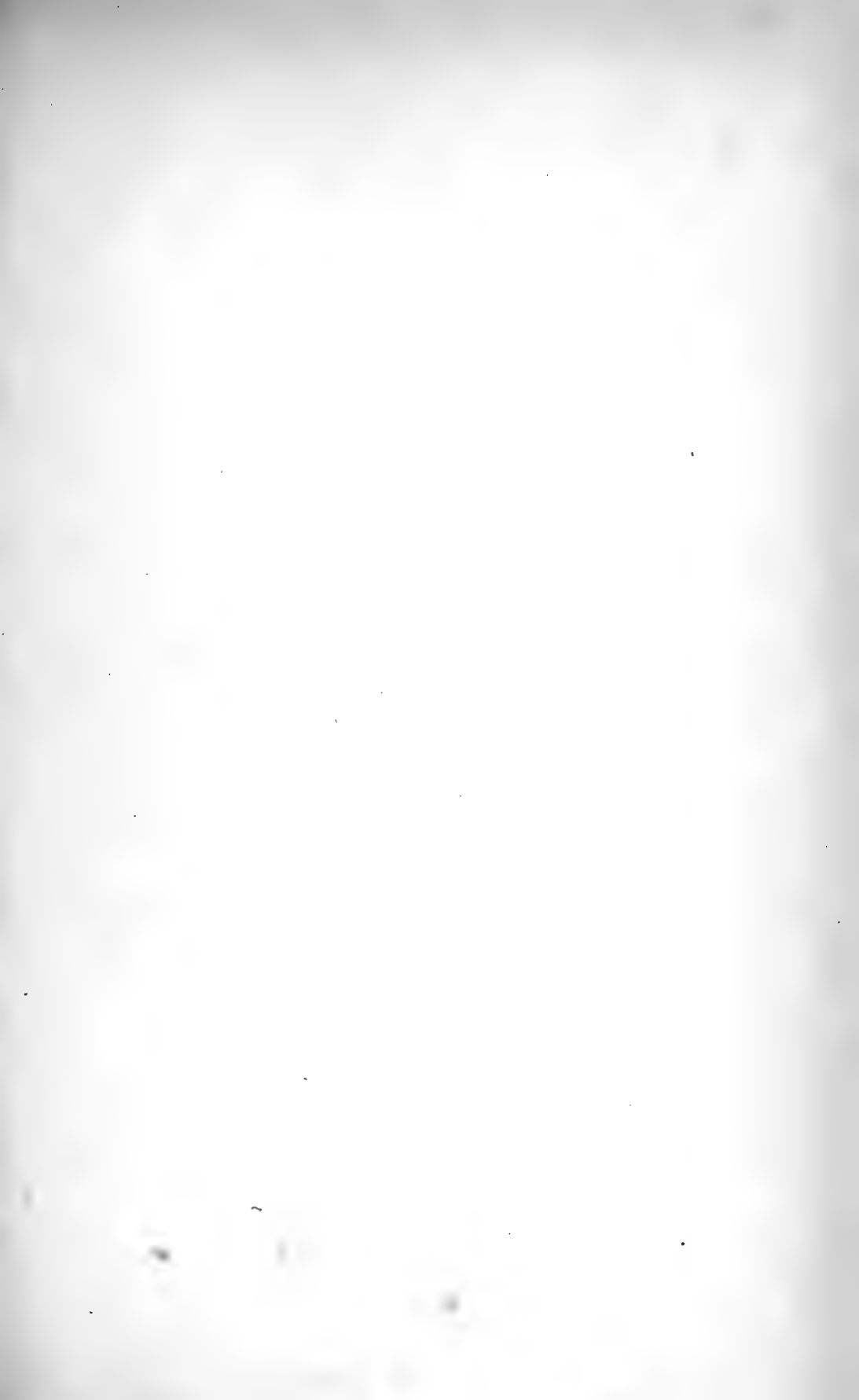
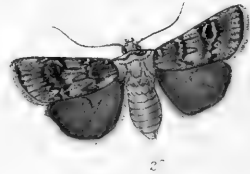
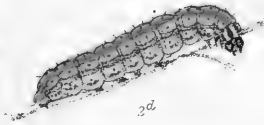
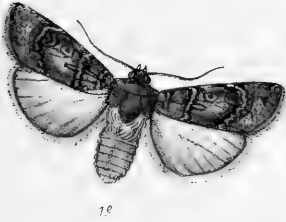
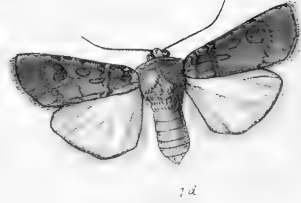
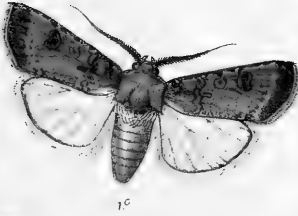
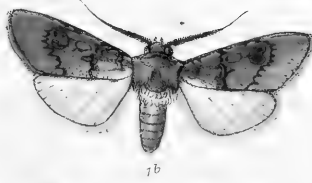
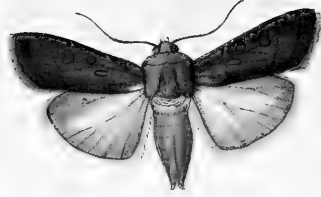


PLATE CXXV.

FIG. 1. *Agrotis segetum*, male.

- | | | | |
|-------------|---|-------|----------------------------------|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var., Mr. F. J. Hanbury. |
| 1 <i>c.</i> | „ | „ | „ „ „ „ |
| 1 <i>d.</i> | „ | „ | female, var., Dr. P. B. Mason. |
| 1 <i>e.</i> | „ | „ | „ „ „ „ |
| 1 <i>f.</i> | „ | „ | „ „ Mr. F. J. Hanbury. |
| 1 <i>g.</i> | „ | „ | larva. |
| 2. | „ | puta, | male. |
| 2 <i>a.</i> | „ | „ | female. |
| 2 <i>b.</i> | „ | „ | male, var. |
| 2 <i>c.</i> | „ | „ | female, var., Colonel Partridge. |
| 2 <i>d.</i> | „ | „ | larva. |



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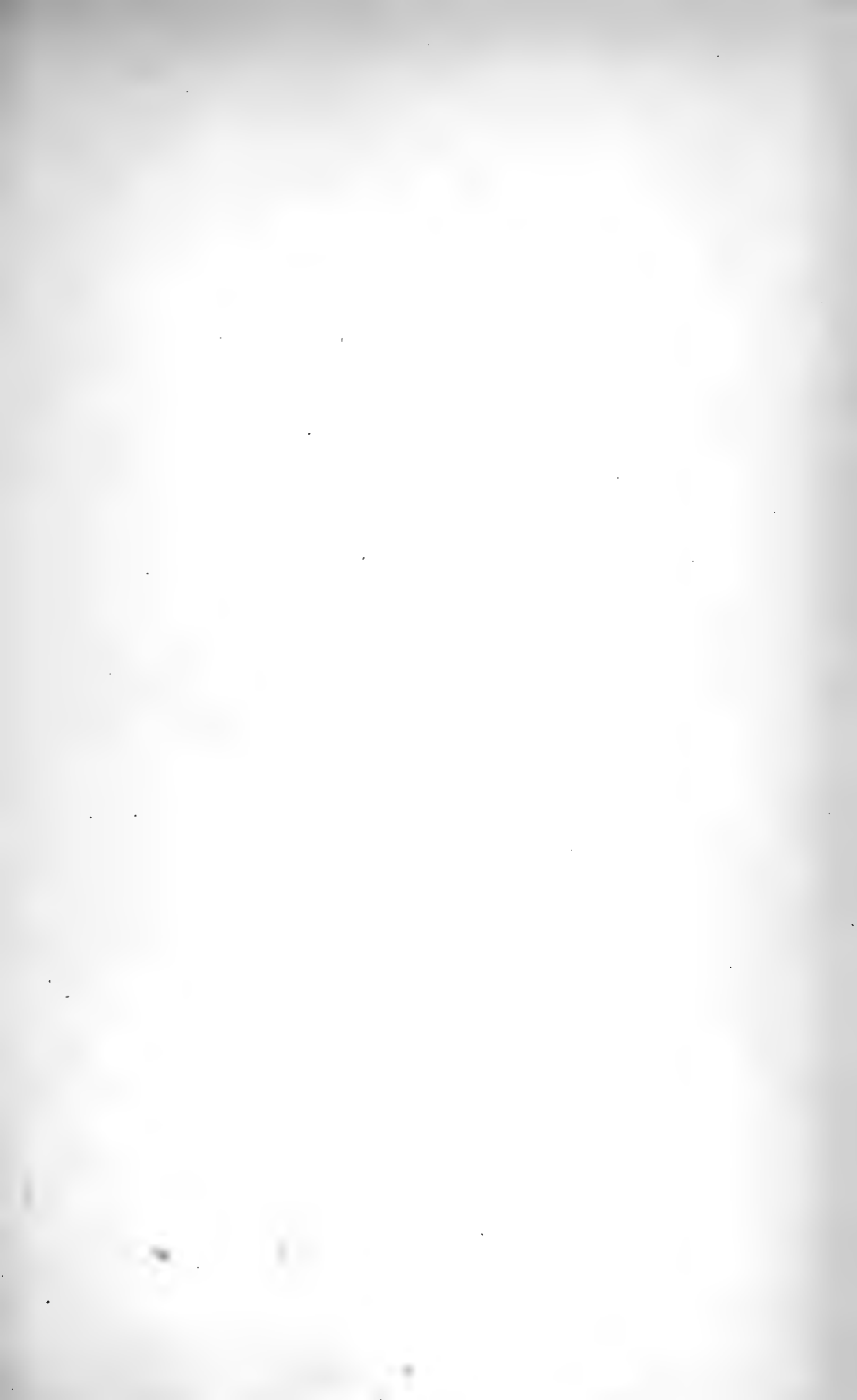


PLATE CXXXVI.

FIG. 1. *Agrotis corticea*, male.

- | | | | |
|-------------|---|---|---|
| 1 <i>a.</i> | „ | „ | female. |
| 1 <i>b.</i> | „ | „ | male, var., Mr. F. J. Hanbury. |
| 1 <i>c.</i> | „ | „ | „ „ Mr. G. T. Porritt. |
| 1 <i>d.</i> | „ | „ | „ „ Mr. F. J. Hanbury. |
| 1 <i>e.</i> | „ | „ | female, „ „ „ |
| 1 <i>f.</i> | „ | „ | larva. |
| 2. | „ | „ | <i>cinerea</i> , male, Mr. F. J. Hanbury. |
| 2 <i>a.</i> | „ | „ | female, „ „ |
| 2 <i>b.</i> | „ | „ | male, var., „ „ |
| 2 <i>c.</i> | „ | „ | „ „ „ „ |
| 2 <i>d.</i> | „ | „ | „ „ „ „ |
| 2 <i>e.</i> | „ | „ | female, var. |
| 2 <i>f.</i> | „ | „ | larva, Mr. W. Buckler. |



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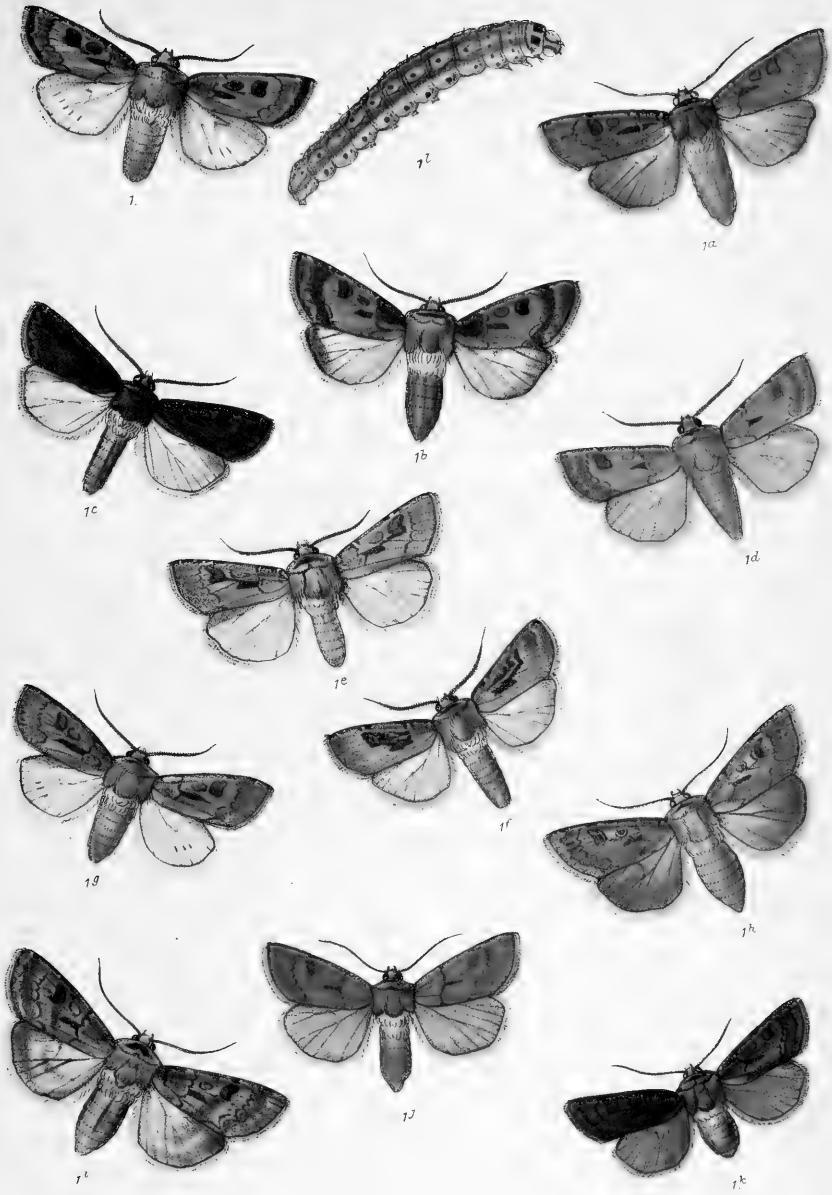
L. Reeve & Co London



PLATE CXXVII.

FIG 1. *Agrotis exclamationis*, male.

1 <i>a.</i>	„	„	female.	
1 <i>b.</i>	„	„	male, var.	
1 <i>c.</i>	„	„	„	„
1 <i>d.</i>	„	„	„	„
1 <i>e.</i>	„	„	„	„
1 <i>f.</i>	„	„	„	„ Dr. P. B. Mason.
1 <i>g.</i>	„	„	„	„
1 <i>h.</i>	„	„	female, var.	
1 <i>i.</i>	„	„	„	„ Mr. F. J. Hanbury.
1 <i>j.</i>	„	„	„	„ „ „
1 <i>k.</i>	„	„	„	„ Mr. G. T. Porritt.
1 <i>l.</i>	„	„	larva.	



R. Morgan del, et lith.

Vincent Brooks, Day & Son Imp

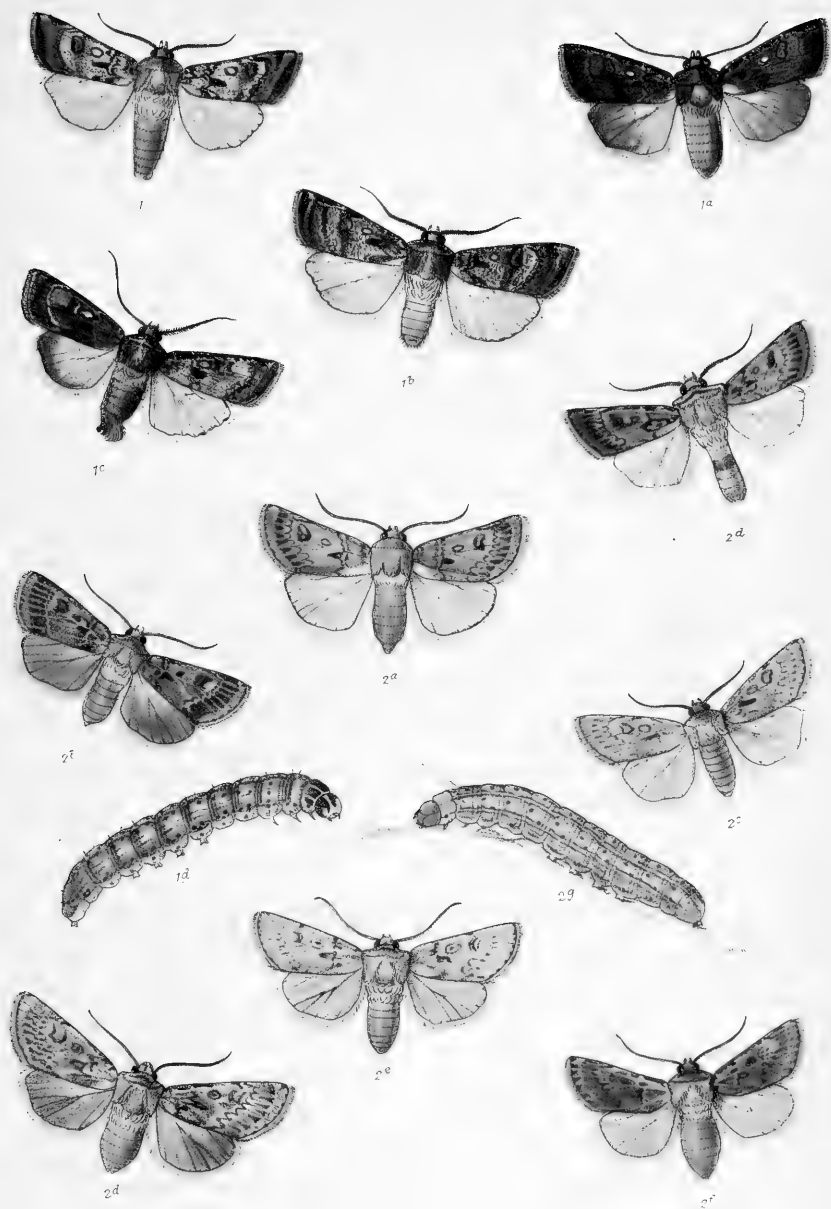
L. Reeve & C^o London



PLATE CXXVIII.

FIG. 1. *Agrotis lunigera*, male.

- | | | | | | |
|-------------|---|-------|------------|----------------------|--------------------|
| 1 <i>a.</i> | „ | „ | female. | | |
| 1 <i>b.</i> | „ | „ | male, var. | | |
| 1 <i>c.</i> | „ | „ | gynandro, | Lieut. E. W. Browne. | |
| 1 <i>d.</i> | „ | „ | larva, | Mr. W. Buckler. | |
| 2 | „ | ripæ, | male. | | |
| 2 <i>a.</i> | „ | „ | female. | | |
| 2 <i>b.</i> | „ | „ | „ | var. | |
| 2 <i>c.</i> | „ | „ | „ | „ | Dr. P. B. Mason. |
| 2 <i>d.</i> | „ | „ | „ | „ | Mr. F. J. Hanbury. |
| 2 <i>e.</i> | „ | „ | „ | „ | „ |
| 2 <i>f.</i> | „ | „ | „ | „ | „ |
| 2 <i>g.</i> | „ | „ | larva. | | |



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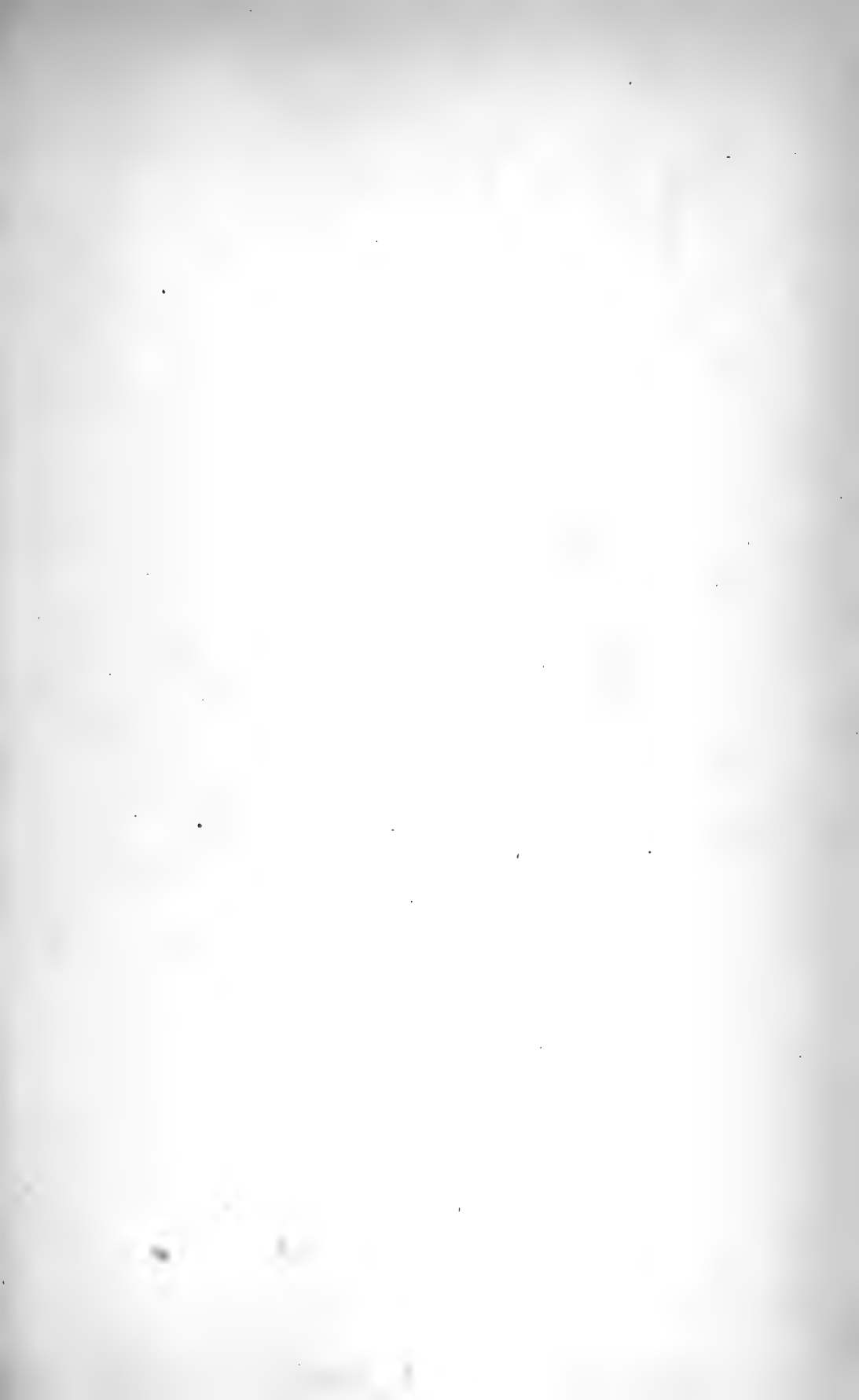


PLATE CXXIX.

FIG. 1. *Agrotis cursoria*, male.

1a.	female.
1b.	var., Eastern Counties.
1c.	..	..	.. .. ..
1d.	..	..	.. .. ..
1e.	..	..	.. .. ..
1f.	..	..	.. .. ..
1g.	..	..	.. East of Scotland, Mr. A. Horne.
1h.	..	..	.. .. ..
1i.	..	..	.. West of Ireland, Mr. P. Russ.
1j.	..	..	.. Dr. P. B. Mason.
1k.	..	..	larva .. Mr. W. Buckler.

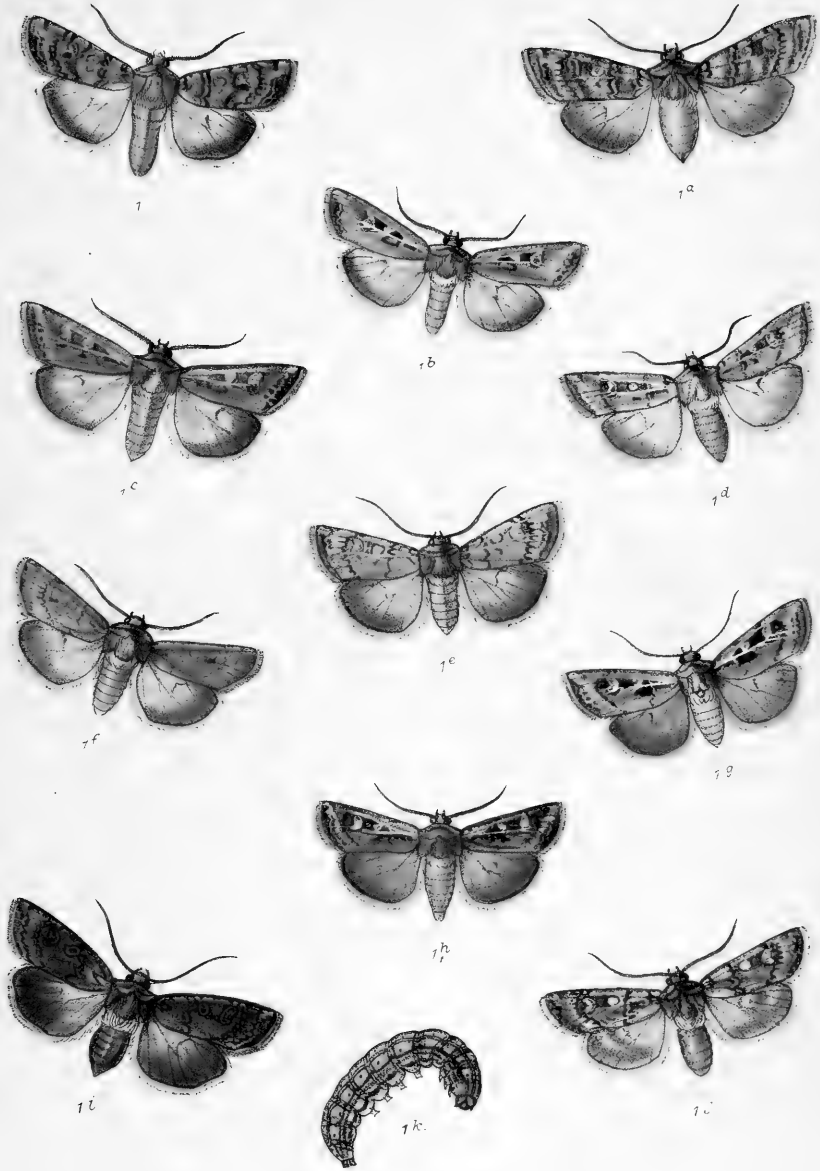




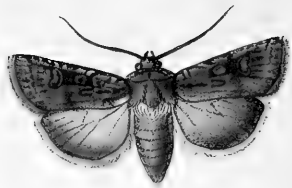
PLATE CXXX.

FIG. 1. *Agrotis nigricans*, male.

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>	..	..	..
1 <i>h.</i>	..	..	.. Mr. G. T. Porritt.
1 <i>i.</i>	..	..	larva, Mr. W. Buckler.



1



12



13



17c



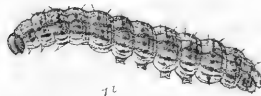
17d



18



17



12



19



18





PLATE CXXXI.

FIG 1. *Agrotis tritici*, male.

- | | | | |
|-------------|---|---|--|
| 1 <i>a.</i> | “ | “ | female. |
| 1 <i>b.</i> | “ | “ | var., Norfolk. |
| 1 <i>c.</i> | “ | “ | “ “ |
| 1 <i>d.</i> | “ | “ | “ “ |
| 1 <i>e.</i> | “ | “ | “ East of Ireland. |
| 1 <i>f.</i> | “ | “ | “ West of Ireland |
| 1 <i>g.</i> | “ | “ | “ “ “ |
| 1 <i>h.</i> | “ | “ | “ “ “ |
| 1 <i>i.</i> | “ | “ | “ North of Ireland. |
| 1 <i>j.</i> | “ | “ | larva, specimen furnished by Mr.
C. S. Gregson. |



7a



7b



7c



7d



7e



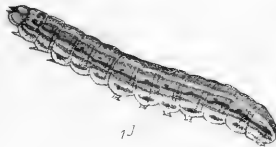
7f



7g



7h



7i

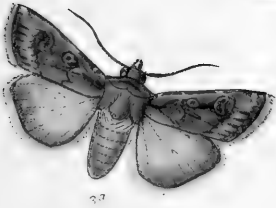
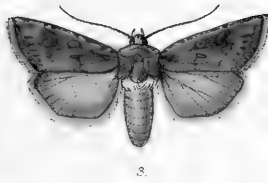
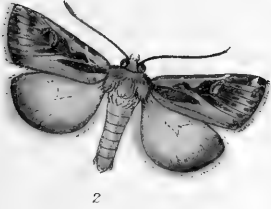
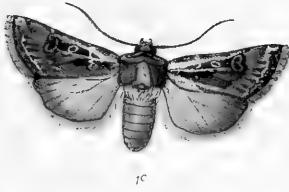
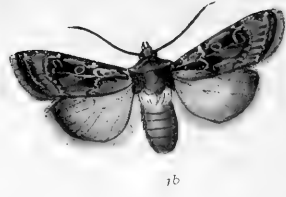
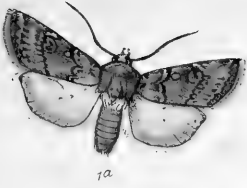


7j



7k





R. Morgan del, et lith

W. H. Edwards, Del. et Lith.

L. Reeve & Co London



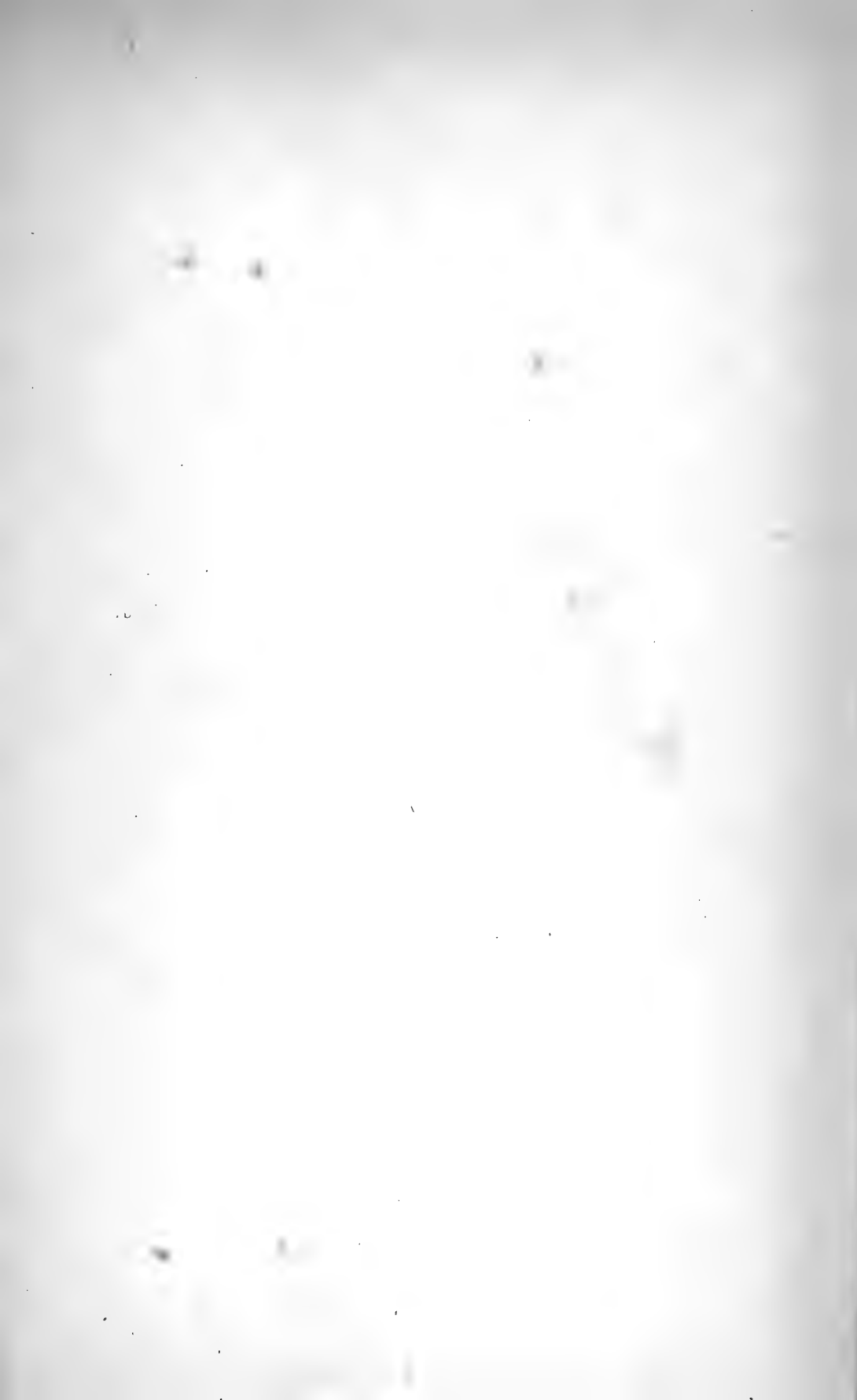


PLATE CXXXIII.

- FIG. 1. *Agrotis obelisca*, male.
- | | | | |
|--------------|---|-------------------|---------------------------------------|
| 1 <i>a</i> . | „ | „ | female, Mr. F. J. Hanbury. |
| 1 <i>b</i> . | „ | „ | var. Ireland. |
| 1 <i>c</i> . | „ | „ | „ Isle of Wight, Mr. A. J.
Hodges. |
| 1 <i>d</i> . | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | <i>agathina</i> , | Norfolk, Mr. E. A. Atmore. |
| 2 <i>a</i> . | „ | „ | var. Dr. P. B. Mason. |
| 2 <i>b</i> . | „ | „ | „ Ireland. |
| 2 <i>c</i> . | „ | „ | „ Scotland. |
| 2 <i>d</i> . | „ | „ | larva, Mr. G. C. Bignell. |



1



1a



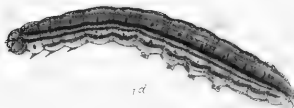
1b



1c



2a



1d



2



2a



2b



2c



PLATE CXXXIV.

FIG. 1. *Agrotis porphyrea*, male.

- | | | | |
|-----|---|---|--------------------------------------|
| 1a. | „ | „ | female. |
| 1b. | „ | „ | male, var. Shetland. |
| 1c. | „ | „ | female, „ „
Mr. J. J. F. X. King. |
| 1d. | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | „ | <i>præcox</i> . |
| 2a. | „ | „ | var. |
| 2b. | „ | „ | „ Mr. F. N. Pierce. |
| 2c. | „ | „ | larva, Mr. G. C. Bignell. |

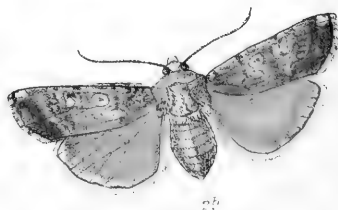
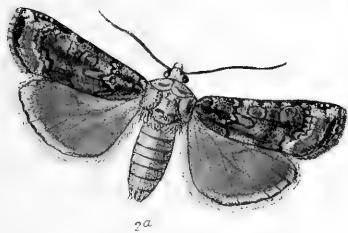
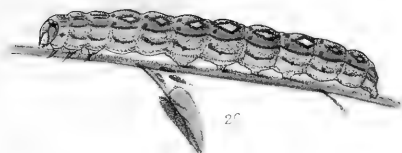
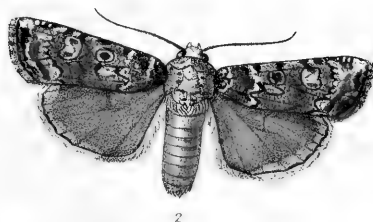
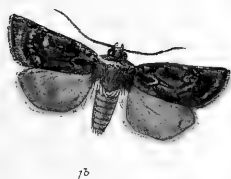
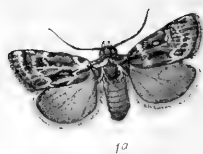
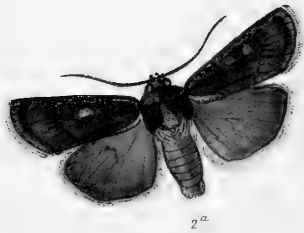
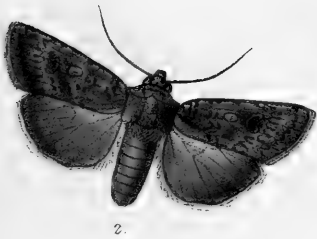
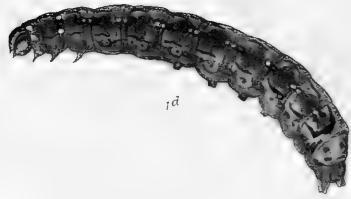
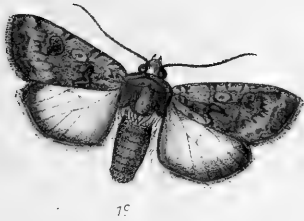
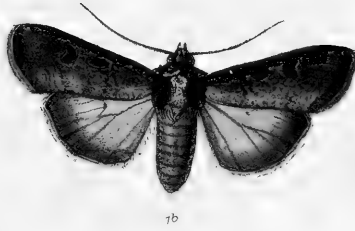
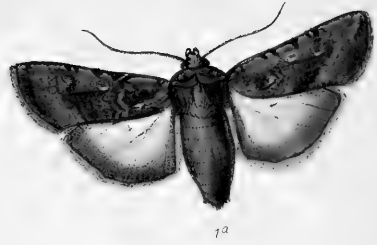
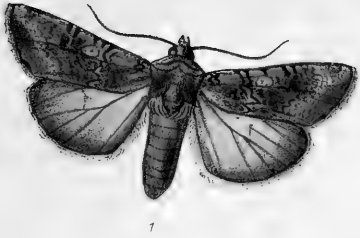




PLATE CXXXV.

FIG 1. *Agrotis saucia*.

- 1*a.* " " var.
1*b.* " " " Mr. F. J. Hanbury.
1*c.* " " "
1*d.* .. " larva, Mr. W. Buckler.
2. " pyrophila, Isle of Portland, Mr. N. M.
 Richardson.
2*a.* " " var. Scotland, Dr. P. B. Mason.



R. Morgan del, et lith

Vincent Brooke Day & Co. Lith

L. Beeve & Co. Lith





PLATE CXXXVI.

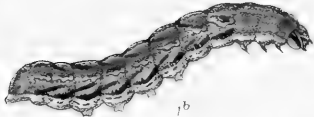
- FIG. 1. *Agrotis ravid*a, male.
- 1*a.* „ „ female.
- 1*b.* „ „ larva, Mr. W. Buckler.
- 2 „ *Ashworthii*, male, Mr. C. S. Gregson.
- 2*a.* „ „ female, „ „
- 2*b.* „ „ larva, Mr. W. Buckler.
3. „ *lucernea*.
- 3*a.* „ „ var. North Wales, Dr. P. B. Mason.
- 3*b.* „ „ „ South coast, „ „
- 3*c.* „ „ larva, Mr. W. Buckler.



1



1a



1b



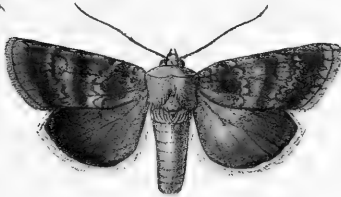
2



2a



2b



3



3a



3a



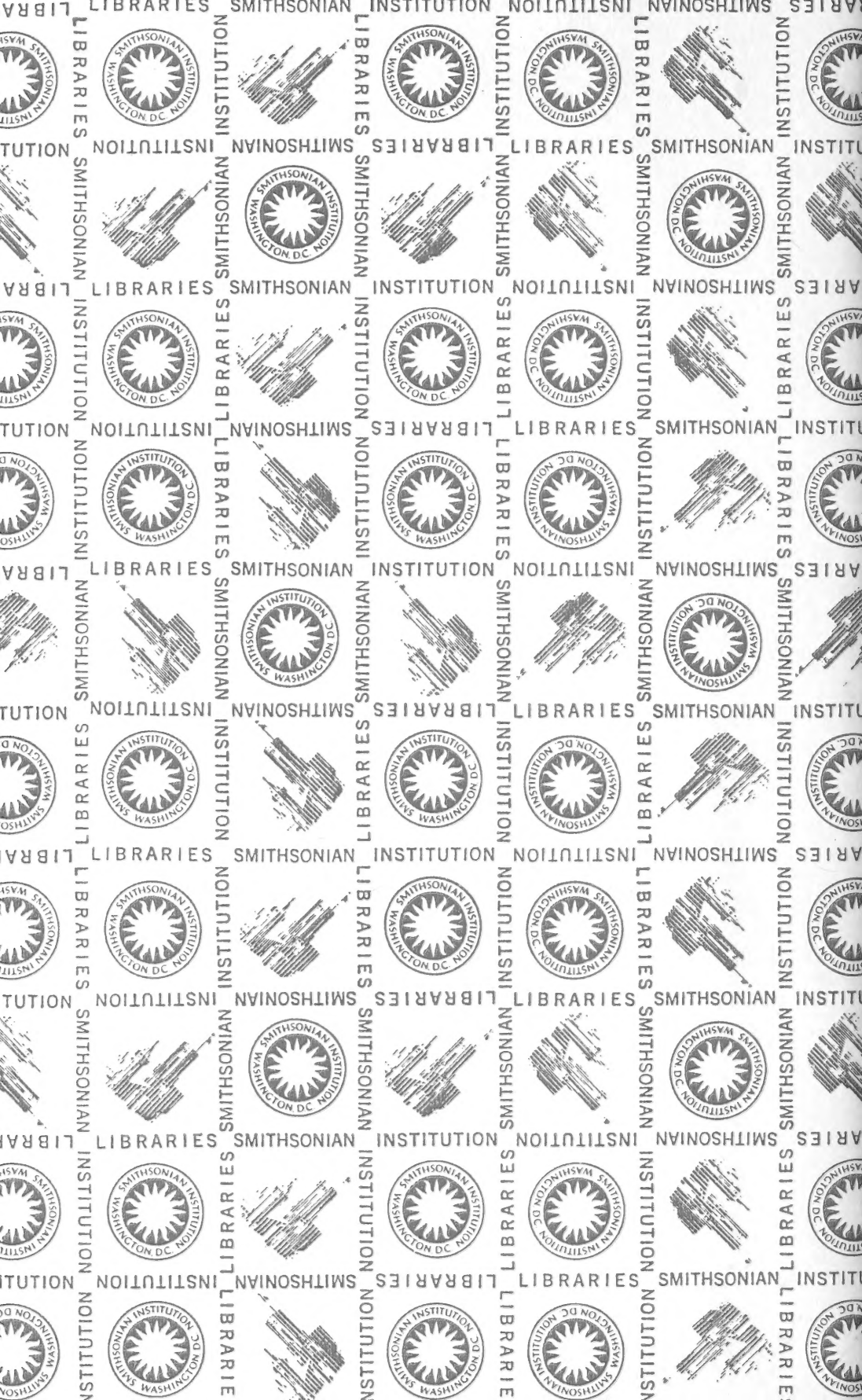
3b

R. Morgan del. et lith.

Vincent Brooks Day & Son lith.

L. Reeve & Co London





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