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THE LARVÆ
OF THE
BRITISH BUTTERFLIES
AND
MOTHS.

BY
(THE LATE)
WILLIAM BUCKLER.

EDITED BY
GEO. T. PORRITT, F.L.S.

VOL. VII.
(THE FIRST PORTION OF THE GEOMETRÆ.

LONDON:
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PREFACE.

THE present volume contains the first portion of the Geometræ; it is intended to complete the Group in Vol. VIII.

I much regret the delay in the appearance of this volume, which is entirely due to the dilatoriness of the artist and lithographer employed on the plates.

The Ray Society is once more indebted to Mr. G. C. Bignell for supplying a list of parasites known to affect the species treated of; and I have again to thank my friend Mr. W. Denison Roebuck for his assistance to myself in editing the volume.

GEO. T. PORRITT.

CROSLAND HALL,
HUDDERSFIELD;
November 13th, 1896.

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THE LARVÆ
OF THE
BRITISH MOTHS.

VENILIA MACULATA.

Plate CVI, fig. 6.

THE pupa of *Venilia maculata* is three-eighths of an inch long, thick and plump in proportion, tapering a little from the middle towards the head, and more towards the tail, which terminates in a knob with a central spike surrounded with eight fine bristles having their extremities curved round. Its colour is dark purplish-brown, pitted or punctured, and very shining, excepting the divisions between the abdominal segments, which are smooth, without gloss, and of a dull brick-red colour.

The moths emerged on the 13th and 17th of May, 1873.

The larvæ fed on wood-sage, *Teucrium scorodonia*. (William Buckler, May, 1873; Note Book II, 10.)

METROCAMPA MARGARITATA.

Plate CVI, fig. 8.

Larva nearly full-grown, measuring an inch and a quarter to an inch and three-eighths in length. Belly quite flat, on surface very wrinkled transversely; the

edges of the sides are produced in a ridge, from which proceeds a fringe of fleshy filaments of a simple kind as in *Catocala*. The colour of the belly and of the filaments is pale ashy grey, and a little shining.

There are two pairs of ventral legs only, no rudimentary ones; the first pair are rather less than the second pair. The anal legs are larger than the ventral ones. So that the larva has altogether twelve legs.

The segments taper a little forwards from the ninth to the fourth, and behind from the tenth to the thirteenth. The back of the twelfth bears rather larger tubercles than the rest, and from these slopes suddenly down to the anal flap when seen in profile. The larva is rounded when viewed on the back, and it is seen to be a little thicker on the thoracic segments, which appear tumid in comparison with those behind them. It thickens again a little on the ninth and tenth segments, both on the back and sides, and from these the remainder taper a little to the anal extremity, and below the flap are three blunt points. The ventral legs of the tenth segment are better developed than those of the ninth.

The skin is puffed, but rugose along the spiracular region, on the third and fourth segments, and deeply so towards the segmental divisions on the back. The upper surface of the back and sides is rounded. The tubercular warts are very small in the front dorsal pair, and a trifle larger in the hinder pair of each segment.

The head is a little less in width than the second segment.

In colour these larvæ vary, some being of a light ochreous green, others drab colour, some brownish-grey, others of a dark purplish-grey, more or less freckled with darker. There is a faint indication of a paler grey dorsal series of markings, most distinct at the hinder part of each segment, and especially on the eighth segment, where there is an ash-coloured triangular patch on the side pointing forwards.

The head is rounded at the sides, rather flat in front, which is ash-coloured, dark grey behind, a black crescentic streak down each lobe, which separates the two colours, and the whole head is freckled with dark grey-brown.

The tubercular dots are black, having the tips white, which in each hind pair melt on the back towards each other gradually. The legs are the same colour as the body. (William Buckler, 1872; Note Book I, p. 176.)

EURYMENE DOLOBRARIA.

Plate CVII, fig. 2.

Length of the larva an inch and a half; head notched and rounded on the crown, rather smaller than the second segment. When at rest, with the mouth tightly pressed to the legs, the first three segments much resemble a miniature dog's head, the head of the larva representing the dog's nose, and the protuberances of the third segment the ears and crown of the animal's head. Head reddish-brown, assuming a mottled appearance on the cheeks; second and third segments blackish-brown, each increasing in size, the third considerably so, especially at the sides, giving the larva when at rest the singular appearance mentioned above. Body, beyond the third segment, with the exception of the ninth, nearly uniform in size; dorsal surface reddish-brown. The fourth segment has four very small black dots, arranged transversely on the fifth, sixth, seventh, and eighth segments; these dots are arranged in pairs, the hinder pair being rather farther apart than the other two; the ninth segment bears a rounded protuberance of a colour slightly darker than that of the four preceding segments, and bounded anteriorly by a black band; the tenth, eleventh, and twelfth segments are of much the same shade as the main portion of the body, and

have the four black dots nearer together longitudinally; the anterior pair on the ninth segment are situated just behind the black band; the posterior pair behind the protuberance. The lateral skin-fold is of a lighter shade of brown than the dorsal surface; the spiracles are black, surrounded by a light-coloured ring. The claspers and anal flap are of the dark reddish-brown of the second and third segments; on the ventral surface the fifth and sixth segments are marked with two large black spots, situated in close proximity to each other; the spots on the seventh, eighth, and ninth segments are smaller and farther apart; the light shade of the lateral skin-fold is continued on the posterior half of the ventral surface of the fifth, sixth, seventh, and eighth segments, in the anterior portion of which the spots are situated.

I am indebted to Mr. J. G. Ross, of Bathampton, and Mr. Peters, of Crawley, for a supply of these larvæ. (P. H. Jennings; Ent., November, 1876, IX, 254.)

ENNOMOS TILIARIA.

Plate CVIII, fig. 4.

The larva of *Ennomos tiliaria* rests in a very stiff and stick-like position, with the claspers firmly attached to the twigs of *Betula alba* (birch), on which it feeds; the head is porrected on the same plane as the second and third segments; the legs are directed forwards, the second and third pairs being closely appressed to the pectoral surface of those segments; the head is nearly equal in width to the second segment, the face flat, and the anterior margin squarely truncate; the body gradually increases in size from the head to the twelfth segment, which is slightly the stoutest of the whole; the fourth segment, bearing the third pair of legs, is somewhat produced on the ventral surface, and the legs are seated on the elevation; their

form is a crescentic curve, and their direction forwards; the fifth, sixth, seventh, eighth, and ninth segments are long in proportion to the width; the sixth and ninth have transverse dorsal ridges, that on the sixth segment being decidedly the larger of the two; the seventh segment has a transverse ventral series of four lumps or warts, each wart being transversely elongate.

The colour of the head and body is grey and brown, except the ventral surface of the twelfth and thirteenth segments, which is glaucous-green. The thirteenth segment terminates in three points directed backwards; the middle one of these is very much smaller than the others.

These larvæ, for an ample supply of which I am indebted to Mr. Birchall, changed to chrysalids about the 16th of July, and to moths on the 1st of August. (Edward Newman; Ent., November, 1870, V, 196.)

ENNOMOS FUSCANTARIA.

Plate CIX, fig. 1.

Varieties of the Larva of Ennomos fuscantaria.—Having during the past summer (1864) made the notable discovery that the larva of this species varies more than (in my ignorance) I was pleased to think it did, I venture to give descriptions, made with Mr. Buckler's kind help, of the varieties that so far have become known to us.

The larva may be generally described as elongate, with the true legs well developed, the third pair being sometimes of large proportions, and with two anal points.

The variety which I first set eyes on gratified a crotchet of mine, inasmuch as it resembled the leaf-stalk of the ash, from which tree I beat it. In figure it was smooth; in colour it was green on the back, with a subdorsal stripe of yellow; the spiracular stripe

primrose-yellow, reaching to the mouth, and bordered above with deep green, which became lighter near the subdorsal line; the belly apple-green; two little warts on the twelfth segment; the true legs black, the ventral legs tipped with crimson-brown, and the anal legs green.

This I thought was the invariable pattern of *E. fuscantaria*, but last summer (1864) Dr. Knaggs sent me six larvæ to rear for him, and I found that at their last moult some of them developed an entirely different appearance: to wit, the ground colour was reddish-grey, slightly mottled with greenish; subdorsal yellow stripe scarcely visible; spiracular line rather greener than the ground colour, and becoming yellowish from the second segment to the mouth; across the third segment was a row of red-brown warts, the largest being on the sides; large transverse red humps on the sixth and ninth segments, and very small ones on the eighth and twelfth; lateral red warts on the fifth, sixth, and seventh, and a ventral hump on the seventh; pale lateral warts on the tenth, eleventh, and twelfth; the true legs crimson-brown, the third pair being very large.

And Mr. Doubleday sent Mr. Buckler another larva, which appears intermediate between these two. It was nearly smooth, the ground colour a pale apple-green; subdorsal and spiracular lines yellow, but not clearly defined; the last five segments suffused with pink; two small red spots placed on a swelling at the seventh segment, two dorsal warts on the twelfth, small lateral warts on the tenth, eleventh, and twelfth; on the third segment a short red-brown stripe running backwards from the spiracles to the middle of the back. (John Hellins, November 4th, 1864; E.M.M., January, 1865, I, 187.)

HIMERA PENNARIA.

Plate CIX, fig. 4.

Note on the Egg, and some Peculiarity of Structure in the Larva, of Himera pennaria.—Early last December (1880) Mr. D'Urban put into my hands an ash twig gathered by a laudable butcher's boy at Exeter, whose attention had been caught by the appearance of a batch of eggs near the tip. I ought at once to have known to what species these eggs belonged, but, luckily, did not recognise them; otherwise, probably, I should not have cared for them, and should have missed making an observation which, I think, deserves some notice.

There were just 151 eggs, laid in nine rows, parallel with the stem of the twig, in most beautifully compact and regular order, the whole mass measuring rather more than three-eighths of an inch in length and about three-sixteenths in width, and firmly stuck together, and to the bark of the twig, by an abundant supply of shining light red cement. The shape of the egg is cylindrical, set upright on end, about one-thirtieth of an inch in height and one-forty-fifth of an inch in transverse measurement; the top is rounded; sometimes the cylindrical shape becomes somewhat hexagonal, from being squeezed in so closely on all sides; the shell is glossy, with a slight roughness round the top; the colour pale green; towards spring this changes to a pale reddish-brown, and again four or five days before the larva emerges to a blackish hue. The batch of empty egg-shells looks like a piece of Lilliputian honeycomb.

The first larva was hatched on the 13th of April, 1881, and the last that came out about a fortnight later. Some died in the egg; I think, however, that the larvæ at large were delayed this year by the cold nights, and that none, probably, were hatched till the

end of April; at least, the larvæ I have captured have been quite three weeks behind my larvæ reared indoors.

The young larva is about one-eighteenth of an inch in length, in colour dull black except the anal flap, which is pale brownish, as also are the legs, tipped, however, with black; the usual spots palish brown with raised central black dot emitting a short, finely knobbed bristle; as the larva feeds the colour grows paler, becoming a sort of dark olive with pale lines; one, which I set apart for observation, moulted for the first time just a fortnight after hatching, and I noted that at this first moult there appeared the two projecting warts on the twelfth segment, which (with other circumstances) enabled me to recognise the species; but I presently also noted another change which puzzled me greatly: I took these little larvæ to be *Himera pennaria*—a species in which I had never before seen more than ten legs, nor had anyone described it with more than ten legs, but now there appeared *a pair of undeveloped ventral legs on the ninth segment*. As I have inferred, I certainly did not see these legs previous to the moult, nor do I think they were then to be seen, but what follows makes me wish I had made quite certain: this pair of legs continues through the second moult, becomes smaller after the third moult, and *with the fourth moult disappears*, the site being marked by a minute eminence, and afterwards by a *little horny depressed plate*; and the larva, to all appearance, has but the ten legs with which it has always been credited. At their fullest development these extra legs are very tiny, still they are plainly enough to be seen, and are more like the rounded ventral legs of a *Noctua* than the spreading, clinging legs of a large Geometer; they have a black ring round them midway, and a circle of tiny black horny points where the usual circlet of hooks is found.

Both Mr. Buckler and Dr. T. A. Chapman have

confirmed my observation from examination of examples which I have sent them, and we are now examining as many species of the large geometrous larvæ as we can obtain, but so far without finding any evidence of a similar absorption or suppression of a leg once developed. In other species—as, for instance, in *Anisopteryx æscularia* (Ent. Mo. Mag., Oct. 1877, XIV, 113) we find such legs developed after a moult or two, but continuing to the last in the same proportionate size; on the other hand, many *Noctuæ* when hatched have only two out of their four pairs of ventral legs of full size, but the other two by degrees grow larger, and at last take their full share in walking and holding fast.

But in this case a pair of legs is developed, is of no use at any time, and by-and-by is again suppressed; the only thing like it at all, which I can now call to mind, is the appearance of two horns behind the head of the newly hatched larva of *Cerura vinula*, which by degrees are absorbed and disappear; still, this does not seem so strange as the appearance and subsequent disappearance of even a useless limb. (John Hellins, 9th June, 1881; E.M.M., July, 1881, XVIII, 33.)

PHIGALIA PILOSARIA.

Plate CIX, fig. 5.

Distinguishing Characters of the Larvæ of Nyssia hispidaria and Phigalia pilosaria.—I have before now been puzzled how to distinguish the larvæ of these two species, and, indeed, have bred the moths of the one from what I had taken for the larvæ of the other; but this year, through the kindness of Mr. Batty, I have had the opportunity of settling this difficulty for myself, and I now venture to send a note of the most striking points of difference.

Both larvæ are alike in this, that they are very

knobby and warty; they have eight pairs of dorsal and eight pairs of subdorsal warts on the fifth to the twelfth segments—both inclusive. They differ as follows:

In *N. hispidaria* the warts, although not uniform in size throughout, yet do not vary so much; the dorsal warts on the twelfth segment being bigger than any of the rest, and the biggest subdorsal warts being on the sixth segment. And then as to the colouring—there is a more uniform pattern and mottling of orange with grey or black.

In *Phigalia pilosaria* both the dorsal and the subdorsal warts of the sixth and seventh segments much exceed in size any of the rest; and, together with some pale ochreous marks on the same segments, which begin on the sides and meet in the shape of a Λ on the back, form a distinguishing feature easily to be caught. (John Hellins; E.M.M., January, 1867, III, 185.)

NYSSIA HISPIDARIA.

Plate CX, fig. 2.

On the 19th of May, 1870, I received from Mr. J. P. Barrett, of Peckham, a few larvæ, which were then rather more than half an inch in length, and were brown, with a double row of orange-coloured spots down the centre of the back. They grew very rapidly, being full-fed on June 1st, when I took the following description:

Length about an inch and a half, of tolerable thickness in proportion to the length: Head narrower than the second segment, retractile, flattened, and notched on the crown. Body irregular, thick on the anterior and posterior segments, thinner in the middle; segmental divisions conspicuous, the anterior part of each segment being narrower than the posterior;

along the spiracles on each side, and on each segment, is a small pyramidal hump, those on the sixth segment being larger than the others; from each of these humps springs a single short hair. The usual tubercles distinct, black, those on the twelfth segment almost taking the character of humps, and lighter in colour than the others; a single short stiff hair also springs from each of these. The skin has a wrinkled appearance.

General colour of an almost uniform dark brown; head chocolate, variegated with yellowish-brown. Dorsal line rather darker than the ground colour, and bordered on each side with a conspicuous interrupted line of rust-coloured marks; between the tubercles and spiracular humps are two faint rust-coloured lines; there is also a good deal of this rust colour along the spiracles, which are pinkish encircled with black. A dull rust-coloured stripe (yellow on the ninth segment) extends along the centre of the belly. Legs chocolate and greyish-white alternately.

Feeds on oak, and turns to a pupa beneath the surface of the ground. (George T. Porritt, June 23rd, 1870; Ent., August, 1870, V, 141.)

NYSSIA LAPPONARIA.

On the 6th May, 1895, I received from Mr. W. M. Christy some ova of *Nyssia lapponaria*, which he very kindly sent to me for the purpose of figuring and describing the insect in its various stages; and having done so, I have now the pleasure of publishing the following life-history and accompanying figures of the species through all its stages.

The ovum is of a compressed oval form, with one end rather larger than the other, and measuring in its greatest diameter one-twenty-sixth of an inch; the surface is delicately and beautifully reticulated with a quinquefarious pattern; each cell is mapped out with

finely raised ridges. The colour is of a very clear bright greenish-yellow; a few days before hatching it deepens in colour, and gradually becomes deeper until, shortly before hatching, it assumes a very deep metallic blue-green hue. The ova hatched between 5 and 6 p.m. on the 16th May.

Directly after emergence the larva measures one-twelfth of an inch while extended; if disturbed it falls, suspending itself by a web; and if falling upon the ground, remains for a short time in a looped attitude.

The larva in its first stage and when ten days old is one-sixth of an inch long, cylindrical, and of uniform thickness throughout; the ground colour is a deep dull black; the first segment has the anterior edge white, forming a collar and encircling the segment. Immediately behind the collar is a series of very minute warts, each beset with a short fine bristle. The fourth, fifth, sixth, seventh, and eighth segments are each encircled with a number of pure white markings, consisting of fourteen on each segment (seven on either side); the dorsal pair are longest, and are separated by a medio-dorsal black line. These, as well as the two largest lateral spots and the lowest ventral one, have each a black central wart emitting a short whitish bristle; the second, third, ninth, tenth, eleventh, and twelfth segments are principally spotted on the lateral region. The head is black, with white spots at the mouth. The legs and claspers are black. During the first stage the larvæ fed upon both birch and whitethorn, and appeared to prefer the latter if one more than the other. The first moult occurred on 31st May.

Before the second moult, twenty-one days old, it measures three-tenths of an inch in length; the ground colour is lilac-brown, with fine white longitudinal lines running the entire length, which are dorsal, subdorsal, superspiracular, and subspiracular. On the fourth, fifth, sixth, seventh, and eighth

segments are six lemon-yellow spots (three on each side), and of the same form as in the previous stage, one being dorsal and forming a transverse mark, the other two on the spiracular line, one elongate transversely, the second round, and each having the black central wart emitting a short hair as in the previous stage; the head, legs, and remaining details being likewise similar. It rests in a straight attitude, with the head slightly bowed, and the first three anterior segments slightly arched, thereby drawing together the first two pairs of legs; a silk cord from the mouth is attached to the stem while the larva is resting. The second moult took place on the 6th June.

Before the third moult, when twenty-six days old, it is nine-sixteenths of an inch long; the body is of uniform thickness and cylindrical; the ground colour is whitish with a lilac-grey tinge, becoming yellowish shortly before moulting; it is chequered with black markings that are arranged in longitudinal bands, which are medio-dorsal, subdorsal, superspiracular, and spiracular; the spiracular row is formed principally of conspicuous black blotches, commencing on the fourth and ending on the eleventh segments. Immediately below these markings is a series of bright light yellow markings running the entire length; the dorsal markings, as in the previous stage, are also bright yellow. The ventral surface is similarly coloured and lined as on the dorsal region, but rather uniformly darker; the head, legs, and claspers are grey, speckled and streaked with black. It generally rests in a straightened attitude. The third moult happened on the 11th June, and directly after moulting the ground colour is a light olive-yellow; all the markings are as in the previous stage, but brighter and more clearly defined. The head, legs, claspers, and anal segment are all of a clear pinkish-white, speckled with pale olive, the colouring of these parts remaining such but for a short time. The cast skin is not eaten by the larva of this species.

Before the fourth moult, thirty-two days old, it measures nine-tenths of an inch. As in the previous stage it is cylindrical, and of uniform thickness throughout; the ground colour is pale primrose-yellow; the longitudinal bands, which are outlined with fine black lines composed of numerous black specks and streaks, have the interspace of a leaden-drab colour, these bands being divided by primrose-yellow lines, thus forming longitudinal rows of alternating stripes; the leaden-drab stripes are medio-dorsal, subdorsal, superspiracular, and spiracular; on the latter band are situated the spiracles, which are small and intensely black; each is placed on a squarish dull deep black spot, forming a conspicuous row of spots; each is bordered on the lateral and posterior sides with bright lemon-yellow, the yellow being again relieved laterally by a black streak; on the posterior half of each segment uniting the medio- and subdorsal bands is a short transverse lemon-yellow bar united to a black spot in the subdorsal band. The remaining details are in every way similar to the previous stage. It rests in a straight position upon the stems of birch, frequently straight along the stem, but sometimes only with its claspers grasping it, and the head a short distance away, but always with a silken thread from its mouth to the stem. The fourth and last moult took place on the 18th June.

After the fourth moult, forty-two days old and fully grown, it measures an inch and a half in length. In every detail the preceding description agrees precisely with this stage, excepting that the yellow markings are now rather deeper, of a gamboge-yellow, and the ground colour of the dorsal surface is also rather deeper, and of course the size increased when fully grown. The ground colour varies in different specimens; of the four larvæ in my possession three having the yellow of different depths, and the fourth of a decided lilac-drab hue; this, with the black markings, assumed quite a deep drab-brown, closely

resembling the colour of the birch stems. (Mr. Christy, referring to this colour variation in a letter recently received from him, says: "The ground colour varies considerably; I have had them dark purplish-brown, so that they matched the birch twigs; and I have had them almost putty-coloured.") The first larva buried for pupation on the 27th June, having remained in the larval state forty-two days.

The pupa is six-tenths of an inch in length; the head and thorax uniformly rounded in front; round the middle of the wings it is rather contracted; the fifth abdominal segment, including the apical portion of the wings, is swollen, the remainder of the abdomen being attenuated; the posterior segment terminates in a slightly curved conical point, cleft at the end; on the same segment at either side is also a short point. The entire surface is finely granulated, the head, thorax, and abdomen of a deep red-brown; the wings, antennæ, and leg cases are light sienna-red; the eye cases are rather conspicuous and blackish. It has no cocoon, being simply buried an inch or two under the surface of the earth.

Mr. Christy has kindly communicated the following:

The ovipositor of the female moth is very long, quite a quarter of an inch. The eggs were laid through some green leno; several folds of it had been tucked inside a chip box, and the eggs were laid between the leno and the box. The female must be able to push her eggs into any chink or crevice quite out of harm's way. I have noticed that *Amphidasis prodromaria*, *A. betularia*, and *Nyssia hispidaria* all like to deposit their eggs in the same way, that is, pushed a long way into some narrow chink, or between folds of muslin or leno. The eggs are laid in a rough untidy batch, sometimes somewhat overlapping one another, precisely after the manner of *N. hispidaria*, and to the naked eye they are in size and shape exactly like those of that species, but the colour is different. (F. W. Frohawk; Ent., September, 1895, XXVIII, 237.)

CLEORA GLABRARIA.

Plate CXI, fig. 2.

For some acquaintance with this species in the larval state I have been indebted to Mr. Bernard Lockyer, who, on the 1st of June, 1875, kindly sent me a larva, and on the 10th six others; and to these were added four more on the 22nd, from Mr. Tate, of Lyndhurst; all of these having been found by him feeding on *Usnea barbata* growing on oaks in the New Forest.

With the exception of the first individual, which died the morning after its arrival, these larvæ were very active, and fed well on the extreme points of the lichen, eating them down rapidly for about an eighth of an inch, and sometimes eating off the nodes, and more rarely the cuticle from the larger branches. I was attentive to keep their food changed, and to moisten it with water thrice a day, as I soon found, if it became at all dry, they were unable to feed.

One larva was contracting for its final change when it arrived, but had not strength to complete it; on the 16th of the month another had apparently ceased to feed, and would no longer remain on the lichen, but would mount to the gauze cover of its cage, persistently returning to it as often as removed. Various substances and soils were supplied to induce it to spin up, but in vain; however, after the lapse of some days the mystery of its strange behaviour was cleared up by the appearance close by it of an ichneumon cocoon, or rather batch of four or five small cocoons spun on the gauze; another, later on, was victimised in precisely the same manner, while three others proved healthy and vigorous, retiring when full-fed into the wet tree-moss kept beneath the lichens, where I observed they had each hollowed out a small cavity, which was kept in an oval shape by help of a few threads, rather far apart, spun across the opening;

but these could scarcely be called cocoons, for when looking about a week afterwards, on the 28th, for the pupæ, two of them rolled out into my hand on taking up the moss, so little coherence had these slightly made puparia.

Of the remaining four larvæ, two pupated as above described, and two proved to be ichneumonated, one of these dying quite rigid, and the other lingering on, attached to the cocoon of its parasite, for some time after the pupæ had disclosed the moths, which proved fine specimens, appearing from July 11th to 21st.

The full-grown larva is nearly an inch in length, moderately slender, and of about uniform substance throughout; the head, a trifle less than the second segment, is a little flattened in front; the segments of the body very well defined, the thoracic ones as usual, each of the others having a wrinkle across the back at the distance of one-third from the beginning, and three others near the end; the anterior legs developed in gradation, the shortest pair in front, the second pair a little longer, and the third pair the longest; the ventral and anal pairs well developed.

In colour the head is pale greenish-white in front, light glaucous-green at the sides, reticulated with whitish; near the crown, on each lobe, is a black streak undulating down to the antennal papillus, and bounding the whiter face from the greener side of the head; above the mouth is a triangular mark of blackish-brown atoms; the ground colour of the body generally is a pale blue-green, that of the back has a more lively green tinge, though so pale as to be a greenish-white; through the back can be distinguished the dorsal line by its bluer tinge, besides a small streak on either side of it anteriorly on each segment excepting the thoracic, which are broadly divided with it; but the chief feature of the back is the row of black spots, viz. one rather oblong spot on the whitest portion on each thoracic segment, and on the others an oblong spot just at the beginning, and another

thicker, of a blunt spear-head shape, about midway towards the end of each segment, and a small spot on the anal tip,—these are upon the dorsal line; along the boundary of the whitish colour of the back runs the row of subdorsal black dashes; these are short and situated midway on the thoracic segments, and on the others are behind the first wrinkle extending nearly to the segmental division; these vary in individuals, being in some simple oblong dashes, while in others they appear open at one end, and in others again at both ends, suggestive of parallel streaks run together in the middle; but in all, each of these dashes is bounded below by a greenish-white dash of the same extent, followed by a group of two or three small angular black spots or streaks, amongst which is the spiracle, which though appearing blackish has a faint flesh-coloured centre; next runs the inflated greenish-white subspiracular stripe marked with a black dash at the beginning of each segment, except on the anterior ones, which are marked in the middle with a squarish spot, and a small black spot is at the base of each anterior leg; the belly has a central faint greenish-white line with a black elongate mark on it at about the middle of each segment from the fifth to the ninth, both inclusive; a little more behind, on each side the central line, are a twin pair of black specks, and a couple of greenish-white spots on each side at the beginning of each of these segments; a very small black mark is at the inside base of each anterior leg; the anterior legs are glistening; the head and body are smooth without gloss; the tubercular dots are excessively small and dusky, each emitting a fine bristly hair.

The pupa measures about half an inch in length, and in its greatest diameter, at the ends of the wings, one-eighth of an inch; the eye-covers rather prominent, and the abdominal divisions deeply cut, the anal tip bearing a spike finely forked at its extremity; at the end of the first week the wings were olive-

green, the other parts brown, the anal spike blackish; the whole surface glossy. (William Buckler, 30th July, 1875; E.M.M., September, 1875, XII, 84.)

On August 12th, 1877, I received a batch of about 24 eggs of this species from Mr. W. H. Ballett Fletcher, of Lyndhurst, laid by a captive female on the 9th and 10th, the parent having been taken from the trunk of a beech tree. These eggs were laid on a small branch of *Usnea barbata*, each egg separate, often at the very extremity, or near it, of the fine tips of the lichen, and adhering to them.

The shape of the egg is roundish-oval, with a depression on either side, its surface covered with minute pits, the colour light greyish-greenish-white, and glistening.

None of this batch of eggs hatched, but Mr. Ballett Fletcher obtained a few others from a much worn female, captured towards the end of August, and these eggs changed colour, two days after being laid, to a faintly perceptible pink tint. They hatched on the 10th September, and on the same day were forwarded to me with a bit of the lichen in a quill.

On the 11th I received them, and found two or three had died during the journey. The others, very active little loopers, now two days old, were flesh-coloured, without any markings. They feed on the fine extreme tips of the branches of the lichen. By September 22nd they had moulted once, if not twice, and were still unicolorous but something more greenish-ochreous in their colour, and tinted rather deeper on the back than on the belly. On October 8th I found they had died from the plant being attacked with mildew. (William Buckler, October, 1877; Note Book III, 209.)

BOARMIA ABIETARIA.

Plate CXII, fig. 1.

I figured the larva of this species as long ago as 1863, but none the less do I feel indebted to the Rev. Bernard Smith for kindly sending me eggs in July, 1876, and thus giving me the opportunity to become more thoroughly acquainted with all its changes.

The food which is generally given for the larva is fir; the examples I had in 1863 chose birch in preference to fir; Mr. Dorville, I remember, found a larva once on whortleberry, which he reared to maturity on the same plant; but from Mr. Machin I learnt that though he had formerly taken the larva *very sparingly* on oak, beech, pine, and spruce fir, it was not until many years afterwards that he discovered the larva to be quite common on yew (*Taxus baccata*), and from subsequent experience was convinced that this tree was the favourite and proper food. For enlightenment on this important point I am greatly indebted to Mrs. Hutchinson, who, in June, 1876, most kindly presented me with three fine full-grown larvæ which she had reared on yew, and I used this food most successfully to rear the larvæ from the eggs which Mr. Smith gave me.

These eggs were laid on July 30th, by a female moth confined in a coarse muslin sleeve over a branch of yew; however, in part she disregarded the branch, and extruded the eggs through the interstices to the outside of the muslin, where they adhered. The larvæ hatched August 12th and 13th, and fed away well; when, however, it became necessary to change their food, their complete assimilation to the colour of the under side of the leaves caused me from time to time to overlook one or two, and thus my stock, at first numbering twenty-seven, was reduced to twelve by the end of the year.

Their time of hibernation began about the middle

of October, and lasted in a very partial way until the following spring, as they frequently moved a little, and nibbled their food during that period; at the end of March, 1877, they fairly waked up, began to moult and thrive, and the most forward individual attained full growth by the 21st April, entering the earth on the 28th, and followed by the others at intervals up to the 9th May. The moths, ten in number, *i. e.* eight males and two females, and all finely developed, were bred from the 8th to 21st June.

The egg in shape is oblong, elliptical, and has a depression on some part of the side, its surface finely ribbed lengthwise and pitted between the ribs; the colour a light subdued green, glistening with a pearly lustre, changing on the seventh day to a paler tint of greenish-drab, and again on the fourteenth day to a deeper hue of olive-grey, when the embryo shows through the shell as a dark line, and on the next day it hatches.

On escaping from the shell the larva is a slender little creature, with an ochreous-green head, a very pale greenish stripe down the back, a blackish-olive stripe on the side, a whitish stripe below, and the belly dark olive-green. When nine days old it is about a quarter of an inch in length, the colouring of the stripes rather browner, and within the pale stripe of the back appears an extremely fine dark green dorsal thread; at this time when disturbed it is an active little looper, but otherwise often hangs by a thread from a twig motionless; when a fortnight old, the dark stripes begin to open into very fine parallel lines. At the age of five weeks it is a little more than three-eighths of an inch long, of uniform moderate substance, with anal legs well developed, ground colour light brown, with darker lines and paler edges to them, showing much of the characteristics of the mature state, *viz.* blackish subdorsal and lateral marks at the hinder parts of some of the segments, and thick blackish dashes below the spiracular region;

the ventral surface dark brown with paler lines; it is now rigid and stick-like, and as it has the habit of drawing the anterior legs up in a bunch close to the head, and as the anal legs are stout and thick, it has the appearance of being stoutest at each end.

During the winter it seems to grow a little, and towards the approach of spring its length varies from half an inch to five-eighths, and the stoutness in proportion; as it approaches full growth its ravages become apparent; it often eats away all the leaves on one side of a yew stem before attacking those on the opposite side; and when it has quite stripped the end of a twig it still keeps to the bare stick as a comfortable resting-place, returning to it, even after feeding at some distance, by help of the strong silk thread attached to the twig from its spinneret, just as in its more juvenile days; at this more mature age, however, the thread is not easily broken, and always drawn forth in its leisurely progress, both on leaving and regaining its bare stem, to stretch itself along it at full length, and embrace it with its legs as it settles itself for a day's sleep; it seems to be only at night that it feeds or moves unless disturbed, for when I had three or four examples asleep on twigs openly before me for many hours, no movement occurred beyond the mere expulsion of a pellet of frass at intervals; probably, at large, on a yew tree, it would be completely hidden from view.

The full-grown larva measures an inch and a half in length, and about three-sixteenths, or nearly, in diameter throughout, though the head is a little less than the second segment, its lobes rounded and well defined on the crown; the segmental divisions are indicated by a fold of the skin; beyond the thoracic segments each has two faint wrinkles anteriorly across the back, and three or four towards the end, rather deeper on the sides, where the skin is much puffed and puckered, especially along the spiracular region; the muscles of the ventral and anal legs largely developed; the tuber-

cular warts rather prominent, especially the hinder dorsal pairs, which are larger than the front pairs, and as well as those along the sides are on little tumid eminences. Of the ground colour there are two varieties: one is light ochreous-brown, having conspicuously paler cream-coloured patches on the back of several segments; the other variety is dark greyish-brown with paler patches, sometimes of light cinnamon-brown, often palest on the fifth, ninth, and tenth segments; the head is much freckled with reddish-brown, and has a brown conspicuous spot on the front of each lobe, and another just above each papillus; the dorsal line on the thoracic segments is but just indicated by very short double black marks at their divisions, but it is more complex on the other segments, being composed of a fine central pale thread within two lines or series of brown freckles, which widen gradually as they approach between the second pairs of tubercles, and then as gradually contract towards the end of each segment; these are followed in a parallel direction on either side of the back by a pale line edged outside with a line of brown freckles, some lighter, some darker, and after an interval of ground colour by the pale subdorsal stout line, edged on both sides with a thin line of brown freckles; the front pairs of warts are black on the fifth, sixth, seventh, eighth, and ninth segments; and the hind pairs, though pale in part, are involved in a strong black mark which, flowing from them, darkens the parts of both adjacent lines to the segmental division; sometimes, but not often, these black markings are present on the four hinder segments, otherwise the warts only bear a black dot; along the side occurs a faint pale wavy line, edged below with black, but this is interrupted for a space just behind each lateral black wart, and again continued to the segmental division; the spiracles are of the ground colour, roundish-ovate in form, and strongly outlined with black, and in front of each is a short line of a few

black freckles; lines occur on the belly, but are very faint. Each tubercular wart emits a fine short bristly hair, and these hairs are rather numerous on the head, the thirteenth segment, and anal legs.

When full-fed, and beginning to contract for its change, the colouring of the larva is turned to a dingy smoky-green.

Apparently it makes no appreciable cocoon, and a few days before the moth is disclosed the pupa makes its way upwards towards the surface of the earth.

The pupa is about three-quarters of an inch in length, stoutest across the ends of the wing-covers, where its diameter is a quarter of an inch, and from whence it tapers gradually to the end of the abdomen, which is furnished with a tapering projection, separating near the end into two fine short points; the surface of the thorax and wing-covers smooth, the abdominal rings very finely punctate, their divisions smooth, and of a dull violet-brown colour; all the other colouring dark brown and glossy. (William Buckler, February 11th, 1878; E.M.M., March, 1878, XIV, 219.)

BOARMIA CINCTARIA.

Plate CXII, fig. 2.

It gives me great pleasure to record my thanks to Mr. J. G. Ross for kindly supplying me with eggs of this species on May 26th, 1876, which were laid together in a cluster.

In shape the egg is elongate, elliptical, bluntly rounded at one end, and more gradually at the other, near which occurs a depression; the surface ribbed longitudinally and pitted; in colour light olive-drab, iridescent with the play of light in the numerous pits, and having a slight degree of transparency, showing, when held against the light, the darker embryo within; the colouring changes the day before hatching to pinkish-grey.

The larvæ hatched on May 28th, and at first they were dark olive-brown, with pale olive-green head, a whitish stripe along the back, another along the side; several kinds of food were given them, but they unmistakably preferred birch, on which, after wandering over other leaves, most of them settled down, and began to eat minute patches of cuticle from the under side, causing transparent specks to appear on the upper surface of the leaves. By the 3rd of June some had escaped, probably during my previous inspection, and one had died on an oak-leaf; the remaining twelve had moulted, and were pale greenish-yellow on the back, with a very broad darker greenish stripe on each side. After another moult, by the 9th, they were a quarter of an inch long, of olive-green colour, with several fine, equidistant, double, longitudinal, darker lines; at this time they were very lively active loopers, and had been apparently feeding a little on oak as well as birch, but preferring the latter. By the 12th they were five-sixteenths of an inch long, and much paler green in colour, with lines only just visible, and by the 15th had again moulted and become darker, and on the 18th were nine-sixteenths of an inch long, having distinct dark lines with the addition of pale subdorsal stripes; by the 23rd the most forward individuals had increased their length to three-quarters of an inch, and were stouter in proportion, their lines still more distinct, the subdorsal white stripe relieved now by a specially dark one beneath.

By the 1st of July they had moulted for the last time, and in the course of three or four more days attained their utmost dimensions, becoming full-fed and returning to earth from July 6th to 10th.

The first moth came forth on April 25th, 1877, simultaneously with about a dozen of *Æcophora pseudopretella*, both species continuing to appear at intervals, and the last specimen of *B. cinctaria* on May 12th, in all seven males and three females, a

wonderful result, as only two of the pupæ had been found and devoured by such a number of those insatiable pests, which appeared to have fed chiefly on the remains of the birch leaves amongst which they had spun themselves up. The *B. cinctaria* seemed not to have made any appreciable cocoons, as the pupa skins were found at the bottom of the pot, at a depth of four inches, apparently loose in the coarse friable soil.

The full-grown larva is an inch and a half in length, moderately slender, nearly of uniform bulk when viewed from above, but when viewed sideways is seen to taper very slightly from the tenth segment, both toward the head and also behind; the head is rather wider near the mouth than at its junction with the second segment; the skin is soft and smooth, its general ground colour a light and tender green, the head the lightest, and rather pinkish at the mouth, the ocelli black; on the second segment the lines to be mentioned are all very faint; the whole of the back appears much lighter than the sides and belly, from the number and closeness of pale longitudinal lines, which are relieved by fine thread-like edges only of the green ground; the dorsal line is rather bluish-green, darkest near each segmental division, and having an exceedingly fine, ragged, greenish-white central thread; close on either side of it comes a ragged-edged, yellowish-white or yellowish line, followed closely by another, less light or fainter, and again by a wider, ragged-edged whitish subdorsal line; these are each defined by a fine thread of green edging, and are relieved below by a wide line of rather darker bluish-green, having a very fine, ragged, paler thread running through it; below, again follows a faint greenish-white thread, edged with a darker thread of bluish-green, followed by a broad space of the light green ground, only faintly marked with the slightest possible trace of a pair of paler threads along the spiracles, which are small, roundish, oval and flesh-

coloured, delicately outlined with black, the skin below them a little puckered, showing yellowish in some places; the belly is of a more bluish-green, having a ventral paler stripe, faintly edged with darker green than the ground, and on either side are two faintly paler ragged lines, also edged with darker green; the lines of the back all terminate in front of the anal flap, which is light yellowish-green, with a sprinkling of most minute black freckles; freckles also occur on the hinder parts of the anal legs; a fine short bristly black hair proceeds from each of the usual tubercular situations, but can only be seen with a strong lens.

The pupa skin is nine-sixteenths of an inch in length, of ordinary shape, thickest at the ends of the wing-cases, plump in character, tapering rather suddenly to the anal tip, which has a small projection and a spike from it divided in two sharp points; the abdominal divisions are smooth; the rest of the surface is finely punctate; the colour dark mahogany-brown, and rather shining; on the abdomen a few extremely fine short hairs pointing backwards. (William Buckler, August 9th, 1877; E.M.M., September, 1877, XIV, 83.)

BOARMIA ROBORARIA.

Plate CXII, fig. 3.

I am indebted to the kindness of my friend Mr. J. P. Barrett, of Peckham, for the opportunity of watching this interesting species in all its stages. The eggs, which I received on the 11th of July, 1871, seemed to be deposited in clusters, were oblong-oval in shape, and in colour reddish-brown.

On July 14th they hatched, and the young larvæ were at once supplied with fresh oak-leaves, on which they fed so long as leaves were obtainable; this food failing in the autumn, tender oak-twigs were sub-

stituted ; and to these the larvæ (then having attained a length of three-quarters of an inch) attached themselves by silken threads spun over the twigs, the threads being then grasped by the claspers ; in some instances the threads were also even spun over the hinder segments of the larvæ. In this position they spent the winter in a semi-torpid state, but in mild weather fed with evident relish on the tender bark, sometimes eating nearly through the twigs. In early spring many of them died off ; and the only one which reached maturity was full-grown early in June, when I described it as follows :

Length about two inches, and of average proportionate bulk. Head flat, and deeply notched on the crown, narrower than the second segment, into which, when the larva is at rest, it is partially withdrawn. Body cylindrical, of tolerably uniform width, but with several prominences, as follows : the fifth segment is swollen from the sides into two conspicuous dorsal humps, divided by a notch on the centre of the dorsal surface ; on the sixth segment is a transverse *ventral* ridge ; and on the twelfth are two very small dorsal humps ; there are also two short anal points. Skin tough and rather shining, puckered on the anterior and posterior segments, but smooth on the middle of the dorsal surface. The ground colour is marbled with almost every shade of pale brown, tinged in several places with dull dark green, and blotched along the sides with pale bluish-grey. Head chocolate-brown, the face mixed with grey. Medio-dorsal stripe interrupted and indistinct, a little darker than the ground colour ; subdorsal and spiracular stripes scarcely perceptible. Spiracles distinct, pinkish-brown, encircled with chocolate. The ground colour of the ventral surface is variegated with the same shades of brown as the dorsal surface, but has in addition several purplish marks ; on each side of the ridge on the sixth segment is a pale yellow mark ; there is also the rather broad,

interrupted, dull yellow central stripe, characteristic of the genus. Legs pointed and curved inwards, dull chocolate-brown, the first joint paler than the others.

When at rest the larva greatly resembles a twig, the notched head being exactly similar to two oak-buds.

The single larva went down on June 10th, and the imago, a female, appeared on the 5th of July, 1872. (George T. Porritt, December 11th, 1872; Ent., January, 1873, VI, 281.)

I am indebted to Mr. W. H. Harwood for repeated help in rearing this species, enabling me at length to offer an account of all its stages. With larvæ sent in 1868 I failed entirely, but succeeded much better with eggs in 1871; and this past spring (of 1874) I have again been furnished with a larva after hibernation, in order to make sure of one or two points.

The eggs reached me on the 5th of July; the larvæ were hatched on the 15th, and I soon put them outdoors on a young oak; when about three-quarters of an inch in length they hibernate, taking up a position on a twig, and remaining motionless as if growing from it; about the end of January, 1872, I found them gnawing the back of the twigs, and this they did at intervals till they had barked all the twigs of their oak-plant, and checked the development of the buds; so that on looking at them about the end of March I found some dead from starvation, and the survivors looking shrunken; I now put them on a fresh plant, the leaves of which had been forced, and on these, as well as on the tender green stems of the new shoots, they fed well, becoming full-grown towards the end of April or beginning of May; the moths appeared between June 5th and 12th.

The egg, as is the case in this genus, is small in proportion to the moth, of flattened oblong figure, one end blunter than the other; the shell down the sides reticulated in regular rows of four-sided meshes, with knots or little knobs at the angles, and generally one or two extra on one of the four sides, as though

the shape were meant to be a pentagon or hexagon ; at the ends the meshes are pentagonal or hexagonal, with the knots in their proper places ; the colour of the eggs when received was dull greenish, one end becoming deep pink, the little knobs being white ; at last the whole egg became dark brownish.

The newly hatched larva is without humps, in colour pale green, with broad dark-brown lateral stripe, and head pale reddish-brown. The first moult takes place in about a week, and the young larva comes out with indications of a hump on the sixth segment ; the colour pale ochreous on the back, lateral stripe pale brown, spiracular stripe pale ochreous, belly darker.

After this the larva gets darker in colour, and attains a length of about three quarters of an inch before hibernation ; the head is now notched, and large for the size of the body, and the ventral and anal pairs of legs are also large ; the sixth segment is puffed, and bears two transverse humps on the back ; the seventh with a pair of ventral warts ; the twelfth with a transverse dorsal ridge bearing a pair of warts. The colour is dull purplish on the back, the belly paler and more brownish, the folds, humps, and ventral and anal legs all dusky grey ; the head ochreous, freckled with brownish ; at the folds a slight dorsal pattern, viz. a blackish spot with an ochreous spot on either side.

After hibernation it moults once, and then feeds up.

The full-grown larva is about an inch and three-quarters in length ; from above it appears of about uniform bulk throughout, except at the sixth segment, but sideways it appears stoutest at the ninth and tenth segments ; the head is narrower than the second segment, flattened in front, notched on the crown, the lobes rising in conical prominences ; the sixth segment very much swollen on the back and sides, and bearing a pair of puckered subdorsal humps ; the swelling begins just below the spiracle, which is thus lifted considerably above the level of the spiracles

of the other segments; the seventh bears on its belly a pair of transverse puckered humps, in some specimens looking more like two sets of warts—three in each; the twelfth has a slight transverse dorsal ridge bearing a pair of warts; in some specimens, also the fourth bears a pair of three-lobed, transverse, sub-dorsal humps; the front pairs of legs on the third and fourth segments are well developed, as well as the ventral and anal pairs; the anal flap triangular, somewhat rounded at the tip, the thirteenth (under the flap) ending in two bluntish points, with a shorter sharper one between them; the skin glossy, but wrinkled on the hinder part of each segment.

The ground colour is generally purplish-brown, sometimes more cinnamon-brown, the folds and humps dark brownish-grey; there is not much pattern, and different individuals vary in the amount of patches of paler colouring, some having broad patches of cream colour in the spiracular region of the fifth and tenth segments; the sixth sometimes tinged with rust-colour; the dorsal line appears as a palish dash on the front of each segment, and a spot just at the end; similar pale spots are sometimes seen where the sub-dorsal line should be on the sixth and ninth segments; the head brownish; the spiracles dirty white, outlined with black.

The whole appearance of the larva, both in outline and colour, is extremely suggestive of an oak twig, and it preserves the resemblance under one or two changes of attitude; sometimes standing stiffly out, with the body in a straight line up to the eighth segment, then the seventh bent slightly upwards from this, and then from the sixth to the head again in one line; the head and thoracic segments and legs more or less "bunched" together; sometimes standing off at a wider angle from a twig, and then with the whole front of the body from the sixth to the head inclined—in a stiff line—towards the twig again; in this position it looks like what had been a forked twig,

with one of the forks broken off; in walking, its humps lose much of their prominence, and then it looks much like other stout geometers.

The pupa is enclosed in a slight cocoon, placed just on the surface of the soil, and formed by drawing together moss, etc.; it is about three-quarters of an inch long, cylindrical, the thorax and upper part of the abdomen stoutish, the lower part tapering off rapidly; the wing-cases granulated and dull, the abdomen glossy; the whole pupa skin sparsely set with fine bristles; the anal spike triangular, flattened, and ending in a long fine spine, barely bifurcated at the tip; colour a very dark brown, with the abdominal rings reddish. (John Hellins, May 30th, 1874; E.M.M., July, 1874, XI, 40.)

BOARMIA CONSORTARIA.

Plate CXII, fig. 4.

Another geometer which came commonly to sugar, but not so abundantly as did *Tephrosia extersaria*, during the expedition of Mr. W. H. Tugwell and myself to Abbott's Wood, Sussex, in June, 1892 (see Ent. Mo. Mag., March, 1895, p. 65), was *Boarmia consortaria*.

Eggs deposited by some of the specimens taken were bright green, and small for so large a moth.

The young larvæ hatched on June 24th, and fed well on oak, birch, and willow, some of them being almost full grown by August 3rd, when I described them as follows:

Length about an inch and three quarters, and slender in proportion; head slightly narrower than the second segment, notched, but not deeply so, on the crown, the lobes rounded at the sides, but flattened in front, giving the face a flat appearance. Body cylindrical, of fairly uniform width, but swollen a little towards both extremities. On the sixth segment are

two prominent humps; two other, but much smaller, humps on the twelfth segment, and still two more small ones, pointing horizontally, at the extreme tip of the thirteenth segment; skin smooth, but with a slightly wrinkled appearance.

The colour varies extremely in different specimens, but the variations are mostly among the brown forms.

Var. 1 has the ground colour a pale glaucous-green, and through it the alimentary canal can be distinctly seen, and forms a darker green dorsal line; head yellow, but almost covered with pale brown marbling; the mandibles and a few small dots at the bottom of the side of each lobe, very dark brown; the humps on the sixth segment chocolate-brown, the smaller ones on the twelfth segment paler brown; spiracles large and distinct, white, encircled with very dark brown. Ventral area of the same colour as the dorsal surface, but having a pale pinkish stripe extending longitudinally through its centre; the legs marbled with pale brown like the head, anal segment and prolegs yellowish-brown, the extreme bases of the latter dark chocolate-brown. Judging from my larvæ reared from several batches of eggs, this is the least common form.

Var. 2 has the ground colour brown, yellowish, or greyish, strongly marked or marbled with dark brown or red-brown; the top of the head in these forms having a pale yellow streak, edged above with very dark brown or black, and the head generally being much darker than in Var. 1; the warty humps on the sixth and twelfth segments are dark chocolate-brown, the tips in some examples being red; spiracles pale, encircled with very dark brown or black. The ventral surface partakes of the colouring and marbling of the dorsal area, but the broad central stripe is much more conspicuous than in Var. 1; in some cases it is ochreous-brown, with smoky edging throughout its length; in others, generally the darkest larvæ, the ochreous is interrupted at intervals with patches of darker colouring. The legs and prolegs vary so

much in the amount and position of the brown on them, that to describe any of them in detail would probably be misleading, so far as concerns the determination of casually-captured larvæ.

Feeds on oak and birch, and in captivity also well on willow.

By August 23rd nearly all the larvæ had disappeared below the surface of the ground, and the moths, a very fine series, emerged from May 16th to nearly the end of July following. (George T. Porritt, September 12th, 1895; E.M.M., October, 1895, XXXI, 226.)

TEPHROSIA CONSONARIA.

Plate CXIII, fig. 1.

On May 15th, 1871, I received from Mr. H. W. Marsden, of Gloucester, a few eggs of this species; they were oval, and in colour dull reddish-purple. In a fortnight, the young yellowish-green larvæ emerged, and took readily to oak and birch. By June 23rd a length of about five-eighths of an inch had been attained, and the general colour was dark brown, with a broad yellow double medio-dorsal stripe; the head paler brown than the ground.

On July 25th they were full-fed, and may be described as follows:

Length nearly one and a half inches, and very slender in proportion; head a little wider than the second segment, globular, rather flattened on the face, and very slightly notched on the crown. Body nearly cylindrical, but slightly flattened on the dorsal, and still more so on the ventral surface. The segments overlap each other, and thus render the divisions conspicuous. The usual dots are slightly raised, and on the twelfth segment appear as two slight humps; the skin has a wrinkled appearance.

The ground colour varies in different specimens from yellowish-green to yellowish-brown; the head is pale,

thickly mottled with light or dark brown, according to the shade of the ground of the body. A dark green pulsating vessel, bordered on each side with yellowish-green, forms the medio-dorsal stripe; there are no perceptible subdorsal or spiracular lines. The spiracles are white, encircled with black; the slight humps on the twelfth segment black. The ventral surface is yellow, tinged with green; the legs and prolegs are brownish. (George T. Porritt, May 16th, 1872; E.M.M., June, 1872, IX, 17.)

TEPHROSIA CREPUSCULARIA.

Plate CXIII, fig. 2.

On the 2nd of June, 1871, I received from my friend Mr. J. P. Barrett, of Peckham, several larvæ of this species, which, being full-grown, I described as follows:

Moderately stout, length about an inch and a quarter. Head flattened and notched on the crown, the same width as the second, but very much narrower than the third segment, which is swollen laterally, forming a prominent hump on each side; the remaining segments are uniform, and of about equal width until the twelfth is reached, where there is a slight lateral dorsal ridge. Skin rather wrinkled, puckered along the sides. The third pair of legs appear longer than the others, caused by the fourth segment being swollen ventrally.

Ground colour stone-grey; in some specimens very distinctly variegated with reddish-ochreous, whilst in others a dull dirty black prevails.

In the grey variety, which I will call Var. 1, the head is stone-grey, marbled with different shades of brown; the medio-dorsal stripe is dull dirty green, interrupted on several of the segments; to the fifth segment the subdorsal lines are dark sienna-brown, with a fine rust-coloured centre; at this segment they

are interrupted, but continued without the rust-coloured centre, at the middle of the sixth, until the eleventh, when they turn downwards towards the front prolegs, forming an angle enclosing a pale yellow mark; they are seen again as a short, oblique, dark sienna-brown streak on each side the ridge on the twelfth segment; on the sixth segment the subdorsal lines also pass obliquely upward, meeting in the centre, and forming a conspicuous V-shaped mark, the apex being pointed anteriorly; there are no perceptible spiracular lines, that region being variegated with smoke colour. The general colour of the belly is dull yellow, thickly clouded with smoke-colour, the space between the two pairs of prolegs being grey. The spiracles are small, and brown with pale centres.

Var. 2, the form variegated with reddish-ochreous, has the head reddish-brown, marbled with darker brown, and a black V-shaped mark, the apex of which is pointed towards, and close to the notch in the crown; the medio-dorsal line the same as in Var. 1, as are also the subdorsal lines, but the pale mark on each side of the eleventh segment, above, and slightly in advance of, the anterior pair of prolegs is lemon-yellow, much brighter than in Var. 1. The ventral surface as in Var. 1, but having the characteristic reddish-ochreous variegations.

Var. 3, the smoke-coloured variety, is the darkest form I have seen. The head is grey, marbled with smoke-colour, and this smoke-colour also prevails on the dorsal surface of the body. Singularly, the pale mark above the anterior pair of prolegs is paler than in either of the other varieties, being nearly white.

The larvæ seem partial to oak, and when at rest, grasp the stem with the claspers, stretching out at full length, with the anterior part raised. The two anterior pairs of legs are tucked in, whilst the ventral humps render the third pair very prominent. All the legs are slightly bent inwards.

At the time these larvæ were changing to pupæ, I

was taking the perfect insect of the closely allied *T. biundularia* at large. (George T. Porritt, January 8th, 1872; E.M.M., February, 1872, VIII, 208.)

TEPHROSIA LARICARIA (BIUNDULARIA).

Plate CXIII, fig. 3.

In May, 1877, Mr. E. Birchall sent me eggs of *Tephrosia biundularia*, which I had much interest in examining under the microscope. The egg is oblong, cylindrical, and full, more conical at one end than the other; the shell of dull appearance without any gloss, but also without any reticulation or granulation, except just in the centre of the fuller end, where there is a small circular patch of oval reticulation; the colour of the egg is a light bright green.

Of course this description shows the egg to be perfectly of the geometer type, but in the point of being devoid of ornament, except in the centre of one end, it is like the egg of *Charæas graminis*; the shell of this egg (which is of the usual *Noctua* form), is evenly granulated all over, in a very fine pattern, but has in the centre of the top a small star or rosette as its ornament. (John Hellins, January 9th, 1878; E.M.M., March, 1878, XIV, 236.)

Several correspondents have at different times sent me eggs of *Tephrosia biundularia*, but I had never had an opportunity of describing the adult larva until last year (1872), when I was enabled to do so from two specimens received from Mr. J. R. Wellman, of London, on the 12th of June.

The eggs are deposited early in May, are slightly oval, and in colour bright green.

The larvæ feed on oak, and become full grown about the middle of June.

The larva is in length about an inch and a quarter, and of average bulk in proportion. Head retractile, flattened, about the same width as the second, but

narrower than the third segment, which segment is swollen on each side into a lateral hump; the remaining segments are of about equal width until the twelfth is reached, on which there is a slight dorsal ridge; the segmental divisions tolerably distinct. The skin along the sides rather puckered; the fourth segment is swollen ventrally, which makes the third pair of legs appear longer than the rest. The ground colour is dull reddish-brown; from the tenth to the thirteenth segments reddish-ochreous, and the sixth, seventh, and eighth segments dull dirty black. Head pale ochreous-brown, spotted and marked with dark brown; medio-dorsal line dull dark green; subdorsal stripes dark brown, with indistinct paler central line; there are no perceptible spiracular lines. Just above and a little in front of the first pair of claspers is an ochreous-yellow mark, and on the seventh and eighth segments, just below the dorsal line, is a pale grey lateral mark. Spiracles small, greyish-brown, encircled with dark brown. The ventral surface is dark purplish-brown, with ochreous-yellow medio-ventral stripe.

These two larvæ were much darker and redder than a brood I had reared to moderate size the year previous, which were much more nearly like the pale greyish variety of the larva of *T. crepuscularia*. Probably the larvæ of *T. biundularia* vary as much as do those of that species. (George T. Porritt, April 8th, 1873; Ent., May, 1873, VI, 385.)

TEPHROSIA EXTERSARIA.

Plate CXIII, fig. 4.

When on a collecting expedition to Abbott's Wood, Sussex, with Mr. W. H. Tugwell, at the beginning of June, 1892, we found *Tephrosia extersaria* a very abundant visitor to the sugared trees. From some of the specimens boxed eggs were obtained, but it was not until some time after they were hatched that I discovered there was no English description of the

larva, hence only meagre notes had been made on the earliest stages. Fortunately the eggs, which were dull dark green, did not all hatch together, so that, when I did find out the necessity of studying them closely, I was able to take notes on the larvæ in various stages. By this time, August 5th, they varied from half an inch to an inch or a little over in length.

Up to nearly three-quarters of an inch the colouring and marking are pretty much the same, and may be described as follows :

Body slender, cylindrical, and of almost uniform width throughout; head rounded, but rather flat in front, fully as wide as the second segment; skin smooth and glossy, and the segmental divisions clearly defined. Ground colour bright pale green; the head yellowish-green in front, brown at the sides; the very fine medio-dorsal line, and the broad subdorsal stripes darker green; spiracles black. Ventral area and prolegs bright green, the front pair of prolegs tipped with brown; anterior legs grey, ringed at intervals with brown.

In the next stage, that is, when about three-quarters of an inch has been attained, two small raised tubercles have appeared on the ninth segment; the ground colour has become a darker green, and the fine medio-dorsal line still darker green; the subdorsal stripes have become more or less purple, some specimens having very little of this colour, while in others it is the predominating colour of the stripes; the two tubercles on the ninth segment are purple in both pale and dark forms; the segmental divisions are yellow or pink in different specimens; the head is still yellowish-green, but has lost a good deal of the brown at the sides.

At the next moult an inch has been attained; the skin has now quite lost its glossy character, and has become rather rough in appearance; the two small tubercles on the ninth segment have swollen into a distinct transverse ridge; the segments also slightly overlap each other. Ground colour bright green; the

middle of the dorsal area forms a broad yellowish stripe, enclosing the fine, dark green medio-dorsal line; the purplish subdorsal stripes have become broken into large, irregular, dark sienna-brown patches, which on the dark green ground colour are very conspicuous; these dark patches are most dense on the front and posterior segments; the ridge on the ninth segment is also of this dark colour; head now almost uniformly green; spiracles dark sienna-brown, with pale centres. Ventral surface of the same green as the dorsal area, but numerously spotted with dark sienna-brown; prolegs also green, with the outside of the front pair purple; anterior legs green, marked with brown.

By August 15th, many of the larvæ were becoming full-fed, though some of them were still not half-grown.

The adult larva is about an inch and a half long, and of fair bulk, inclining, however, more to slenderness than obesity. Head rounded at the sides, rather flattened in front, a little narrower than the second, and still narrower than the third and fourth segments, which, with the tenth, eleventh, and twelfth, are rather swollen; the remaining segments are of nearly uniform width, allowance being made for the overlapping at the divisions; there is a raised transverse hump on the ninth segment, and a smaller transverse ridge on the sixth segment.

There are two very distinct types of colouring:

In Var. 1, which is the more numerous, the ground is pale pea-green, the head and the dorsal area at the segmental divisions strongly tinged with yellow; the lower part of each lobe spotted with black; the alimentary canal shows through as a very narrow and interrupted dorsal line; a purplish-brown patch, marbled with white (this white forming two distinct spots on each of the middle segments), on the posterior half of each segment, except the twelfth and thirteenth, and extending from the subdorsal to the spiracular regions, take the place of the subdorsal and spiracular stripes; the hump on the ninth segment is dark

chocolate-brown at each side, but paler purplish-brown in the middle, which gives the appearance of there being two small dark humps; the smaller ridge on the sixth segment dark chocolate-brown; spiracles distinct, each being placed on a round lunule of a paler shade of the ground-colour; they are pink, encircled with a clear black ring.

Ventral area dingy green, in some specimens with a central longitudinal row of white spots; in others these spots are absent; the segmental divisions, and the outside of the front pair of posterior legs purplish-brown; anterior legs also reticulated with purplish-brown.

In Var. 2 the ground colour is purplish-brown, except the head and second segment, which still partly retain the green character of the more numerous form; head tinged with brown, and the black spots at the base of the sides of each lobe distinct; in some specimens two interrupted yellowish lines extend through the dorsal area; in other specimens these lines are almost obliterated; the purplish-brown marks of Var. 1 are in this form replaced by dark chocolate-brown, but the two white, nearly triangular spots on the posterior edges of the segments (in some specimens from the second to the eleventh) show out distinctly; both the lateral ridges are dark chocolate-brown; each spiracle is placed in a pale lunular patch, pinkish, ringed with intense glossy black.

Ventral surface dull purplish or chocolate-brown (in some specimens tinged with dingy green), except on the frontal segments, where it is green, and an interrupted stripe of clear white spots extends through its centre; segmental divisions purple; outer part of the front pair of posterior legs purplish-brown, the hind pair green; anterior legs reticulated with purplish-brown.

My larvæ fed on birch, oak, willow, and osier, but seemed to prefer willow and osier. The last specimen went down on September 4th, and on the 19th I described one of the pupæ as follows:

Pupa of ordinary shape, a little less than half an inch in length, stout, slightly rough, but glossy; the head-, eye-, leg-, and wing-cases dull olive-green; abdominal segments reddish brown, with darker spots and segmental divisions.

The moths emerged from May 20th to 28th in the spring following. (George T. Porritt, January 5th, 1895; E.M.M., March, 1895, XXXI, 65.)

TEPHROSIA PUNCTULATA.

Plate CXIII, fig. 5.

I received a few eggs of this species, together with the parent moth, from Mr. J. R. Wellman, of London, on June 14th, 1876. They were oval, and of a dingy smoke-colour.

The young larvæ emerged on the 25th of the same month, and in colour were uniformly bright yellow. They were fed upon birch, and by the end of July had attained their full growth, when I took down my notes as follows:

Length about an inch, and of moderate bulk in proportion; the head has the lobes rounded, and is about the same width as, or a trifle narrower than, the second segment; body of uniform width throughout, rounded above, but a little flattened ventrally; segmental divisions well-defined, and each segment rather numerously divided transversely into sections, which give the skin a somewhat rough appearance.

Ground colour a bright apple-green, the head tinged with yellow; two yellowish-white lines, having a yellowish pulsating line between them, form the dorsal stripe; subdorsal lines yellowish-white, and there are two other lines of the same colour, but much finer and indistinct, between them and the spiracular region; segmental divisions yellow.

The ventral surface is of the same colour as the

dorsal area, with pale central and side lines, and the segmental divisions yellow.

The larva forms a cocoon below the surface of the ground, by drawing particles of earth rather firmly together with silken threads.

The pupa is nearly half an inch long, and moderately stout in proportion; it is of the ordinary cylindrical shape, attenuated to the anal point, which is not very sharp; the wing-, leg-, antenna-, and eye-cases are well defined, those of the antennæ being conspicuously ribbed; there are also two short but distinct points extending outwardly forward from the head. Colour almost uniformly dark mahogany-brown. (George T. Porritt, January 4th, 1878; E.M.M., March, 1878, XIV, 235.)

GNOPHOS OBSCURATA.

Plate CXIV, fig. 1.

During the first week of August, 1877, I took this species not uncommonly on the heaths in the New Forest; and from one of the females eggs were obtained, which duly hatched about the third week of the same month. By the end of November the larvæ were rather over half an inch in length, and still feeding occasionally, though they had not eaten much for several weeks. Towards the end of May following, 1878, they were full-grown, when I described them as follows:

Length about three quarters of an inch, and rather stout in proportion. The head has the lobes rounded at the sides, but is flat in front, and there is a slight depression on the crown; it is slightly narrower than the second segment, into which it can be partially withdrawn. Body of nearly uniform width, but slightly wider at the middle segments than elsewhere; it is rounded above and below, but the two portions are distinctly separated by a wrinkled raised lateral ridge;

the segments are clearly divided, and each is numerously ribbed transversely; the tubercles are raised and rather large for a geometer; there is also a pair of short but conspicuous pointed prominences on the twelfth segment; the anal segment is wedge-shaped, the apex pointing downwards behind. The various prominences and the unevenness of the skin give it a rather wrinkled appearance. Ground colour stone-grey, many specimens having a strong ochreous-purple tinge, others an undecided dull greenish tinge; head stone-grey, thickly marbled in different specimens with purplish-brown or smoke-colour; a double pale grey line (the space on the anterior segments filled up with smoke-colour) forms the dorsal stripe; and there is a similarly pale, but thread-like line above the spiracles. On each side of the fifth, sixth, seventh, and eighth segments a dark streak extends from the spiracular region upwards anteriorly, becoming almost black before meeting in the centre on the front of each segment; in the angle thus formed is a conspicuous pale blotch; in one or two larvæ of the brood, however, these dark streaks are entirely absent, though the pale blotches are still distinct. Tubercles white or grey; spiracles large and round, intensely black; prominences on the twelfth segment grey, with distinct black streak on front of each. Ventral surface stone-grey or pinkish-grey, thickly freckled with very minute dark smoky spots; it has a pale central stripe, edged on each side with a fine irregular smoky line, enclosing together another double smoky line; there is also a pale stripe (varying much in colour in different specimens, in some being pinkish, in others yellowish) between the central stripe and the spiracular region; this stripe is edged inside with dark smoke-colour.

The foregoing is a general description of the brood reared from the New Forest eggs; but two larvæ received from Mr. J. Gardner, of Hartlepool, were much darker, and the markings altogether stronger. One of them had a purplish ground, and the dark

streaks on the fifth, sixth, seventh, and eighth segments were much larger and broader, and the dorsal area altogether much blotched and marbled with this dark colour, which gave it a very irony appearance. The ventral surface was smoky, with the pale central stripe pinkish, and like the others enclosing the double smoky line.

The larvæ were fed on strawberry, and the first moth emerged on August 8th, a rather late date. (George T. Porritt, November 8th, 1879; Ent., January, 1880, XIII, 12.)

DASYDIA OBFUSCATA.

Plate CXIV, fig. 2.

The eggs of this species were kindly forwarded to Mr. Buckler by Dr. F. Buchanan White in July 1869. Mr. Buckler took notes of the egg-state, and of the young larvæ till hybernation commenced, and from that period handed them over to me.

The larvæ were hatched during August and the early part of September, fed readily upon *Calluna vulgaris*, and just as readily on *Polygonum aviculare*, attained the length of rather more than a quarter-inch before hybernation near the end of October; began feeding again towards the end of March, 1870; moulted some time during the first fortnight of April, and again in May, and by the end of June the most advanced were full fed, but they did not all keep pace together.

The moths appeared from August 17th to September 5th.

The egg is shortish-oval in outline, flattened; the shell ribbed with lines of fine beads; the colour at first yellowish-white, changing in a few days to salmon, and again, shortly before hatching, to bluish-grey, the ribs, however, showing white to the last. Judging from those sent by Dr. White, the eggs appear to be

laid in little groups of two or three or even more together, and to be set up on end, on the sprays of heather.

On hatching, the young larva makes its escape from the top of the egg-shell, and even at this early age has, for a geometer, a stout figure; its colour is pale leaden-grey, with a paler subdorsal line, which is bordered below with a darker grey stripe; the head blackish.

Just before hybernation, when of the length of rather more than a quarter-inch, the larva is very rugose; its colour is now a dingy blackish-brown on the back and sides, with a broad subspiracular stripe of reddish or violet-grey, intersected by a blackish line; the head blackish, with a grey spot on the crown of each lobe; an indistinct, dark, dorsal stripe, edged with fine grey lines; the tubercular raised warts grey, the dorsal pair on the twelfth segment being more prominently raised than any of the others.

As the larva grows it becomes lighter in colour, and when full-fed may be described as follows:

Length not quite an inch, figure very stout and stiff, cylindrical in the middle, slightly flattened at the extremities; the spiracular region forming a puckered ledge; head smaller than the second segment, and tucked in; legs short.

The ground colour grey, in some specimens becoming gradually paler behind; on the front segments a fine double dorsal line, enclosing a whitish-grey thread, but afterwards this double line appears only as a small elongated spear-head in the middle of each segment; the subdorsal line is a fine waved pale thread, edged with black, and bearing thick dark dashes at the beginning and end of the segments; the tubercular warts are whitish with dark rings, the dorsal pair on the twelfth are placed close together, and, being more developed than the rest, stand up as obtuse points; the row of warts on the thirteenth segment above the anal flap are very small, and black in colour; the spiracles are pale brown ringed with

black, and are placed in a stripe of dark grey, with darker dashes at the folds, and some fine dark streaks, wavy and sloping upwards; this is followed by a line of whitish-grey, which melts into the grey or reddish-grey of the belly, the centre of which is buff, and bears a row of pairs of brown dashes down the middle, with five sets of curious curved pairs of streaks on either side at the folds between segments five to ten.

The stout, stiff figure of this larva, its short legs, and its sluggish habits are all very congruous, but, as in former cases, I leave others to decide whether figure forms habits, or habits form figure.

The larva spins under the surface of the soil, but, owing to the death of most of my stock just when they had disappeared for this purpose, I am not able to say anything of the pupa or cocoon.

The "concave" outline of the costa of the fore-wings (see Stainton's 'Manual,' vol. ii, p. 30) is very noticeable in the freshly bred moths, as they rest with expanded wings; in the male the concavity is greater almost than that shown by *Hypena proboscidalis*, though, of course, the tip of the wing is rounded, and not at all falcate. (John Hellins, May 11th, 1871; E.M.M., June, 1871, VIII, 20.)

BOLETOBIA FULIGINARIA.

On the 23rd of June, 1882, I received a larva of this species from Mr. W. H. B. Fletcher, together with a piece of fungus.

The larva measured about an inch in length, and tapered very little, only just at each extremity, i. e. from the second segment to the head, which is of a roundish full character, as is also the hinder end. Being a geometer with twelve legs, both ventral pairs are equally well developed, and those segments bearing legs, the ninth and tenth, are shorter than the fifth, sixth,

seventh, and eighth, which are not only longer but more plump at the sides, being deeply wrinkled only at the ends, while the others have their deep transverse wrinkles farther apart.

In colour its soft dark skin reminds one of some of the *Lithosiæ*; it is of a sooty grey-brown colour, very dark, approaching to blackness, but this is relieved by a number of fine longitudinal streaks of brownish-grey along the sides, and on the back by two lines of this colour enclosing the contracting and expanding blackish dorsal lines, and by subdorsal markings of velvety black, consisting of a thick oblong dash on either side in that region, about midway on each segment, followed close beneath by a fine short streak of brownish-grey; the blackish-brown head is of dull dark colour like that of the body, and similarly marked a little with the grey-coloured streaks, but fainter; the belly is entirely brownish-grey or leaden-grey, softer and smoother than elsewhere; the anterior pair of tubercular round warts are smaller than the second pair of each trapezoid, and are of brownish-grey colour and slightly glistening, but the second or hinder pair of each trapezoid are larger and of bright ochreous-yellow, which still further relieves and ornaments the blackish ground colour; these ochreous-yellow warts project and glisten, and also occur on each side of the segments in threes, the largest like those on the back occur near the beginning of a segment, the next size smaller about the middle, and the smallest lower and further back; besides these there is a small grey glistening one, and below this occurs the small black round spiracle; each wart emits a fine hair, though in the example I had many of these had been broken off and reduced to bristly stumps.

The larva is a veritable geometer in its mode of progression. (William Buckler, 1882; Note Book IV, p. 136.)

A few weeks since, my friend Mr. J. Trimmer Williams, of Foots Cray, kindly brought for my inspec-

tion six very fine specimens of *Boletobia fuliginaria*, which he was interesting himself to sell for Mr. Edward Upton, of Bermondsey. Mr. Williams told me that he knew the history of the specimens, and that they could be depended on as genuine native London examples of this rarity. The simple fact of Mr. Williams offering them to his friends as genuine was in itself a good guarantee, and was sufficient to tempt me to obtain a pair. These I placed in my cabinet with every confidence, which opinion has since been confirmed beyond suspicion.

Mr. Williams gave me at the time a short history of them, which I will here detail. I cannot do better than quote from one of his letters to me, in which he says, "Some few years since I was looking over some insects taken by Mr. Upton, when he called my attention to what he supposed was a variety of the common *Fidonia atomaria*, and which he kindly offered to give me, but I declined to accept it, telling him it might be of some value, although at that time I did not know the name of the insect. I, however, exhibited the specimen (which was a very large one, and not quite perfect) at a meeting of the South London Entomological Society, when Mr. Farn at once recognised it as *Boletobia fuliginaria*. Mr. Upton was told of the rarity of his capture, and advised to keep a good look-out for more."

This he has evidently done, and each year since Mr. Upton has taken an odd specimen, and in some years two or three, but generally wasted, sometimes only portions of wings found floating on water. All these specimens were taken near the river Thames. Last year Mr. Upton, after many failures, succeeded in discovering the larva feeding on fungus on rotten wood, and by dint of close search secured full-fed larvæ, and also pupæ, from which he bred some twenty specimens; and it was some of these bred examples that Mr. Williams offered to his friends.

A few weeks later I arranged with Mr. Williams to

be introduced to Mr. Upton, who called upon me with him. The object of this visit was to ask me to meet them in Bermondsey, and see for myself the genuineness of Upton's discovery; the reason assigned being that doubts had been expressed in some quarters as to the specimens being truly British moths. This was a very natural doubt without some proof, and one which I should most certainly have held, but from the fact of my relying on my friend's good faith, and that to me was above suspicion. However, I agreed to meet him and Mr. Upton to be conducted to the locality, which was on the 24th of May. It will readily be understood that I am not free to give the exact spot, as that would tend to deprive Mr. Upton of the fruits of his discovery.

We were conducted to an old wooden building in Bermondsey, near the river, to a spot most difficult of approach, in an obscure light, consequent on its position; and there, after a short search, Mr. Upton showed us the larva apparently feeding. In all he found four specimens. The food appeared to be a black sooty-looking fungus or mould. The position of the larvæ, the surroundings, and the locality were such as would convince anyone, as they did me, that I had seen *B. fuliginaria* really and truly at home. But, to remove any possible doubt, if this queer-looking fungoid mass was the food of the larva, I suggested that it would be more absolutely conclusive if I could feed the larva on this pabulum at my leisure. At once Mr. Upton broke off a portion of this fungus-covered rotten wood, and, removing one of the larvæ, gave it to me to bring home; and I have had the great satisfaction of seeing it not only eat, but thrive upon the fungus for the past three weeks, and of showing it to several entomological friends. This, I think, establishes the genuineness of Mr. Upton's *Boletobia fuliginaria* beyond doubt.

The larvæ we saw on the 24th of May varied from about three-eighths to five-eighths of an inch long.

The colour and markings then were very much of the same character as the now (June 14th) full-fed larva, which is about seven-eighths of an inch long, moderately stout for a geometer larva, cylindrical in form, attenuating slightly at the anterior and posterior segments. The ground colour is of a sooty-black, the dorsal line marked by ten pairs of orange-coloured raised tubercles, two on each segment. The four central segments have also a second pair of smaller and less distinct tubercles, from the region of which spring longish and curiously recurved hairs. The spiracular line is also indicated by a row of raised orange-coloured tubercles.

When full-fed it spins up in the crevices of the rotten wood, and forms a fairly compact cocoon of greyish silk, the outside being coated with particles of fragments of wood and dried fungus. Three old cocoons, from which Mr. Upton had bred some of his insects last year, were handed to me, and these show most markedly the character of the wood on which grew the fungus where I saw the larva feeding in a state of nature.

I forwarded a portion of this fungus-covered wood to Dr. M. C. Cooke, who is one of our ablest authorities on British fungi, and he most kindly determined it for me as an effused Muscedine, order Hyphomycetes, fam. Muscedines (see his 'Handbook of British Fungi,' p. 587). Dr. Cooke could not determine the genus, as it was not then in the stage of development necessary for identification.

The larva was full-fed, and duly spun up its characteristic cocoon, on the 25th June. (W. H. Tugwell, June 14th, 1884; Ent., July, 1884, XVII, 153.)

I was much gratified by finding, on the 14th of July, that an imago had emerged from the pupa mentioned above. The insect is a perfect female, and is a trifle smaller than those bred by Mr. Upton from pupæ collected in their native habitat. This was doubtless caused by the difficulty I experienced in retaining a

uniform balance of moisture in growing the fungus upon which the larva fed for three weeks after I obtained it.

The life-history of *Boletobia fuliginaria* appears to be summed up as follows:—Ova deposited end of July or beginning of August; larvæ hatch in August, and after hybernation continue feeding until the end of June of following year, when the pupa state lasts about three weeks, and the perfect insects appear about the middle of July. (W. H. Tugwell, July 20th, 1884; Ent., August, 1884, XVII, 183.)

NEMORIA VIRIDATA.

Plate CXIV, fig. 5.

Last summer (1864) Mr. McLachlan kindly sent eggs of this species to Mr. Buckler and myself, and we were successful in rearing several larvæ. I should not, however, have said anything about them, had they not been of a variety differing considerably from that to which the description by Borkhausen in Stainton's Manual must refer.

The larvæ were hatched on the 30th June, 1864, being then of a saffron-yellow colour. They chose for their food whitethorn, especially preferring the young pale summer growth, and the tender shoots thrown up from stems cut off close to the ground. That they should make this choice, and thrive on it, seems strange, for I have generally observed that the summer growth of trees and bushes is not such wholesome food for larvæ as the older firmer foliage.

Some of this batch of *N. viridata* escaped, and I afterwards captured one of the runaways feeding on a withered poplar leaf; but this was evidently only from starvation, and the larva never recovered sufficiently to become a pupa.

The remainder of them were full-grown about the last week in August, being then about seven-eighths

of an inch in length. In form they were rather slender, somewhat flattened, and tapering towards the head; the head and second segment acutely bifid; the anal segment ending in a pointed flap; the whole skin rough with fine granules.

The ground colour was either a full clear green or a yellow-green; the granules of the skin whitish; the points of the head and second segment red; a purple-red stripe down the back, or in some individuals this was interrupted on the middle segment, and, with some small whitish dashes, formed five acute diamonds; the subdorsal line whitish; the spiracular line yellowish or whitish-green, in some specimens having in it small purplish spots on the eighth, ninth, tenth, and eleventh segments; the belly with subspiracular and central pale lines; the true legs light red.

In habit these larvæ were quiet, generally resting in an extended rigid posture. About the beginning of September they drew the leaves of their food together with a few threads, and changed to pupæ, rather truncated in front, but slender and pointed behind; colour, a dull pale ochreous, head and wing-cases dusky, with a faint tinge of olive-green; a dark line down the back; the spiracles showing black, and two short dark lines along the belly. (John Hellins, E.M.M., April, 1865, I, 263.)

IODIS VERNARIA.

Plate CXV, fig. 1.

The eggs are laid in July in a very singular manner, as first pointed out to me by Mr. Wright. The female selects a twig of the food-plant, *Clematis vitalba* (wild clematis or traveller's-joy), and standing lengthwise on a twig deposits an egg on the rind, never on a leaf; the egg is somewhat longer than broad, and very flat. After a short interval a second egg is laid on the top of this, and again, after another interval, a third, a

fourth, and so on, until a little pile of twelve or fourteen stands out at right angles with the twig like a lateral twig or thorn. Under a lens of moderate power this pile of eggs exactly resembles a stack of oblong cheeses, symmetrically arranged one on the other. In some instances, when the parent has been restless, or disturbed in mind, or dissatisfied with the spot she had first selected, she has abandoned her egg-tower when only three storeys high. But this is not usual; she generally continues her labours until a dozen eggs are thus carefully adjusted in a pile: the lowest number yet observed in this columnal structure is three, and the highest fourteen. The eggs are not angular as in a column of basalt, but the arrangement is precisely similar. In one instance that came under the notice of Mr. Jennings the pile of eggs was branched, thus assuming the form of the letter V.

The eggs usually hatch during the first week in July, and the young larvæ disappear, after feeding a little, with the leaves of the food-plant, and reappear after hybernation, as soon as the leaves of another season are ready for them in the spring. The most likely spots for finding these larvæ are on the shoots trailing on the ground, or at a very slight elevation. When the larvæ leave the egg they are very interesting little objects; they stand on the general or partial leaf-stalks, or sometimes on the edge of the leaf, in a variety of attitudes; some parallel with the object on which they are resting; others forming an obtuse angle with it; others erect; and others looped, after the ordinary manner of geometers when travelling. The second segment has two pointed horn-like projections directed forwards, and concealing the head if viewed from above; they are of a pale green colour, the surface of the skin frosted with white, the tips of the horn-like projections tinged with red, brown, or purple, and the head deep purple, contrasting strongly with the almost colourless body.

About the middle of last June the Rev. P. H. Jen-

nings most kindly supplied me with a number of the larvæ of *I. vernaria*; and when quite full-grown I described one as follows:

Rests in nearly a straight position, firmly attached by its anal and ventral claspers to a twig or leaf-stalk of its food-plant, from which it projects with the rigidity of a stick at an angle of about 45 degrees; the head is prone, deeply divided on the crown, and the two divisions are produced into acute points, directed forwards like ears; the face is flat, and the mouth bent under and brought into contact with the legs, which are massed together, forming a lump beneath the head; the body is dilated on the sides by the presence of a rigid skinfold, almost resembling a lateral keel; the second segment is produced dorsally into two acute points, similar to those of the head, but rather longer, and, like these, directed forwards; the ninth, tenth, and eleventh segments are incrassated; the anal flap is triangular and pointed; it is equal in length to the anal claspers; the body is transversely wrinkled, and every part of the head and body is finely shagreened. The colour of the head and legs is purple-brown; the body is green, exactly of the same tint as the twigs of the clematis on which it feeds; and the frosted appearance of the surface (each point of the shagreen being tipped with white) makes the resemblance to a growing and succulent twig still more exact; the spiracles are ochreous.

On the 26th of June the first larva changed to a pupa, and on the 8th of July to an imago; the thorax of the pupa is smooth but not glabrous, being coarsely punctured; it is suspended by the tail, which is furnished with minute hooks adapted for the purpose, as in the *Suspensi* among the butterflies; the colour is green, excepting the eyes and antennæ, which are tinged with purple. (Edward Newman, Ent., August, 1872, VI, 168.)

PHORODESMA BAJULARIA.

Plate CXV, fig. 3.

Eggs were laid by a captured female in a pill-box on the 23rd of June, 1864; they were large in proportion to the size of the insect, oval, brownish, finely reticulated; they hatched on the 11th of July.

Food of larva—oak.

Larva at first brownish, mottled, hairy; four bunches of green and white atoms along each subdorsal line, and a bunch on the anal segment, the gnawings of oak. Until I had ascertained, by watching a young larva emerge from the egg, that it came out naked, I could scarcely believe that these ornaments were not part of itself, as every individual was so adorned, though apparently only just hatched. The one of whose birth I was an eye-witness was immediately removed to a separate box, and supplied with the petal of a rose, from which, in a few minutes, it made up nine rosy "favours," and fastened them one by one, with perfect regularity, upon its back. I then restored the rosy-favoured to its green-and-white-favoured companions, and it very soon joined them in gnawing away at the oak leaves, for nourishment now, having *first* satisfied the (shall I not say?) natural craving for dress. They fed on slowly till the cold weather began, when they fixed themselves to the under side of the oak twigs, in a doubled-up posture, and looked like little round tufts of vegetable débris. I kept them through the winter in an arbour open to the air, and did not lose one. In April I put into their flower-pot some fresh twigs of oak, and split some of the buds. On the 18th of April they began to bore round holes in the buds that had *not* been split, and to clean out the inside, seeming quite to despise my rough endeavours to help them. When they were nearly full-fed I made the following description of one of them, having stripped off the tufts on one side for the purpose:

Body flattened, attenuated towards the head, which is of the same colour as the body, reddish-brown. Dorsal line and wavy subdorsal line fuscous, a row of dark fuscous spots underneath the spiracles. On each segment from the fifth to the ninth (both inclusive) is a pair of dark brown papillæ, one outside each subdorsal line, with a dark spot on the apex, furnished with a single hooked bristle (easily seen through a good glass), and also a pair on the twelfth segment, to which the gnawings are attached with silk. Being very curious to know how this was done, I put the half undressed individual just described into a box covered with glass, together with an oak bud just bursting into leaf. After surveying his new abode, previous to eating, he firmly fixed himself by his claspers (anal prolegs) to the bottom of the bud, took hold of one of the brown scales encasing the bud by the top with his jaws, and drew it with some force towards him, with the intention of pulling it off if loose (as some which he afterwards tried were); but as it was still firmly fixed at its base, after two or three strong pulls he began to gnaw it off at the base; having effected which, he took it between his legs, turned it invariably with the convex side towards him, which he overlaid with silk, and then, taking it in his jaws, turned back his head and fixed it by the convex side to one of the naked papillæ, not contented with hooking it on, but winding silk about it at the point of connection. After putting on two or three pieces, he refreshed himself by eating for a few minutes. The new piece was not always put on a vacant papilla, but sometimes fastened with silk to another piece on a papilla already covered. The larva, at this stage of its existence, used almost exclusively the brown scales of the buds, probably as being so easily detached, but did not seem to care whether they were long or short, rounded or pointed; consequently the *tout ensemble* had certainly a ragged and untidy appearance, compared with the neatly cut and symmetrically arranged

habiliments of earlier life. The time, too, taken by the full-grown larva over dressing was much greater than that required by the active infant. Although it had only one side to dress, it took some hours about it. I began my experiment about 6 p.m., and the dressing was not over at ten; but next morning I found all the papillæ covered.

Every time the larva changed its skin, the dress of course was changed with it; and when, on the 25th of May, it changed to pupa (of the same colour as the larva), it was enclosed in a very loose network, formed of the bits that covered it as a larva, fastened together with silk, and attached to the under side of a twig.

The first imago came out on the 20th of June. (E. Horton, July, 1865; E.M.M., September, 1865, II, 91.)

I read Mr. Horton's note on this species [given above] with great interest, and should like to add one or two observations of my own to his full and accurate account.

On the 3rd of July last (1865) Dr. Hearder kindly sent me some eggs, the larvæ from a portion of which were hatched on the journey and came to me already dressed (oak leaves having been put in with them), but a few were still remaining in the egg, and gave me an opportunity of seeing them emerge in their nakedness. It happened that, on two occasions, a couple of larvæ were hatched in their pill-box, whilst I was not at hand to put them at once on their food, and so great was the innate desire of dress, that each time I found one of the pair had killed his brother and stuck his carcase upon his own back! When, however, they had once tasted oak, I saw no more of this fratricidal wickedness. As to their re-adornment after a change of skin, I fancy, but am not quite sure, that they remain close by the cast skin, and pitch off from it their old bits of clothes, and stick them on their backs first, but, of course, as they grow bigger they add larger scraps.

About the middle of August one of my larvæ had so far outstripped the rest in growth that I sent him to Mr. Buckler, who, having first depicted him "*dressed*," with a great deal of trouble pulled off all his coverings, and took a second figure of him "*naked*;" after this there was no attempt to replace the lost dress, but, after feeding a few days longer, by the end of August the larva changed into a pupa, without any covering or fastening whatever. All the rest of my larvæ are now feeding very slowly, and will probably hibernate when about half-grown.

If the oak leaves supplied to them are tender, I notice they are eaten in the usual way, but the harder and drier leaves are turned into skeletons, all the network of ribs and veins being left untouched.

I must conclude with saying that I cannot call the head of this larva *bifid*; in this point it differs from all the other British Geometridæ. (John Hellins, September 9th, 1865; E.M.M., October, 1865, II, 114.)

PHORODESMA SMARAGDARIA.

The eggs of *Geometra smaragdaria* are laid in July on the stems and leaves of *Artemisia maritima*, generally near the top of the shoots. When first laid they are of a light yellowish colour, changing in about a fortnight to dark greyish, soon after which the young larvæ emerge, and immediately cover themselves with minute portions of their food-plant, which they attach to their bodies with some glutinous secretion so firmly that it is very difficult to remove them. It seems a matter of great importance to these larvæ that they should so cover themselves; for a few eggs laid by a female which I had temporarily placed in a chip-box, being firmly attached to the side of the box, were left there until they hatched, when the young larvæ, having no *Artemisia* to operate upon, appro-

priated the loose splinters and other small particles that were inside the box, and attached them to their bodies, giving themselves a most singular appearance when viewed under a lens, not unlike that of miniature porcupines. On putting them into a glass jar with some *Artemisia* they very soon changed their costume, and, on looking at them a few hours afterwards, I found them covered with fragments of their food-plant, as in their natural state.

The larvæ during the whole of their existence keep the body in an arched position, except when feeding, when they stretch themselves out a little; but on the slightest alarm they again assume the curved position, with the anal claspers fixed to the plant, and the prolegs drawn up close to their bodies. They feed rather slowly, and for about three weeks after emerging from the egg appear like little balls of white wool, from being covered with the mealy portions of the *Artemisia*. As the larva increases in size, it increases the length of the morsels of the food-plant it attaches to its body, which on some adult larvæ are often three-quarters of an inch in length. When the pieces are first attached to the body they are, of course, green and fresh, but they soon become discoloured, and in a few days are withered and brown; then the larvæ, in their curved position, so exactly resemble the dead shoots of their food-plant that they are extremely difficult to detect, unless some movement betrays them, or one is familiar with their peculiar appearance. Thus it is evident that the object of the larvæ in attaching these pieces to their bodies is for the purpose of protection against their numerous enemies.

The larvæ continue feeding till about the end of October, by which time they have attained the length of one-half to three-quarters of an inch, after which they fix themselves to the food-plant, and remain motionless during the winter months. With the first warm days of spring, towards the end of February, they begin moving; and about the first week of March,

when the *Artemisia* is again appearing above the ground, they commence feeding, soon after which they moult and again cover themselves with pieces of the food-plant, which, being now green and fresh, give them a healthy appearance. About the middle of June they are full-grown, when they rest for a day or two, and then spin a loose network cocoon; this they form by drawing together, with silken threads, the pieces of the *Artemisia* that are thickly adhering to their bodies, into an oval-shaped covering attached to the stem of the food-plant, and in it they change to a greyish pupa, with the striped wing-cases showing very distinctly.

The larva, when full-fed, is about an inch and a quarter long, of a dirty greyish colour, with darker lines along the body, the skin very rough, and the head and legs brown; but, owing to its being covered so entirely with the dead and brown portions of the food-plant, it is extremely difficult to make out the exact markings. It sometimes feeds at dusk, but more frequently during the morning sunshine, and at times, when the sun is hot, it eats most voraciously, appearing in a very excited state during the whole time the sun is shining upon it. This necessity for sunshine constitutes one of the many difficulties the collector has to contend with in rearing these larvæ, for the sun is, of course, a great obstacle to keeping the food fresh. The only way to keep the food comparatively fresh is to dig up the *Artemisia* with a large clod of earth, so as not to disturb the roots, and even then it rarely keeps longer than a week. To be successful, therefore, with these larvæ, a great deal of trouble must be undergone.

The perfect insects appear about the middle of July, generally during the early morning, and remain motionless the whole of the first day, and I believe until daybreak of the next, for I have looked at them as late as twelve o'clock at night, and found them still motionless; but, on again looking at them about seven

o'clock on the following morning, some had paired, remaining *in copulá* during the whole of that day, but parting towards the evening. By the following morning the females had commenced depositing ova, and continued to do so for four or five days, each laying about 150 eggs altogether, and some more. (George Elisha, Trans. Ent. Soc. Lond., December, 1886, p. 465.)

EPHYRA PUNCTARIA.

Plate CXV, fig. 6.

On the 28th of August, 1871, I received from the Rev. E. N. Bloomfield, of Guestling, near Hastings, a few eggs of this species. They hatched in a few days, and the young larvæ were pale greyish-green, rather broadly transversely barred with brown. At the end of September they were full-fed, and may be described as follows :

Length about an inch, and of moderate thickness in proportion. Head very slightly wider than the second, but not wider than the third, segment (until full-fed it is considerably wider than the second) ; it is very finely notched on the crown, the cheeks are globular, and the face is flat. Body cylindrical, and of nearly uniform width throughout, the second segment being the narrowest, and the twelfth slightly the widest.

In my brood were two distinct varieties, the more numerous of which I will describe as Var. 1. Ground colour pinkish-brown ; head chocolate-brown, variegated with grey. A narrow but distinct pale grey line, edged on each side with a smoky-black line of equal width, forms the medio-dorsal line ; an exceedingly fine and almost imperceptible waved grey thread forms the subdorsal lines ; and there is a similar line above the spiracles. On each side, and on each segment, commencing on the spiracular region, is a dark smoky mark extending obliquely upwards and uniting at the divisions on the anterior of each

segment; each of these smoky marks is edged anteriorly with lemon-yellow. Usual dots minute, black. Ventral surface grey, with pink longitudinal lines. Some specimens have a much yellower appearance than others, with the oblique marks perfectly black, but edged with yellow in the same way.

Var. 2. Ground colour bright emerald-green; the head as in Var. 1; a narrow white line, edged with smoke-colour on the posterior segments, forms the medio-dorsal line; subdorsal and spiracular lines scarcely perceptible. The oblique marks are brownish-red, surrounded with yellow, not so large as in Var. 1, and, unlike them, do not meet on the dorsal surface; on the anal segment is a chocolate-brown wedge-shaped mark, edged anteriorly with pale yellow. Ventral surface uniformly green, thickly powdered with whitish.

Feeds on oak, and rests in a very peculiar position, the food being grasped by the claspers, and the whole remaining portion of the body turned sideways against the food-plant, which gives it a very ludicrous appearance. There are two equally distinct varieties of the pupa; those from the brown larvæ being grey, and those from the green variety green. The first larva changed to a pupa on October 6th, and a moth appeared November 3rd. (George T. Porritt, November 10th, 1871; E.M.M., January, 1872, VIII, 183.)

EPHYRA OMICRONARIA.

Plate CXV, fig. 8.

The Rev. P. H. Jennings, of Longfield Rectory, Gravesend, very kindly gave me the opportunity of rearing the larva of this species by sending a few eggs on the 10th of June, 1875. They hatched on the 21st of the same month, and the newly emerged larvæ were pinkish-brown, with the sides paler. Being supplied with maple and sycamore they fed on both,

though probably the former is the only food in a natural state.

A larva being well grown by the 5th of July, I took down the following notes on it:—Length about an inch, and of average bulk in proportion; the head has the face flat, but the lobes rounded, and is broader than the second segment. Body cylindrical, and of almost uniform width throughout; the ninth, tenth, and eleventh segments very slightly broader than the remainder. Skin smooth, but has a few scattered very short hairs; segmental divisions well defined. Ground colour rather dark, but clear velvety green; head chocolate-brown, with paler markings. Mediodorsal line yellow; it commences on the head, and is conspicuous throughout the entire dorsal area; subdorsal lines waved, also yellow, as are the subdorsal region and the segmental divisions. Spiracles and the usual tubercular dots distinct, black. Ventral surface pale green, with small black tubercles; the segmental divisions black.

The pupa is shaped like the others in the genus; it is attached to the leaf at the tail, and by a belt of threads passing over the body in the same manner as in the *Pieridæ* amongst the butterflies. It is about half an inch in length, stout and broad at the head, but gradually and evenly attenuated towards the anal extremity. Eye- and wing-cases prominent. Colour dull green tinged with yellow, and there are three yellowish lines throughout the entire length of the dorsal area; the rest of the dorsal surface is marbled with brown, and the wing-cases have a deep smoke-coloured edging. The winter was passed in this stage. (George T. Porritt, April 7th, 1877; Ent., May, 1877, X, 137.)

EPHYRA ORBICULARIA.

Plate CXV, fig. 9.

On the 29th of July, 1876, I received, through the kindness of Mr. J. G. Ross, of Bathampton, a dozen full-grown larvæ of this species.

Length about an inch, and of moderate bulk in proportion; the head has the lobes rounded, is slightly notched on the crown, and is the same width as the second, but narrower than the third segment. Body cylindrical and of nearly uniform width throughout, the front and last three posterior segments, however, being slightly narrower than the middle ones; the segmental divisions are well defined, and the skin has a somewhat tough appearance. Ground colour of the dorsal surface bright apple-green; head pale brown, very prettily reticulated and spotted with dark brown, and two stripes of the paler brown colour running through each lobe are very conspicuous; a pale greyish line, finely edged with dark green, forms the dorsal stripe; the subdorsal lines are of the same colour, but waved throughout their entire length; the whole of the spiracular region, including the space between the subdorsal and ventral regions, is in some specimens entirely white, but in others is very delicately and beautifully marked at regular intervals throughout the entire length, with blotches of pink or bright pale purple. On each side of the fifth, sixth, seventh, eighth, and ninth segments is an oblique smoky mark, each mark commencing on the front of the segment, and extending backwards into the pale spiracular area; the usual dots and spiracles are distinct, black. The ventral surface is green, with five longitudinal white stripes,—a central one, and two on each side outside it; the usual dots distinct here, too, and also black; the prolegs tipped with pink.

It feeds on sallow; and when full-fed, like others in the genus, affixes itself to a leaf by the anal claspers,

and spins a band or belt round the middle of the body, exactly in the same manner as the *Pieridæ* among the butterflies.

The pupa varies from half to three-quarters of an inch in length, and is of the usual *Ephyra* shape and position. Head square and blunt, and from it the body is attenuated gradually and evenly to the anal point; the front and back are rounded, but are distinctly divided by a lateral ridge, which extends a little beyond the head on each side, forming two short blunt points; the back is also slightly arched. Ground colour of the pupa greyish-white, with the leg- and wing-cases veined with smoke-colour; there is a pale grey longitudinal line through the centre of the back, and on each side of it a series of black dots.

Two imagos emerged about the middle of August; the remainder of the pupæ stood over until spring. (George T. Porritt; *Ent.*, April, 1877, X, 97.)

EPHYRA PENDULARIA.

Plate CXV, fig. 10.

In August, 1872, I beat rather commonly from birch, in Sherwood Forest, two very distinct varieties of the larva of this species, and am not aware that a description of either of them has been published.

Length rather over an inch, and slender; the head small, the same width as the second, but narrower than the third segment; it has the face flattened, and is notched on the crown. Body of tolerably uniform bulk, attenuated slightly from the posterior to the third segment, which is swollen laterally. The skin has a very slightly puckered appearance, and the segments overlap each other, rendering the divisions conspicuous.

Var. 1 has the ground colour pinkish-purple, in some specimens greyish-purple; head dark sienna-brown, the mouth, and a line down each side the

median suture, dull ochreous-yellow. Throughout the dorsal area extends a broad, pale, smoky band, having through its centre the pale grey medio-dorsal line; bordering this band on each side are the interrupted, indistinct, similarly coloured subdorsal lines; there are no perceptible spiracular lines, but that region is variegated with conspicuous pale grey marks. On the front of the fifth, sixth, seventh, eighth, and ninth segments is a very conspicuous brick-red transverse mark; the spiracles and trapezoidal dots are distinct, black. The ventral surface is dull smoke-colour, with interrupted grey central stripe; legs pale yellowish-brown barred with black, prolegs pinkish-purple.

Var. 2 has the ground-colour bright green, and the head reddish-brown. Medio-dorsal line indistinct, yellowish-grey, edged on the second, third, and fourth, and again on the tenth, eleventh, and twelfth segments, with a dark green line; subdorsal lines more distinct, yellowish-grey; there are no perceptible spiracular lines, that region being variegated with yellowish-green; the anal segment is of the same colour as the head, reddish-brown, but has in addition a yellow streak outside each clasper; spiracles and usual dots very minute, black; the segmental divisions yellow. The ventral surface is green with interrupted paler central stripe; the legs and prolegs reddish-brown.

The moths from both varieties have appeared during the present month (June, 1873). (George T. Porritt, June 10th, 1873; E.M.M., August, 1873, X, 71.)

HYRIA AURORARIA.

Plate CXVI, fig. 1.

This species is not one of the *unknowns*, still I venture to give my notes on it, since the larvæ I have seen differed not only among themselves, but also from the description given in the Manual after Guenée.

In August, 1865, Mr. Batty, of Sheffield, sent me some young larvæ, which were then, and continued afterwards, of a very dark variety. In 1866, Mr. T. Brown, of Cambridge, sent me some eggs, the larvæ from which were very much paler than the former brood. I find the following dates recorded in my note-book:—Larvæ hatched July 12th; about half an inch long in October; began to feed after hibernation about the end of February; full-fed about the beginning of June; moths bred during the first half of July.

These larvæ fed on *Polygonum aviculare*, and, although very much of the *Acidalia* form and habit, did not, as many species of that genus do, show any preference for *withered* leaves over fresh. All, save one of the Sheffield brood, died during the winter of 1865–6, whilst, as far as I could see, the much sharper frost of last winter made no impression on the Cambridge brood, which fed up well, though about a third of their number died in the final change.

The Sheffield larvæ, when small, were very dark brown—almost black—all over, but with a lens a slightly paler subdorsal line could be discovered, as well as some black dorsal central spots placed in a slightly paler space. The Cambridge larvæ, whilst small, came near to the Manual description, for they were then dusky brown, with the anterior segments pale ochreous on the back, and the middle segments having pale diamond marks enclosing a central dusky spot; but the full-grown appearance was quite different.

When full-grown the larva is about three-quarters of an inch long, slender, rather flattened along the spiracles, tapering towards the head, which is small and bifid; the skin a little wrinkled; in fact, it is a *slender* form of the shorter (or *aversata*) type of *Acidalia*. The ground colour either brown or very pale grey; in either case the anterior and posterior segments are much tinged with ochreous; a dark, blackish, double

dorsal line, commencing very fine and faint behind the head, but on segments five to nine suddenly growing thicker both in the middle of each segment and at each segmental fold, so as to form a series of nine pairs of dark curved dashes (alternately curving inwards and outwards); on segments ten to twelve the dorsal lines become continuous again, but strong and distinct; the blackish subdorsal line distinct on the front and hind segments, but splitting into two or three faint irregular threads on the intermediate ones; one larva had also a strong black spiracular stripe beginning at the fourth segment, and ending at the anal pair of legs; spiracles black; the belly darker than the back, with a pale central line, and between it and the spiracles some curved oblique dark streaks, and a row of five black dots just below the spiracles on segments five to nine; the ventral and anal legs tinged with blue.

The larva makes the merest apology for a cocoon, just drawing together with the greatest economy of silk, a few bits of moss and grass, between which the pupa can be easily seen; this is slender, cylindrical, very smooth, with the wing-cases short and distinctly marked; colour a pale dull ochreous, wings finely outlined in black. (John Hellins, October 8th, 1867; E.M.M., December, 1867, IV, 158.)

I am much pleased to be able to send a description of this species; and for the opportunity of doing so I have to thank Mr. John Harrison, of Barnsley, who gave me a dozen larvæ on the 4th of September, 1875, and further sent me a supply of eggs on the 19th of July last.

The egg is large for the size of the moth, is oblong-square, with the edges rounded, and considerably depressed on the upper side; the colour at first pink, afterwards olive-brown.

The young larvæ fed, but grew slowly, on knotgrass until autumn, when they ceased feeding, and remained rigid on the sides of the cage or on bits of stick, etc.,

through the winter, and well into the summer of the present year, as, at the time in spring when most other hibernating larvæ were waking up, they persistently refused to show any signs of vitality beyond moving the front portion of the body backwards and forwards when touched. At this time they were about five-eighths of an inch in length, and were about the most soberly attired larvæ I ever had, being in colour almost uniformly very dark dull brown (almost black in some specimens), and with the exception of a still darker double dorsal line, and being a little paler at the segmental divisions, there was no other colour or marking. The latter part of May having arrived, and finding they did not seem disposed to avail themselves of the various kinds of plants I endeavoured to induce them to accept as food, including *Plantago major*, *Anemone nemorosa*, etc., besides the *Polygonum aviculare*, I took them up into a warm room, and again gave them a plentiful and varied supply of provender. Here I had soon the satisfaction of finding that one of them had evidently set to work with a will, again on *Polygonum aviculare*, and by the 1st of July it was full grown, when I described it as follows :

Length three-quarters of an inch; can scarcely be called slender, though not stout; head the same width as the second segment; it has the face flat, and is distinctly notched on the crown; body somewhat flat when viewed from above, but rounded ventrally; the ninth segment is the widest, and from it each becomes narrower to the head; the four posterior segments are of nearly uniform width, and about as wide as the sixth; the segments overlap each other considerably, rendering the divisions distinct, and also forming on each side a conspicuous lateral ridge; the skin is ribbed transversely throughout, and has a tough wiry appearance; in shape and habits it bears a very strong resemblance to many larvæ of the *Acidaliæ*; ground colour a medium shade of brown, with a very faint pink tinge, and also appears to be slightly powdered

with greyish; head brown, marked with greyish,—from it extends the distinct black double dorsal line; there are no perceptible subdorsal or spiracular lines, but the lateral ridge on each side is faintly outlined with pink; the ventral surface is a mixture of dull brown and smoke-colour, with a distinct slate-coloured median line.

This larva spun up next day, and was the only one I reared to maturity; the cocoon was loosely constructed in an upper corner of the cage.

I had no opportunity of describing the pupa until after the emergence of the imago, which event took place on the 18th of July. Afterwards I found the empty case to be five-eighths of an inch long, the wing-cases prominent, and the anal tip sharply cut; colour reddish-brown, the wing-cases conspicuously streaked longitudinally with black. (George T. Porritt, 4th August, 1876; Ent., September, 1876, IX, 197.)

ASTHENA CANDIDATA.

Plate CXVI, fig. 3.

On the 14th of August, 1872, I received a larva from Mr. Harwood, feeding on birch. This geometer reminded me very much of *Cidaria sagittata* in its hunched posture, while the colouring was a good deal like that of *Venusia cambricaria*.

The tubercles were warty eminences, each bearing a black finely-pointed hair or bristle. The larva was upwards of half an inch in length. Segments tumid, wrinkled, divisions deep.

In colour it was very pale yellow-green, blue-green at each end, rather sulphur-yellow along the puffed spiracular region, the subdorsal stripe faintly whitish-yellow. Head clear greenish, marked on each lobe with black. All the legs pink. The second segment deep damask rose-pink on the back, faintly divided by a dorsal line of pale green just at the beginning.

This rich crimson colour continues on the third, fourth, and front of the fifth segments, bounded by the subdorsal stripes, within which it forms a broad stripe. It spreads on the fifth in a saddle-like way to the spiracles; on the sixth, seventh, eighth, and ninth segments there is an irregular triangular blotch of crimson; on the spiracular region on the tenth to the anal extremity it is filled up with crimson between the subdorsal stripes. The spiracles are of the ground colour, outlined with blackish. The ventral surface is pale yellow-green, broadly blotched on all but the tenth segment with crimson on each side, softens towards the centre, and on the last three segments is paler pink. The pale yellow spiracular puffed region separates the crimson above and beneath.

The larva spun up in a slight web of a cocoon, to which the pupa was attached by the tail.

The pupa was three and a quarter lines long, of moderate stoutness, but the abdomen rather sharply pointed, ending in a small spike with three diverging bristly curved points or hairs. Its colour was pitchy black, the abdominal divisions bright ochreous orange.

The moth appeared May 28th, 1873. (William Buckler, May, 1873; Note Book I, 191.)

ASTHENA SYLVATA.

Plate CXVI, fig. 4.

On the 15th of July, 1876, I was very glad to receive some eggs of this species, which had been obtained by Mr. J. Batty on the 4th of the month. The larvæ were hatched on the 16th, fed away at once on alder, preferring all through their growth tender open leaves, but avoiding the sticky leaf-buds; they grew rapidly, and by the 8th August were in their last skin, and in a few days more would have been full-fed, when I had the misfortune to get them killed. To replace them, Mr. Batty kindly sent me the larvæ he

had been rearing himself, but I found these were by no means so far advanced as mine had been, for by August 15th they were not half-grown, and did not pass their last moult for another week; however, by the beginning of September they had spun up. A larva captured by Mr. McLachlan in Devonshire, in 1875, did not spin till the second week of September, whilst one lent for figuring in 1874 by Mr. A. H. Jones was nearly full-fed by July 17th. These dates for the maturity of the larva—varying from the middle of July to the middle of September—almost give time enough for a second brood, but I suppose the safer inference is that the single brood of moths has a flight of some duration.

The egg is bluntish-oval in outline, flattened, the shell embossed all over with a small triangular pattern, the colour very pale yellowish-white throughout, no change taking place to the last; hence it is necessary to watch very carefully for the hatching of the larvæ, for there is nothing to give warning of their exit, and, being very delicate, they will soon die if not supplied with food.

The newly hatched larva is of a very pale greenish-white tint, the head very slightly tinged with brown, the skin shining, the usual hairs fine, and whitish in colour. As the larva grows, and up to the last moult, it becomes more translucent; when three-eighths of an inch long its figure is stumpy, the segments looking puffed, stoutest at the ninth, and thence tapering towards either end. The body now looks quite pellucid, except that the internal organs show as a pale dull green stripe down the back, and the puffed spiracular region is pale yellowish-green; the small head black.

With the last moult comes a complete change; the pellucid look disappears, and a very handsome contrast of colours is seen, the tints of which, as usual, are much richer and deeper at first, becoming gradually paler as the larva approaches maturity.

When full-fed the larva measures five-eighths of an

inch in length, or nearly three-fourths when fully stretched out, in figure stoutest at the ninth and tenth segments, tapering considerably towards the head, which is the smallest segment and has its lobes well defined, and not so much towards the tail; this actual tapering of the figure appears much enhanced to the eye by the arrangement and outline of the markings; all the segments are plump and well defined.

A favourite attitude of the larva is to rest along the midrib at the back of a leaf, with the head held up; the segments two to five kept close to the leaf, six to nine raised in an arch or sometimes a loop, and ten to thirteen again pressed close to the leaf.

The colour of the head is shining blackish-brown, the triangular space between the lobes in front pinkish, barred across above the mouth with blackish-brown. The lip and base of papillæ pinkish, the jaws blackish-brown. On the second segment is a narrow black shining plate, from which commences, on the back, a broad marking of dark purplish-brown, widening as it proceeds, and obliterating the pale yellow-green ground; at the end of the fifth segment it reaches below the spiracles and begins to spread over the ventral surface, in some examples quite enveloping the whole body as far as the ninth, on which segment its colour becomes rosy-red, and thence narrows again as a dorsal stripe to the anal extremity; this dark marking is darkest—almost black—on its lower edge, and has throughout a narrow edging of sulphur-yellow melting into the yellow-green below; on each side of the fifth is a patch of yellow on the yellow-green ground, and there is an elongate yellow patch on each side of the ninth, showing very conspicuously on the dark colouring which there surrounds it. On the dark marking at the beginning of segments five, six, seven, and eight, is a squarish dorsal violet mark, whence slants backward on either side a whitish streak, thus forming nearly a perfect chevron pointing forwards; the dorsal line can scarcely be traced on the thoracic segments, but thence

backwards it continues as a violet-white line to the anal extremity. On the dark marking the shining black tubercular warts project conspicuously from white rings, on the green portions they are also green, small in size, and escape notice; the spiracles are also inconspicuous, being small, and of the same colour as the segments on which they happen to come; all the legs are yellow-green.

The cocoon is placed just on the surface of the soil, and formed of small particles of earth, leaves, etc., fastened together with a tough, although not hard, lining of pale silk.

The pupa is five-sixteenths of an inch in length, rather stout in proportion, the abdomen tapering off rapidly from the end of the wing-cases, and ending in four or five curled-topped spines of unequal lengths, but twisted together so as to look like a spike; the eye-cases rather prominent; in colour the wing-cases are tinged with greenish, all the rest mahogany-brown and shining.

I have now made acquaintance with the earlier stages of three species of *Asthena*, namely, *A. candidata*, *A. sylvata*, and *A. blomeri*, and find them exhibiting as close a resemblance in these as in the perfect state. Of *A. luteata* I do not know so much, and am anxious to know more. (John Hellins, January 10th, 1877; E.M.M., February, 1877, XIII, 213.)

ASTHENA BLOMERI.

Plate CXVI, fig. 5.

To Mr. W. H. Grigg, of Bristol, is due the credit of discovering the larva and food-plant of this species, which have baffled us so long.

In July, 1873, Mr. Grigg took the moths in some numbers, and found them to lay their eggs freely in chip-boxes, and he most kindly sent me a good supply

of them, together with information as to every kind of green thing that grew in their locality; when, therefore, the larvæ hatched, they were supplied with leaves of all the trees and plants which had been suggested, but they would touch none of them; we then thought of lichens, and supplied them also, but with no better success; all our young larvæ died of starvation.

However, in September Mr. Grigg visited the locality again, and, after a good deal of hard work, succeeded in beating from some wych elms growing there a large number of geometers; most of them proved to be *Abraxas ulmata*, but with them were several others of a smaller species, which, from their likeness to the larva of *Venusia cambrica*, gave us great hopes. They were, however, horribly ichneumonated, nine out of every ten being thus infested; but, luckily, some three or four sound ones were secured, and this summer all doubt was removed by their appearing in the imago state as *A. blomeri*.

Being now sure of the food, Mr. Grigg again procured eggs this summer, and generously halved his supply with me; but the young larvæ in confinement are so abominably restless and obstinate, that, although I had considerably more than a hundred eggs, I have been able to rear barely twenty-five larvæ, and Mr. Grigg not so many. No wonder we failed with them last season, when together with wych elm we gave them so many other sorts of food to choose from, for now, with nothing but the wych elm leaves in their bottle, I found they would not feed at all, but would continually crawl to the light, and entangle themselves together till they were starved; at last I shut them up with some twigs in a large tin box, making the cover quite secure by stuffing cotton wool all round, and left them to themselves for some days, and in this way I managed to rear the number above mentioned.

This year (1874) the eggs were laid on July 9th and 11th, the larvæ hatching on the 18th and following

days, and now, as I write (August 14th), all are in their last skin, and several nearly full-fed.

Last year (1873) I had the eggs during the last week of July and the first week of August, the larvæ hatching from July 30th onwards, but living only a day or two; the larvæ, nearly full-fed, were captured during the last week in September, and the survivors among them changed to pupæ in a few days.

From the manner in which the moth deposits her eggs in any crevice in the chip-box, I imagine that in freedom she would arrange them in small batches along the ribs on the under side of the leaves, which in the wych elm are very prominent, and I noticed that the larvæ prefer to remain on the under-side of the leaves throughout their existence, carefully spinning a thread wherever they move; in feeding, at first they eat only the under surface of the leaf, but by the time they are a quarter of an inch long they eat holes quite through the leaves, generally avoiding the ribs, at last reducing them almost to skeletons.

The egg is small, somewhat brick-shaped, being long and flattened, but one end is squarer and thicker than the other; the shell glistening, and covered with a diamond pattern of *sunk* lines, each diamond having a central sunken dot (the egg of *A. candidata* has also this character of being embossed, as it were, by a pattern of sunk lines); the colour is at first pale, afterwards rich deep yellow, with the edges still deeper, and a red tinge near the bigger end; at last becoming again quite pale, but with a dark spot.

The young larva escapes by eating out one end of the egg; in colour it is whitish, with a purplish tinge in the front segments from the internal organs showing through; as it grows it becomes quite shining white; after the first moult it is glassy-looking and translucent, with an internal green stripe through the body, probably caused by the presence of food; when about three-eighths of an inch long it is more opaque, with the back whitish-green, a broad dark green subdorsal

stripe, the head greenish-white, all the rest pale green ; the bristles conspicuous.

Soon after attaining the length of three-eighths of an inch it passes its last moult, and after that grows rapidly ; the markings are at first paler in the lighter portions, and darker in the dark portions, than they become afterwards.

The full-fed larva is about three-quarters of an inch long, slender, but cylindrical and plump, of almost uniform size throughout, except that the head is narrower than the second segment, and the last three segments taper off both in width and in thickness ; the skin is soft and rather glossy, wrinkled at the divisions, puckered along the sides, and set with a few hairs.

The general colour on the back and sides is pale greenish-yellow, the belly slightly greener ; the crown of each lobe of the head is marked with a streak of crimson-brown ; the collar is shining ; on segments two to four is a long oval dorsal patch of pinkish or crimson-brown, widest on the third, and ending in a blunt point at the division between the fourth and fifth ; through this runs a central thread of yellow, bordered with an edging of brown, darker than the patch, which has also a darker line running along just inside its outer curved edge. About the middle of the sixth commences a pair of lateral blotches, which run through the seventh and eighth, of either rose-pink or crimson-brown, having a streak of darker brown just in the place of the subdorsal line. These blotches have waved edges, which nearly meet at the segmental divisions both above and below. Through segments five to eleven inclusive there is no dorsal line whatever, but on the twelfth and the beginning of the thirteenth, in the place of the dorsal line, is a broad stripe of rose-pink, bearing at each end a dark spot of crimson-brown. The spiracles are roundish, but very hard to be seen, being greenish-yellow on the ground colour, and brown on the coloured blotches ; so too with the usual warts, on the ground they are scarcely

to be seen, but on the blotches they become prominent, shining, and dark brown.

The above description applies to all the larvæ I have reared this season, for there is scarcely any variation amongst them, but among the captured larvæ last year there was a great deal; this was shown not only in the depth of colour of the blotches, but also in their size, and by their absence; one variety was greenish-yellow all over, with no markings whatever; another had the blotch on the second, third, and fourth, and a dot on the twelfth segment, and nothing else; another had a dark dorsal spot in the middle of the fifth; another had a similar spot on the sixth, almost connecting the lateral blotches; the example had a dark spot on the side of the anal legs.

The larvæ last year (1873) retired into the earth furnished them for pupation, and there made weak, roundish, oval cocoons, nearly half an inch long, and formed of peaty fibres and earth, spun together with a slight lining of silk.

The pupa is about one-third of an inch long, plump in character, the abdomen tapering rather suddenly to a point, which ends in two slightly diverging curled-topped bristles, these last being attached to the threads that line the cocoon; its colour a light reddish-brown; the tumid margins of the wing-covers yellowish-ochreous; the centres of the wings and the antennae-cases olive; the tip of the abdomen black. (John Hellins, August 14th, 1874; E.M.M., September, 1874, XI, 87.)

EUPISTERIA HEPARATA.

Plate CXVI, fig. 6.

On the 2nd of July, 1873, I received a few larvæ of this species from Mr. A. H. Jones, of Eltham, and on the 5th I described them as follows:

Slender, length about five-eighths of an inch; head

the same width as the second segment, globular, and slightly notched on the crown; body cylindrical, and of nearly uniform width throughout; each segment is plump in the middle, which makes the divisions distinct; skin clothed with a few short scattered hairs. Ground colour bright green; head glaucous-green, with a large black ocellus on the upper part of each lobe; the mandibles brown. A broad velvety black band extends throughout the dorsal area, and is intersected by the pale greenish-yellow indistinct dorsal line; it is also edged on each side with a clear yellow stripe, which is again divided into black squares by clear yellow segmental divisions; these black squares vary in intensity in different specimens, in some only occupying the anterior of the segment, the other half being of the ground colour; all have a mark of the ground colour, varying in size, on the posterior part of the segments. The sides are minutely dotted with grey, and there is a very indistinct yellowish line along the spiracular region. Ventral surface, legs, and claspers green, of a darker shade than the ground of the dorsal surface. When young, the black dorsal band, so conspicuous in the adult larva, is absent.

Feeds on alder, and shortly before spinning up the colour entirely changes, becoming dark green with purple tinge, and the segmental divisions purple.

My larvæ spun loose cocoons amongst the leaves, etc., but in a state of nature they probably form them amongst moss, etc., on the trunks and about the roots of alder. (George T. Porritt, 26th June, 1874; Ent., August, 1874, VII, 175.)

ACIDALIA OCHRATA.

On the 9th of July, 1878, I received about thirty eggs of this species from Mr. E. G. Meek, who had found the moths plentifully on the 6th near Deal (its

old locality), "occurring amongst the coarse shore grass and *Ononis arvensis* and a few sprays of yellow bed-straw (*Galium verum*)," the only plants growing in the spot where the insect appeared, of about thirty feet by fifteen, although there are some five miles of suitable ground.

In shape the egg is oval, boldly ribbed and finely reticulated, and of a whitish straw-colour.

On the 17th the eggs became a decided straw-yellow, and on the 18th, a remarkably hot day, they turned brown, and in the evening they hatched.

The young larvæ were at first of a drab colour, with brown heads, and the next day showed a dark internal dorsal line. On grass, restharrow, knotgrass, and *Galium verum* being offered them as food, they chose the *Galium*, showing rather a partiality for the flowers, and rested often at first in a coiled position, but more often in a loop.

By the 23rd they had become reddish-pink, with heads a deeper pink, and with rather a purplish-pink or grey dorsal line.

By the 29th two or three had moulted; these by August 2nd showed decided lines down the back, and notably double dark grey dorsal lines enclosing a paler fine thread, and blackish on the sides of the belly, showing as four dark spots at the side of the spiracular region. Two being dead now reduced the number of larvæ to twelve.

On the 13th August only eight or nine remained alive. The most forward had again moulted, and was more of a dark greyish colour than before, but yet with a reddish ground; the skin very rugose, and the segments overlapping at the sides and somewhat flattish on the back—a true *Acidalia*.

On the 15th I discovered that the larvæ like flowers of *Lotus corniculatus*, from one supplied to them yesterday as an experiment.

On the 17th I saw them eating off the yellow covering from the seed-vessels of *Galium verum*, but I

found they took no notice of the *Lotus* flowers whilst fresh, but only attack them when withering.

By the 24th of August, when fully stretched out, they were nearly three-sixteenths of an inch in length, and already exhibited the tremulous motions for which this genus is remarkable. Their colour is now a paler pinkish than before.

By the 31st, six of the eight had moulted, and were now much darker again, and their pattern of markings could with a lens be seen much better; the dorsal fine palish thread is enclosed within two dark reddish-grey stripes; the paler pink subdorsal stripe follows, finely edged outside only with dark grey, which is black just at the end of a segment, and at each end of the body; the sides pinkish-grey; the spiracular line pinkish-white; the belly dark pinkish-grey, with a black sub-ventral spot on each side of a segment; very rugose, with short stubbly bristles.

On August 20th, 1880, I received from Mr. Tugwell, of Greenwich, ten young larvæ of this species, and, just as before described, they had been fed with flowers of *Galium verum* and *Solidago virgaurea*, and I placed them on the former plant in a pot for hibernation.

On November 2nd I received from Mr. Tugwell a full-grown example, fed latterly and still feeding on flowers of *Crepis virens*, seeming to like them in a withered state better than fresh.

The larva measures when stretched out three-quarters of an inch in length, and is of good substance though of rather slender character. *Its ventral pair of legs is on the eleventh segment*; it is stoutest at the tenth, and gently tapers thence to the fourth, then decidedly more to the head, which is of a full and roundish character, though notched a little on the crown, the lobes well defined, and broadest low on the cheeks, the antennal papillæ long in proportion. On each of the segments between the fourth and tenth there are as many as twelve transverse wrinkles, so that it is rugose; the segmental divisions are tolerably well defined,

particularly along the sides, where the spiracular region is puffed out, and there shows each break distinctly enough, and also gives rather a flattened appearance to the body both above and below.

In general colour it is of a whity-brown, rather inclining to a buff tint; the back of pale brown has twin lines of dark grey deepening almost to black as they approach the posterior segments, and they enclose a thread-like line of the ground colour; a subdorsal stripe faintly paler. The back is defined with a ragged edging of atoms of grey-brown; a narrower line follows, defined faintly in the same manner; the spiracular stripe is the palest tint of buff, almost whitish; the spiracles are excessively small and black; a small dark grey or blackish mark is at the end of each segment from the fifth to the tenth inclusive, just at the lower edge of the subdorsal, very faint on the intermediate segments, strongest on the ninth and tenth; on this last another dark mark occurs beneath the pale spiracular stripe in a similar relative position. The belly is of the same colour as the back, and has a central pale stripe on each segment, bordered with pale grey, which is dark and distinct just at the end of each segment, and two paler stripes approximating a little towards each of the anterior segmental divisions, suggestive of a lyre; the usual tubercular bristles are very short, and whity-brown. The spiracular region of *A. ochrata* is an inflated projecting ridge, which in colour bears a stripe of whitish flesh tint, the palest part of the pale larva. The head is pale pinkish flesh-colour, finely freckled with brown, the tips of the papillæ brownish. When the larva bends down its head beneath the belly the segmental divisions on the back appear then brownish as they open a little. There are twelve wrinkles across each of the long segments, a less number but rather deeper in the shorter ones, so that the body appears to be composed of a numerous series of narrow rings.

By the 8th November the larva had fed well and

grown to be nearly seven-eighths of an inch long; the wrinkles are now less deep than before.

The larva fed well with me on flowers of *Picris hieracioides*, *Crepis virens*, and *Apargia autumnalis*, up to the 11th of November, and got fat. It then by degrees contracted a little in its length and grossness, and at night on the 13th spun itself up in a bit of moss on some earth in a pot.

The moth, a female, emerged in the evening of the 14th of December, the pupa having been kept on the mantel-shelf, and a piece of blotting-paper moistened daily to prevent its being dried up.

The pupa skin was nearly three-eighths of an inch in length, and of the usual figure, with a small rounded anal projection furnished with four fine curly-topped bristles, two of them shorter than the others; the colour light chestnut brown, with dark brown anal tips, the surface rather shining.

The attitude of the larva when feeding was extended nearly straight along a stem; at other times the back was arched, with only the first four segments extended, its hold sustained with the prolegs only, or if at all alarmed the front segments are bent down under the belly in a coil. (William Buckler, December 15th, 1880; Note Book III, 242, 253.)

This extremely local species has not hitherto been recorded as bred in England. The following notes will be of interest.

The eggs are not apparently attached to the food, but dropped loosely amongst it. They hatch in a few days, about the first week in August. Having no information as to food-plant, a general selection of the most probable was made, and placed in a wide-mouthed bottle for their choice. For the first week, so little sign was there of any feeding that I feared I had lost them. After two or three weeks, although they made very little progress, still they were alive, and must have eaten something. Generally most of the little larvæ were on or near *Galium verum* flowers, one of

the plants supplied. Still, being so small, the frass was hardly perceptible; as time went on it became more apparent that they ate only, or, at any rate principally, the withered flowers of the *Galium*. During the month of August, as long as this plant could be obtained in bloom, it was continued as food; when this could no longer be obtained I had to seek some other food, and early in September I tried flowers of golden-rod. The larvæ took to this readily enough, although evidently not a natural food, as the golden-rod did not grow in the district where the moths were taken. I simply tried it because I had it growing in my garden. My stock of this plant failing, Mr. W. H. Grigg, of Bristol, kindly sent me a weekly supply of it by post until the middle of October, when flowers could no longer be obtained. By this time about ten of the larvæ had fed up much in advance of the rest of the brood, and almost gave me hope that, provided I could get them food, they might be induced to feed up this year. I pondered as to what food I could procure, when *Crepis virens* suggested itself to me, from the fact of recollecting that a species of *Crepis* was very plentiful in their habitat. *Crepis virens* being a late flowering plant and common on Blackheath, there was not much difficulty in getting flowers of it to try, and it proved a complete success. Some of these flowers were placed in a glass cylinder, with a few broken pieces of flower-pot, light soil, and moss, which were kept moist, but not wet, having a free drainage. The cylinder was kept in a warm room, and the ten forward larvæ now fed up rapidly, and by the 1st November the first one had spun up. I immediately dispatched one of the largest to Mr. Buckler, who has secured three drawings of this long-desired species. I may mention that at first I had tried the coast *Crepis*, but then only the leaves. They did not apparently care for them at all, or, in fact, for foliage of any kind. Flowers when withered appeared to be most to their taste.

The full-fed larva may be briefly described, being almost without ornamentation and of an almost uniform warm stone-colour. It is about three-quarters of an inch long, moderately stout for an *Acidalia*, slightly thickest in the middle, and tapering gradually to the head, which is rather flat and small. The dorsal and subdorsal lines are obscurely indicated. When viewed through a glass of low power the dorsal line is seen to be composed of two fine parallel lines of faint grey; the subdorsal lines by a broken and indistinct row of grey dots, most distinct on the tenth, eleventh, and twelfth segments. The whole dorsal area is seen to be a series of fine transverse wrinkles, which with a higher power appear very like the ridges of corduroy, such as is used for workmen's trousers. The spiracular line is closely marked by a produced and wrinkled skin-fold, which towards the head appears almost fringed, and to which portions of the yellow petals, or rather florets, often adhere. The abdomen and claspers are of the same uniform stone-colour, with a faint indication of a double row of dark spots, two or four on each segment.

The larva spins a few coarse threads of silk, drawing together portions of food-plant or moss into an open-work cocoon, through which can readily be seen the light brown chrysalis.

Naturally these larvæ would hibernate, which the rest of my brood are now doing. (W. H. Tugwell, November 13th, 1880; Ent., December, 1880, XIII, 306.)

ACIDALIA RUBRICATA.

Pl. CXVII, fig. 1.

On the 28th of July, 1864, Mr. F. Bond took nine specimens of *Acidalia rubricata* and obtained some eggs, which he kindly sent to me.

The larvæ were hatched on the 6th of August, and chose for their food *Polygonum aviculare*, *Lotus corniculatus*, *Medicago lupulina*, and *Trifolium minus*.

M. Carl Plotz, whose drawings of *Geometræ* and their larvæ are referred to by Mr. Crewe in the *Entomologist's Annual* for 1865, had figured *A. rubricata* as feeding on *Thymus serpyllum*, but I could not discover that my larvæ showed any liking for that plant. They continued feeding till some time in October, and had attained a length of rather more than a third of an inch before hybernation. About this time I discovered amongst them a very tiny larva of *Boarmia rhomboidaria*, which I believe must have been produced from an egg laid upon one of the food-plants before it had been potted for the use of *A. rubricata*. I fancy it must have been on the *Lotus corniculatus*; but whether this intruder in any way injured his fellow-prisoners I cannot tell (if he did, he met with a comical punishment afterwards; a larva of *Zygæna trifolii* took possession of him as he was stretched out stiff between two stems of the trefoil, and actually spun its cocoon upon his back!); however, during the latter part of October and the month of November, from some cause or other, I lost six out of nine larvæ which I had hoped to rear. The remaining three I nursed very carefully, on fine days exposing them in their glass cylinder to the sun and air, and on stormy days and every night putting them under shelter. They began to feed again some time in March, from that time showing a decided preference for *Polygonum aviculare*. They changed skin for the last time about the end of April, and spun up during the latter part of May and beginning of June. On the 29th of June a very perfect specimen emerged of the "bright purple" variety of the moth, puzzling me until I learned that the "dull brownish-red" of the *Manual* is not the constant uniform of *A. rubricata*. I can compare the colour of this specimen to nothing so well as to the beautiful tint on the hind

margin of the fore-wings of *Chærocampa elpenor*, only it is brighter.

The larva when full-fed is not quite an inch in length; in shape rather slender, tapering towards the head; the head itself is notched, having the lobes rounded and swelling out wider than the second segment; the whole body is ribbed with transverse rings. The ground colour is grey or ochreous on the back, paler on the belly. The dorsal line is composed of two very fine dusky threads; there is a thicker and darker subdorsal line, commencing on each lobe of the head, and vanishing again after the fourth segment, and as far as this extends there is between it and the dorsal line a pale grey stripe; on the next five segments both these subdorsal lines reappear only as light or black spots at the segmental divisions, while on the back of the same segments there are five elongated dusky lozenges faintly edged with black; the remaining segments are paler both in ground colour and in distinctness of lines. The spiracles are black, placed in a drab longitudinal ridge, which is bordered above by a fine black line, and below by a wider one.

All the dark lines and marks become much fainter as the larva approaches its final change.

The pupa is apparently placed in a slight cocoon under moss; but, as I am hoping to get out another moth, I have not disturbed the cage to describe it.

The larva is very similar in figure, tints, and habits to many others of the same genus (twisting itself when disturbed into almost a double coil); but the eye at once catches, as the chief point of distinction, the shape and colour of the head. (John Hellins, 13th July, 1865; E.M.M., August, 1865, II, 66.)

On the 13th of August, 1870, I received, through the kindness of the Rev. John Hellins, a young larva of this species. It fed on *Polygonum aviculare*, growing slowly until the early part of October, when it

began to hibernate. On the 15th of that month I took a description as follows :

Length nearly half an inch, slender, but of average *Acidalia* proportions; head larger than the second segment, notched on the crown; body cylindrical, and of nearly uniform width, but slightly thickening posteriorly; segmental divisions distinct, each finely ribbed transversely, which gives the skin a rather rough appearance, being also rough to the touch; general colour greyish brown; head grey, marked with smoke-colour; medio-dorsal line indistinct to the tenth segment, faint rust-colour; on the remaining posterior segments broad and distinct, dull black. When seen through a lens, however, the faint rust-coloured dorsal line seems to run very narrowly through the broad black of the posterior segments; on each of the other segments the black appears in the shape of two short parallel black marks, one on each side the dorsal line; there are no perceptible subdorsal lines; spiracular lines puckered, lighter than the ground colour; ground colour of the belly similar to the dorsal surface; it is bordered on each side by a conspicuous, dark smoky, subspiracular line.

When at rest the food-plant is grasped by the claspers, and the body bent in a curved position, more so than in any other *Acidalia* larva I have noticed. In this position my larva remained a great part of the winter, but the very severe weather we had appeared to have been too much for it, as I found it dead on examining my hibernating larvæ in the early part of February.

What its food is in a natural state I believe is as yet unknown. (George T. Porritt, 3rd March, 1871; Ent., April, 1871, V, 275.)

ACIDALIA SCUTULATA.

Pl. CXVII, fig. 2.

Eggs laid July 12th, 1867; larvæ hatched on the 17th; ate withered dandelion, and in the spring seemed very fond of a mouldy slice of turnip, which had been put into their flower-pot to catch an intruding slug; spun up during May and June; moths out June 8th to July 2nd.

The egg of *A. scutulata* is rather longer in shape (than that of *A. holosericeata*), one end flattened, the other more conical, covered with minute pits or depressions; colour whitish, mottled with brownish-pink.

The larva, though still belonging to the stiffer type of *Acidalia* larvæ, is yet an advance toward the other, being more slender and elongated in form, than that of *A. holosericeata*, while still retaining the spiracular ridge, the great rugosity of skin, and the tapering to the head. When full-grown, about three-quarters of an inch long; slender, flattened, front segments more rounded, head notched and moveable; the front and hinder segments very short, so that the legs appear as if placed close together at either extremity. In repose it keeps the front segments bent down, but the head and neck turned up again, in an uncomfortable-looking attitude, suggestive of a "crick" in the neck. Colour pale ochreous, a brown double dorsal line showing strong on the head, faint on the front segments, confluent and strongly marked behind; a brown subdorsal line very plain and strong on the head to the fourth segment, then almost lost till it becomes strongly marked again on the hinder segments, but its place is marked at the segmental folds by a pair of dots; on segments five to nine pale brown oblique dashes reaching from the dorsal to below the subdorsal line; the spiracles black, placed on a whitish ridge; belly darker than the back,

being suffused with blackish, some darker dashes under the spiracles, and a darker irregular central line.

These larvæ formed compact little cocoons in the sand, and one bit up a piece of paper, and made itself a very neat little envelope. (J. Hellins, July, 1868; E.M.M., September, 1868, V, 95.)

ACIDALIA BISETATA.

Pl. CXVII, fig. 3.

Eggs sent me by Mr. Doubleday on the 26th July, 1867; larvæ hatched on the 30th; fed on *Polygonum aviculare* and withered bramble leaves; spun up in May; moths out June 20th to 25th, 1868.

The egg of *A. bisetata* is obtusely oval in outline, not quite cylindrical, but rather depressed; irregularly covered with fine shallow reticulation; colour salmon-pink, with large spots of deeper tint.

Putting *A. imitaria* in its place as the lengthiest of the *Acidalia* larvæ, and *A. rusticata* as the stumpiest, *A. bisetata* seems to occupy a middle station, and, as far as I have seen, to form the connecting link between the two forms; being more slender and of more uniform bulk than the short larvæ, and more rugose than the long ones.

When full-grown, length about three-quarters of an inch, in form slightly flattened, slender, tapering very gently towards the head, which is notched, and scarcely smaller than the second segment; skin rugose; bristles slightly clubbed; position in repose something like that of *A. scutulata*. The colour is variable; I think I have seen three good varieties.

Var. 1.—Ground colour dingy drab, warmer on the back, and duller below; the six segmental folds between four and ten showing as broad blackish-brown bands round the body, and shaped on the back by some dark oblique dashes, which reach to the spiracles, into a sort of broad, clumsy Λ , pointing forward; there is a double dark brown dorsal line to be traced where

the ground in the middle of each segment allows it to be seen.

Var. 2.—This variety was so dark on the back that the segmental folds were no darker than the ground, but the space between the double dorsal lines was distinctly paler throughout, and the oblique dashes, which in the first variety outlined the Λ s, could still be traced.

Var. 3.—A pale variety sent to Mr. Buckler by Mr. G. T. Porritt, of Huddersfield. Ground colour pale ochreous; the broad bands wanting; the double dorsal line very fine, most distinct at the folds, the subdorsal line and the oblique dashes fine also, all brown in colour; under the spiracles a clouded irregular blackish stripe, shading off to the pale grey of the centre of the belly, with some oblique dashes.

The pupa, as in the other species, just under the surface of the fine loose soil. (John Hellins, July, 1868; E.M.M., September, 1868, V, 95.)

ACIDALIA TRIGEMINATA.

Pl. CXVII, fig. 4.

I am very much indebted for young larvæ of this species to the kindness of Mr. J. R. Wellman, who captured the parent moth on the 18th of June, 1870. The eggs, Mr. Wellman informs me, were, as well as he can remember, of a pale pinkish colour, and much like those of *Acidalia rusticata*; they were laid loose in a box, and hatched in about ten days.

The young larvæ were supplied at first with a variety of food, including maple, birch, and knotgrass. In their infancy they appeared to feed on the two first-named; but when nearly half-grown they fed entirely on *Polygonum aviculare*, and on this plant I had the pleasure to make their acquaintance on the 28th of June, and continued to feed them with the same up to their pupation, which occurred July 22nd to 24th.

One moth, a male, appeared on the 14th of August, the others remaining over the autumn and winter. Mr. Wellman, more fortunate, bred upwards of a dozen specimens between the 3rd and 16th August.

The full-grown larva is about three-quarters of an inch in length, and although its shape is really more cylindrical than flattened, the puffed spiracular region gives the appearance of a rather flattened form; its breadth is greatest at the ninth segment, from which it tapers by degrees both behind to the anal tip and in front towards the head, which is the smallest segment; it is very rugose, each segment being subdivided into twelve portions by deep wrinkles; the segmental divisions deeply cut, and much less in diameter than the segments themselves.

Its colour is a dingy deep brown, relieved along the spiracular ridge by an almost continuous streak of dirty pale ochreous, interrupted at the segmental divisions. On the back, as far as the beginning of the tenth segment, is a very faint pale dorsal line, chiefly visible before and behind each segmental division, where it is palest, and set off by being bordered by thick black strokes; from these, two blackish streaks diverge obliquely towards the subdorsal region, forming a kind of **A** mark pointing forwards on the anterior of the segment, the middle part of which is much suffused with dark brown; the subdorsal line is also blackish but not continuous, being interrupted twice on each segment; on the tenth segment there is a central, somewhat star-shaped, whitish spot, and the remaining posterior segments are brown without any definite markings. The ventral surface is dark brown, and contrasts strongly with the pale spiracular ridge; the head is shining brown. The larva of this species is further distinguished from those of its congeners by having, from each of its wart-like tubercles, a rather long dirty ochreous bristle, curved forwards on all the segments as far as the tenth, but curved backwards on the other three; these bristles have the

extremity as thick as the base, and greatly resemble those on some species of *Caradrina*.

It is a very timid larva, contracting itself at the least alarm, and remaining a very long time afterwards without movement. Its usual position in repose is a close coil, with its head twisted round on one side over the back of the tenth segment. (William Buckler, November 26th, 1870; E.M.M., June, 1871, VIII, 22.)

ACIDALIA CONTIGUARIA.

Plate CXVII, fig. 5.

Through the kindness of Messrs. Greening and Bond, Mr. Buckler and myself have had the pleasure of rearing the larva of this species this season.

The larva after hybernation, at the beginning of April, was about half an inch in length; and at that time, although rugose, and presenting a most decided 'wave'-like appearance, was not at all so plainly marked as it afterwards became. The ground colour was a warm ochreous-brown above, and a dark chocolate-brown beneath; and on the middle segments was a row of elongated diamond-shaped markings, slightly darker than the ground colour, with the four usual dots on each segment blackish; along the spiracular region the dark and light shades of brown met in a sort of zigzag line.

About the 20th of April the larva moulted for the last time, and after that continued to feed for about four weeks.

When full-fed it was about three-quarters of an inch in length, belonging to the shorter and thicker type of *Acidalia* larvæ, rather flattened below, slightly tapering from tail to head, rugose; the head small and bifid. The back of a buff-brown, brighter on the head and three following segments; a dark subdorsal (but no dorsal) line on these same segments; at the fifth segment the subdorsal line ceases, and the dorsal row

of dark brown elongated diamonds begins ; this contracts to a double dorsal line, but is much darker, on the hinder segments ; the usual dots black, emitting bristles ; the spiracular region puffed and puckered, bordered below with a broad irregular stripe of dark brown ; the centre of the belly of an ochreous-brown.

When disturbed the larva draws back the front segments, but I did not see it twist into a coil.

Understanding that the food must be *Empetrum nigrum*, we troubled our friends to send us a supply of this plant out of Yorkshire, and then soon found that ling, whitethorn buds, and *Polygonum aviculare* were just as acceptable ! The two moths emerged on the 27th June and the 5th July. (John Hellins, July 12th, 1866 ; E.M.M., August, 1866, III, 69.)

ACIDALIA RUSTICATA.

Plate CXVII, fig. 6.

Whilst rearing this species from larvæ kindly sent by Mr. T. Eedle, Mr. Buckler and I have made a few notes, for which I venture to think the descriptions of Mr. Newman and M. Millièrè have still left room.

We received the larvæ in September, 1865, then about half-grown, and feeding on tender leaves of ivy and lilac ; but after hybernation we found that having by chance got hold of some withered bramble leaves, they preferred them to any other food. They spun up about the beginning of June, 1866, and the perfect insects appeared from the 8th to the 20th July.

M. Millièrè speaks of this species as double-brooded, and describes the larva of the summer brood, which feeds up quickly ; but in England it seems there can be but one brood, for there would not be time for another between the middle of July and the beginning of September—when we received our larvæ.

I do not know whether there is more than one form

of the larva, but in neither of the above-mentioned descriptions is there any mention made of the row of five dorsal markings which, in our specimens, were very conspicuous.

The ground colour was a dingy brown, paler on the ninth segment, the dorsal and subdorsal lines paler than the ground; on each segment from the fifth to the ninth (both inclusive) is an oblong space paler than the ground, shaped somewhat like an acorn, the tip of which is formed by a very pale spot behind; these acorns are partially enclosed (at the beginning and end of each segment, that is) by blackish marks like Vs, only with the arms curved to suit the outline. There are also some much shorter curved lateral marks crossing the segmental folds just below the subdorsal line; and there is a pale ochreous plate on the second segment.

The great rugosity of the skin, and its curious short clubbed bristles, have been described before. (John Hellins, January 28th, 1867; E.M.M., April, 1867, III, 259.)

The larva of this species rests in a bent position, its claspers attached to its food-plant, and its anterior extremity raised; the head is slightly narrower than the second segment, and is partially received therein; it is divided, but not deeply, on the crown; it is beset with numerous linear fleshy processes, which have the appearance of elongated warts; the body gradually increases in width after the head; it is much dilated on the sides, and has two indistinct ridges on the back; the incisions of the segments are well marked, and each segment is obviously divided into six sections by transverse furrows, besides the manifest skin-fold which intervenes between the segments; the sections are composed of wart-like projections, which give a rough and scabrous appearance to the entire body; in addition to which it is beset with many clavate processes, which might be compared to the glandular hairs frequently occurring in plants; the extremity of

these processes is flattened after the fashion of the antennæ of butterflies.

The colour of the head is black, the processes being dirty white; the body is dingy putty-coloured, freckled with smoky black; the ventral is slightly paler than the dorsal surface.

I am indebted to Mr. J. R. Wellman for a liberal supply of this most interesting larva. I am unable to state what is its natural food-plant, but, like so many of its kindred, it feeds freely in confinement on *Polygonum aviculare* (the common knotgrass). (Edward Newman, 1870; Ent., October, 1870, V, 176.)

ACIDALIA OSSEATA.

Pl. CXVII, fig. 7.

At the time Mr. Alfred E. Hudd, of Bristol, sent me the eggs of *A. incanaria* (Ent., January, 1878, xi, 18), he also forwarded a few of *A. interjectaria* [*osseata* of Stainton's Manual]. They were globular in shape, and of a pale salmon-colour.

On the 3rd of August the young larvæ emerged, and were dark purplish-brown; the head black. Until autumn they fed on *Polygonum aviculare*, but after hibernation on withered dandelion leaves, etc. Only one reached maturity, and it I described on April 18th as follows:

Length nearly half an inch, stout, and rather stumpy in appearance; the head has the face flat, and is distinctly notched on the crown; it is rather narrower than the second segment. The body has a more uniform appearance than many of the species in the genus, but, like its congeners, the segments gradually widen from the second to the ninth; the next three are of nearly uniform width, but narrower than the ninth, and the thirteenth is still narrower. Like all others of the genus I have seen the segments overlap each other, rendering the divisions distinct,

and each segment is also transversely ribbed, and is clothed with very few, scattered, short, bristly hairs. Ground colour a dirty, dull, smoky brown, marbled and variegated with ochreous-yellow, the darker colour predominating on the front segments, the ochreous on the ninth to thirteenth segments. The head is also of these two colours, in about equal proportion. Dorsal line ochreous, deeply edged with smoke-colour; there is a distinct white spot on the posterior part of the sixth, seventh, and eighth segments. There are no perceptible subdorsal lines, but a conspicuous ochreous line extends through the region of the spiracles. The ventral surface is of the same dull, dark, smoky brown as the dorsal area, but has a very pretty series of large, ochreous, crescentic marks throughout its entire length, and there is a very faint indication of a pale central line; the hairs are black.

This larva spun a slight cocoon of loose threads, and the imago, a fine female specimen, emerged August 4th. (George T. Porritt, February 6th, 1878; Ent., April, 1878, XI, 91.)

Eggs of *A. interjectaria* (as we must now call what used to pass in this locality for *A. osseata*) were obtained here (Exeter) on July 12th, 1867; others were sent me by Mr. Brown, of Cambridge, on the 17th July.

The larvæ hatched on the 24th and 26th; fed on dandelion and scarlet pimpernel, preferring withered leaves, and indeed would eat almost anything withered; spun up in May, 1868, and the moths appeared June 24th to 29th.

The egg of *A. interjectaria* is flattened at either end, but not so decidedly (as in *A. holosericeata*), the reticulation finer, the colour pinkish.

The larva of *A. interjectaria* is also one of the short stiff larvæ, in figure much like *A. holosericeata*. When full-grown its length is about half an inch; tapering towards the head, which is small, notched, and move-

able ; skin very rugose, and ridged with warts not quite so prominent as those of *A. holosericeata* ; bristles slightly clubbed. Colour a brownish-grey, hinder segments paler ; a pale dorsal line with dark edges interrupted at the four middle folds by a whitish dot, behind which comes a black X, the arms of which reach beyond the dorsal ridges of warts ; the spiracular ridge is paler than the ground, and below it are some oblique blackish dashes.

Pupa in a cocoon just below the surface of the fine soil. (John Hellins, July, 1868 ; E.M.M., September, 1868, V, 96.)

ACIDALIA HOLOSERICATA.

Pl. CXVIII, fig. 1.

To Mr. A. E. Hudd, of Clifton, Bristol, I am indebted for the opportunity of watching the earlier stages of another *Acidalia*, viz. *A. holosericeata*, and his kindness is the more thankworthy in that he supplied me with eggs three years in succession, until I could succeed in breeding the moths. Whilst engaged with this species I took in hand some others, *A. bisetata*, *A. scutulata*, and *A. interjectaria* (as we must now call what used to pass in this locality for *A. osseata*), and made notes of their various stages, also *A. imitaria* and *A. immutata* ; but having described these before, I now go no further with them than the egg.

I confess I am not satisfied with what I have done about the eggs. More careful labour with the microscope than is in my power to bestow is needed to make good work here ; I should like the micrometer to be brought into use for the more accurate comparison of dimensions, and a good equipment of condensers and reflectors will be required to make *quite sure* of the colouring and markings of the surface ; and, after all, I fancy it will be found that

while certain genera—*Ennomos* and *Acidalia*, for example—furnish interesting studies in this stage, there are others in which the allied species cannot be safely distinguished in the egg.

The eggs of *A. holosericeata* reached me on the 17th of July, 1867; the larvæ hatched on the 25th. They fed on the rock-rose, *Helianthemum vulgare*, and their habit was to congregate three or four together near the bottom of a shoot, strip it for some distance of its bark or skin, and then feed on the withered leaves at the tip of the shoot as it hung down; but of course I cannot say whether in nature they are to be found singly or in company. They ceased feeding during the winter, and were at all times very sluggish and quiet in their habits. They moulted for the last time about the end of March, spun up during May, and the moths appeared June 20th to 29th, 1868.

The egg of *A. holosericeata* is almost barrel-shaped, and perhaps more evenly flattened at the ends than any other of the *Acidaliæ*; it is covered with a coarser reticulation than *A. interjectaria*, and in colour is decidedly yellow.

The larva of *A. holosericeata* belongs to the shorter type of *Acidalia*, and is perhaps the plainest in dress of all this very plain family. When full-grown the length is a little over half an inch, in figure tapering considerably towards the head, which is small and notched, tucked under when at rest, thrown forward when in motion; skin most wonderfully wrinkled and warted, the warts being on the wrinkles, and so arranged that they form on the back a double ridge on each segment, which contracts to a single median ridge at each fold, and another more prominent ridge at the spiracles; the segmental divisions very decidedly cleft; bristles short and clubbed; the larva feels very stiff and firm; when disturbed it curls in the front segments in the same plane with the rest of the body, and not on one side, as the longer *Acidaliæ* do. In colour it varies little throughout its growth,

being generally a very muddy reddish-brown, but just after moulting almost black, the markings few and indistinct; the hinder segments are somewhat paler than the rest of the body; the segmental folds are darker; there is a paler dorsal line edged with black threads, which show most distinctly on the hind segments; and the dorsal ridges are paler than the ground.

When full-fed the larvæ retired into some sandy soil to undergo their pupation. (John Hellins, July, 1868; E.M.M., September, 1868, V, 95.)

ACIDALIA VIRGULARIA.

Pl. CXVIII, fig. 2.

I am indebted to Mr. J. E. Fletcher, of Worcester, for the opportunity of renewing my acquaintance with the larva of *A. incanaria* [*virgularia* of Stainton's Manual]. Some eggs kindly sent by him, loose in a quill, on the 26th of July, 1872, hatched on the 2nd of August following.

The young larvæ fed from the first on *Polygonum aviculare*, thriving so fast that one had changed to a pupa by the 31st of August, several others by the 5th of September, and more by the 14th; the remainder being attacked and killed by mildew when approaching pupation. The first moth appeared on the 14th of September, the others between the 26th of that month and the 3rd of October.

The egg is of a rather long oval shape, a little depressed on part of its surface, with the shell very finely reticulated, and of a deep flesh-colour, turning to brown two days before hatching.

The young larvæ at first, and for some time, were of a pale ashy grey tint above, and darker grey beneath; resting often with their front segments curled under; at the end of a fortnight they were sufficiently grown to show their distinctive characters very well; at the end of another week varieties in

their colouring began to appear, and from this time they were generally in straight postures on their food-plant, and even when disturbed from it they remained rigid, as if feigning death.

When full-grown the larva is nearly three-quarters of an inch in length; though convex both above and below, yet its shape appears a little flattened; the broadest segment is the ninth, from which those in front taper very slightly towards the head, which is the smallest segment, and is indented on the crown; the last four segments are also very little tapered until near the anal tip; all along the sides the inflated spiracular ridge is interrupted at each segmental division, and there are four subdividing wrinkles at unequal distances on the back, and twelve at equal distances on the belly, of each segment.

The ground colour, according to the individual, is either brownish-grey or reddish or ochreous brown; the head, dark in the centre, is brown, and freckled with darker at the sides; the subdorsal line begins a little below the crown of each lobe, and continues very distinct to the end of the fifth segment, the dorsal line beginning on the second segment, and continuing distinct for the same distance, both being pale ashy or ochreous in colour; from thence to the tenth segment both dorsal and subdorsal lines generally become so suffused in their course as to be but partially visible, and in some instances hardly to be traced through the brown bands which cross each of those segments, namely, a narrow band in front and a broad one on the hinder part, leaving between them but a small space of the ground colour; on the last four segments, however, the lines are more distinct. At the end of the fifth segment on either side is a conspicuous round black spot near the subdorsal region, followed in some instances by another, a trifle smaller, on the end of the sixth. In segments five to nine inclusive the back of each bears the following details, composed chiefly of brown freckles, more or less confluent, viz. :

on the dorsal region in front of each two simple leaf-like shapes of darkish brown, pointing backwards, united at their base but diverging near their tips, which end at the anterior pair of tubercular black dots; on the hinder part of each of these segments are equally wide dorsal shapes of brown, merged together at their base, but soon separating into Vs with double side strokes, the outer stroke of each pair being longer than the inner and reaching to the side, the central space between the inner strokes mostly filled up with the same brown colour until near the anterior pair of dots, where it fades away; the posterior pair of black dots just within the outer strokes, and not far from the segmental division. Instances occur where these outer oblique dark strokes are margined a little way on their course by pale ashy or ochreous. The ninth segment is paler than the others, and the tenth paler still; and on the back of the three hinder segments the markings are very simple rudiments of the preceding details. The sides are throughout clouded and streaked with darkish brown, and on the thoracic portion a strong dark brown line borders the pale subdorsal below; the spiracles are of the ground colour, ringed with darker brown. The belly of each segment is darkish grey-brown at the sides, with a paler ashy tinted pear-shape in the middle, outlined with dark brown, and on the narrowest part of this pear-like outline is placed on each side a conspicuous blackish spot; a whitish ashy stripe runs down the centre, widening at the end of each segment, and interruptedly outlined with blackish, most strongly at its widest part.

The most noticeable variety among the larvæ I had, was of a pale grey ground colour, in which the dorsal line could be distinctly traced throughout, though but little paler than the ground, and (as in many other species of *Acidalia*) was strongly bordered at the beginning of each segment with a short black mark (and this again, in one instance, with a white mark),

these black marks becoming more and more developed towards the twelfth segment; the dorsal markings down the back but thin and slight imitations of those described above, and none of them clouded or merged together; the anterior pairs of tubercular dots black, and the hinder pairs white, finely ringed with black.

The pupa is five-sixteenths of an inch in length, rather stout in proportion, broad at the thorax, the abdomen tapering rather suddenly to a point which terminates in six minute bristles, curved at their extremities; its colour ochreous-brown, broadly marked with black on the thorax and back of the abdomen, the wing-covers being delicately striated with dark brown. (William Buckler, December, 1872; E.M.M., March, 1873, IX, 246.)

In July, 1875, I received from Mr. Alfred E. Hudd, of Clifton, near Bristol, the eggs of *Acidalia incanaria*. They were globular, and pale straw-colour. On the 29th of the same month they hatched. The newly emerged larvæ were slender, with the body dark green and the head brown. They fed on *Polygonum aviculare* until autumn, when they hybernated; still feeding a little, however, on withered dandelion leaves on mild days all winter. The dandelion leaves had been supplied when the knotgrass failed, and was subsequently their food until their full growth. They were spinning up from the middle till towards the end of April.

Length about three-quarters of an inch, and of average bulk in proportion. The head has the face flattened, and is notched on the crown. Body tolerably cylindrical, tapering from the ninth segment to the head, which is very small. The segments overlap each other, making the divisions distinct; but there is not the marked difference between the width of the posterior and anterior of each segment which is characteristic of so many of the species in the genus *Acidalia*. Skin tolerably smooth, but with a tough appearance. The ground colour of the dorsal surface is stone-grey,

with very faint pink tinge on the front and posterior segments. Head dirty, smoky brown, with pale stone-coloured streak on each lobe. The medio-dorsal line is pale grey, but very narrow and indistinct; on the 10th to 13th segments it is very broadly edged with smoke-colour; on the other segments this smoke-colour takes the form of a very pretty, but almost indescribable pattern, having the appearance of a double series of V-shaped marks, or rather a V mark and an X mark, the posterior half of the X, however, being much narrower than the anterior, the V mark being within the anterior of the X mark. There are no other distinct markings, but the sides are much marbled with the dark smoke-colour. The ventral surface seems to have an underground of pinkish-grey, but is very strongly suffused throughout with pale blue; the sides are thickly dotted and marked with smoky black. Extending the whole length is a series of large pear-shaped marks, one on each segment, and the narrow end of the pear-mark pointing towards the head; these marks are of two colours, a broad central stripe being pale blue, the remainder pinkish, and on the marks is a conspicuous series of black Y-shaped marks; spiracles imperceptible.

When at rest the food-plant is grasped by the claspers, and the anterior segments coiled inwards, the head and legs being tucked closely together.

The cocoons were formed of a few threads, drawn loosely together in the corners of their cage, or amongst withered leaves at the bottom.

The pupa is about three-eighths of an inch long, has the thorax rounded, the eyes prominent, and the abdomen tapering sharply to a point. Ground colour dark ochreous-yellow, and the back of each segment neatly marked with four transverse dark brown spots; eye- and wing-cases dull dark green; tip of abdomen very dark brown.

A beautiful and strongly-marked series (some almost black) of imagos emerged at the end of June or in

July. (George T. Porritt, December 6th, 1877 ;
Ent., January, 1878, XI, 18.)

ACIDALIA CIRCELLATA.

Plate CXVIII, fig. 3.

On the 6th of August, 1865, Mr. Batty, of Sheffield, sent me some larvæ of this species which had been hatched early in July. Two of them were nearly full-grown, but the rest more than half-grown ; the former spun up during the last week in August, and the moths appeared about the middle of September, whilst the latter have remained nearly stationary, scarcely eating anything since I received them. I am thus able to describe the larva at two stages of its growth.

The smaller ones are of a dark brown all over except the back of the segments five to nine, which is occupied by a pale buff space ; down the middle of this space are four little dark insulated Xs, dividing it into five long diamonds, with a stripe of the pale colour on either side.

When full-fed the larva is about three-quarters of an inch long, slender, tapering towards the head, and rather flattened ; the head small and notched ; the skin very rugose ; in attitude it is stiff, not curling in much when disturbed. The colour is pale grey, or yellowish-grey above, darker grey below ; the sub-dorsal line dark blackish-grey ; dorsal and spiracular lines very fine and whitish in colour ; on the anterior segments up to the fifth the dorsal line is edged with fine blackish lines, but on segments six to nine the Xs of the younger stage reappear as pairs of blackish curved dashes, darkest just at the segmental folds, and lighter on the following segment ; and on the same segments these marks are followed by a pair of blackish dots and fainter dashes ; the ninth segment is

the palest, and the hinder ones are much darker, all the lines being there strongly marked.

The pupa is enclosed in a loose cocoon, formed by drawing together either earth or leaves with a few threads, and is slender in form, the tip of the tail ending very bluntly with three little horny warts; the colour reddish-brown, the edges of the wing-cases brighter.

The food supplied was *Polygonum aviculare*, and seemed to suit very well.

It appears that the larvæ of *Acidalia*, if they can meet with sufficient heat, and a supply of fresh tender food at the same time, will feed up so rapidly as to produce a second brood of moths in August or September; thus, this season (1865), I know *A. ornata*, *A. mancuniata*, and the species I have just described have been partially double-brooded; but I am inclined to think that with most of the species the greater number of the larvæ hybernate. (John Hellins; Ent. Annual for 1866, p. 164.)

ACIDALIA ORNATA.

Plate CXVIII, fig. 4.

I have more than once had eggs of this species, but never succeeded in rearing the larvæ to full growth.

On the 30th July last (1865) I received eggs from Mr. Wright, the larvæ from which are at the time I write this still quite small, and not looking likely to come to perfection, although I took some trouble to procure for them plants of *wild* thyme, thinking it might suit them better than the garden sort. However, almost on the same day with Mr. Wright's eggs, I received from the Rev. J. Greene some *larvæ* feeding on *mint*, which had even then (last July) nearly attained their full growth; and from other larvæ of the same brood, Mr. Greene, in the course of last autumn, bred the moths. My small hybernating larvæ are about four

lines in length, very rugose, and very dark and dingy to look at; but with a lens one can see that the back is brownish-ochreous, with a pale grey interrupted dorsal line, and five dusky Λ s on the middle segments, with their apices pointing forward. When full-grown the larva is not quite an inch in length, rather slender, almost uniform in bulk throughout; the head slightly notched, the skin rugose; the spiracular region puffed out and puckered. The ground colour of the back is brownish-ochreous; the dorsal line fine and interrupted, darkest near the head, afterwards showing pale grey, edged with dusky; subdorsal line dark brown, commencing very distinctly on the head. On each segment from the fifth to the ninth there are two obtuse dark V s, one pointing forward, the other backwards (their arms reaching nearly to the subdorsal line, and terminating in the usual four dots), and between them enclosing a blunt diamond of the ground colour, through the centre of which the dark-edged dorsal line shows distinctly. The posterior segments are marked only with the dorsal and subdorsal lines, and the usual four dots in each, here showing more distinctly as being not confounded with the other markings. The spiracular stripe pale ochreous, freckled and edged below with dusky; the body pale grey, freckled and mottled in the same way.

Certainly *mint* seems to have suited the growth of these larvæ better than *thyme*, but I perceive that after they have once tasted the latter they will not leave it for another food. (John Hellins, February 7th, 1866; E.M.M., July, 1866, III, 44.)

ACIDALIA INCANATA.

Pl. CXVIII, fig. 5.

On September 7th, 1875, I received half a dozen young larvæ of *A. promutata* [*incanata* of Stainton's Manual] from Mr. J. G. Ross, of Bathampton,

near Bath. They fed on *Polygonum aviculare* until hibernation, which in their case extended over an unusually long period, as, in the spring following, they did not recommence feeding until long after other hibernating species I had had begun to do so, although kept under precisely the same conditions. This, however, cannot be taken as the natural habit of the species, whatever may have been the cause in this case, as my larvæ were consequently not full-grown until quite the end of June, or several weeks after the imagos ought to have been on the wing at large.

Length nearly an inch and a half; the head has the lobes rounded, and is of equal width with the second segment; body slender, cylindrical, and of almost uniform width throughout, tapering very slightly indeed toward the head; segmental divisions tolerably well defined, but do not overlap each other in the marked way which characterises so many of the species in the genus; skin distinctly but very evenly transversely ribbed.

Ground colour of the dorsal surface and head a very pale slaty-olive; a dull olive stripe extends throughout the centre of the dorsal area, and encloses within it a very fine interrupted pale medio-dorsal line; this olive stripe, however, is much darker on the last three segments than on any of the others; there is a pale yellowish, not very well defined, line along the sub-dorsal area, but there are no perceptible spiracular lines; spiracles distinct, black. Ventral surface uniformly of a pretty, very pale slaty-blue colour.

The pupa is nearly half an inch long, smooth and polished, tolerably cylindrical, but attenuated towards the anal point; compared with the larva it is very stout. General colour of the dorsal surface pale brown; head and segmental divisions chocolate-brown; wing-cases yellowish-green; the anal tip brown.

The imagos began to emerge July 23rd. (George

T. Porritt, April 10th, 1878 ; E.M.M., May, 1878, XIV, 279.)

ACIDALIA MARGINEPUNCTATA.

Pl. CXVIII, fig. 6.

One young larva of *A. straminata* [*marginepunctata* of Stainton's Manual], the survivor of two larvæ reared from eggs, reached me October 1st, 1872, from Mr. J. R. Wellman, feeding on knotgrass. On the 4th he sent me three more, being all his stock, and the following particulars. The parent moth was captured in the New Forest in July, 1872, by a friend of Mr. Wellman's, who forwarded him the eggs laid in a cluster of about ten or eleven. When Mr. Wellman received them they were of a pink colour, and about the size of eggs of *A. rusticata*; and before hatching they changed to a dark slaty-brown.

By the 5th of October the larvæ had attained the length of three-eighths of an inch. They were moderately slender, very slightly tapering forwards from the ninth segment, the head a trifle the smallest and indented on the top of the crown, full and rounded at the sides, the last five segments of about uniform bulk; the upper and under surfaces are convex, with a spiracular inflated ridge along the sides tending to give rather a flattened look to the back. The segments are decidedly rugose, with about twelve deep subdividing wrinkles on each. The bristles are very short and stumpy, rather numerous about the head and the anal extremity.

The ground colour of the back is a pale grey, chiefly seen in an imperfectly elliptical, somewhat diamond shape on the fifth to the ninth segments inclusive; this is defined by blackish; a faint whitish-grey dorsal line appears only just at each end of this mark, which is strongly edged with black; on either side the grey becomes suffused with darker; the subdorsal lines are black, with a fine whitish-grey line on each side

of it, but which appears only at each end of a segment. The ventral surface is entirely black.

These larvæ all died during the end of winter. (William Buckler, 1873; Note Book I, 205.)

On the 30th of September, 1873, Mr. F. Bisshopp, then on the point of leaving Ipswich, kindly sent me a few larvæ of *Acidalia straminata* feeding on knot-grass sparingly, and when after a time this food failed, they nibbled a little at tormentil and heather, but soon began to hibernate, and about the end of November one or two died, which induced me to make them over to the Rev. J. Hellins, knowing that if they could be kept alive during the winter and spring he would be successful; and my belief was verified, for on the 5th of June, 1874, I received from him a larva in its last dress, and on the 14th another grown to the same size.

These were about seven-eighths of an inch in length, slender in proportion, tapering gradually from the end of the ninth segment to the head, which is the smallest, and from the ninth to the anal extremity. On the back it is a trifle flattened, the spiracular inflated projecting ridge helping this appearance; rounded on the ventral surface similar to that of the back, and rugose above and below; segmental divisions well defined; the head rounded at the sides and notched on the crown; some very minute stumpy bristles rather numerous proceed from the head and second segment, as well as from their usual situations on the other parts of the body and ventral and anal legs.

The colour of this larva is a pale ashy grey or pinkish grey, becoming on the eighth and ninth segments almost white, but a fine hair-like dorsal line is whitest faintly edged with blackish or grey. This pale portion on each segment beyond the fourth is somewhat of a pear or pegtop shape, the broad part behind and surrounded with grey, its apex defined by a blackish inverted V mark followed by the two anterior black dots; the posterior dots also black, and a short open V mark at the end of the segment;

the black dots and Vs are strongest and most noticeable on the end of the fifth segment; on the thoracic segments the markings are linear and darkish grey, as they also are on the last four; the inflated ridge is very dark grey, freckled; the belly suffused with a sooty blackness, excepting a narrow grey transverse band at each segmental division, the sides of the last four segments being a little paler, of a grey colour; two black central or twin lines can be seen on the narrow grey transverse band. The colour of the head is dirty whitish, broadly marked with blackish down the front and side of each lobe. When full-grown (June 22nd) the ventral surface is black only beneath the inflated spiracular ridge, the rest being grey with two central undulating stripes followed on either side by another of blackish-grey. One of my two examples became quite white in ground colour on the back of the eighth, ninth, and front part of the tenth segments, the pale grey of the thoracic segments gradually becoming whiter, on the last three segments dark grey as before. The first ashy-grey larva retained its colouring in all respects until it retired for pupation on the 26th of June.

The other larva on the 3rd of July spun some few silken threads amongst its food-plant, and remained to pupate there.

The perfect insects appeared on the 27th July and 5th August, 1874. (William Buckler, August, 1874; Note Book II, 74.)

For the opportunity of studying the history of *A. straminata*, the larva of which, I believe, is hitherto undescribed, I am indebted to the kindness of Mr. G. B. Corbin, of Ringwood, who sent me eggs with the female moth on July 23rd, 1873.

The eggs are rather large for the size of the moth, oblong-square with the corners rounded, in colour reddish-brown,—deposited loose; they hatched on the 29th of the same month, and the newly emerged larvæ are long and slender,—in colour a very dark

brown. They were fed on *Polygonum aviculare*, and grew slowly until autumn, when they hibernated, and recommenced feeding early in March of the year 1874. A great many of them died during winter and spring, and at the end of May I had only four left. These were nearly full-grown on the 18th of June, when I described them as follows :

Length about an inch, and rather slender; head rather narrower than the second segment, and deeply notched on the crown; the body is rounded beneath, but rather flattened above, not so conspicuously, however, as in some other *Acidalia* larvæ; the 2nd, 3rd, and 4th segments are the narrowest, and are of about equal width; from the fourth they gradually become wider until the 10th, which is the widest segment, is reached; the 11th, 12th, and 13th are of about equal width, but narrower than the 10th. The segments overlap each other, rendering the divisions distinct, and, as in other species of the genus, each segment is conspicuously ribbed transversely; the skin has a tough appearance.

The ground colour of the dorsal surface is pale slaty-grey; the head is grey, with the sides and the notch dividing the lobes dark brown; medio-dorsal line very narrow and pale, edged on each side in the centre of the 5th, 6th, 7th, 8th, 9th, and 10th segments with a narrow black streak; on the other segments the black edging is continuous, but narrower and much less distinct. On the middle segments, between the medio-dorsal and subdorsal lines, is another series of very black streaks, and these, being situated nearer the subdorsal region than the edging of the dorsal line, give the dorsal surface a very pretty variegated appearance. The subdorsal lines are of a very indistinct pale slate-colour; the spiracular lines are scarcely perceptible even with a lens. The ventral surface is of a uniform pale slate-colour, with a very narrow indistinct paler central line, and equally indistinct transverse waved longitudinal lines.

This description applies to the two more strongly marked larvæ; in the others the black markings on the dorsal surface were comparatively indistinct, in one showing only as paler confused marks.

When nearly ready for spinning up, I had two of them preserved; the others spun loose cocoons in a corner of the cage, and on the 21st July a ♀ imago emerged. (George T. Porritt, July 11th, 1874; E.M.M., October, 1874, XI, 116.)

ACIDALIA SUBSERICEATA.

Pl. CXVIII, fig. 7.

[The following description is given in a paper on the larvæ of this species and *A. manconiata*, for which see under that species.]

On the 25th August, 1870, I described the larvæ as follows:

Acidalia subsericeata.—Length about three-quarters of an inch, tolerably stout posteriorly, but tapering considerably from the ninth to the second segment; head small, nearly as broad as the second segment, and notched on the crown; a division in the centre of the face renders the cheeks, which are rounded, prominent and distinct; body flattened when seen from above, but rounded on the ventral surface; divisions of the sixth, seventh, eighth, and ninth segments very conspicuous, the anterior end of each being narrower than the posterior; there are a few scattered but scarcely perceptible hairs, most conspicuous on the second segment, where they are pointed forwards; skin ribbed transversely and rather tough; ground colour composed of several shades of brown and ochreous, the eighth and ninth segments being conspicuously of the latter colour, some specimens having a faint green tinge; head ochreous, surrounded with dark brown; mouth and central divisions of the face black; from the notch in the head extends the fine pale greyish dorsal

line, bordered on each side with an equally narrow dark line; dorsally, on the anterior part of the ninth segment, is a conspicuous rust-coloured mark, shaped somewhat like an arrow-head, the apex pointed anteriorly; there are a number of confused brown markings along the spiracles, which are of a still darker brown; usual segmental dots conspicuous, black; the ground of the ventral surface is of a beautiful slate-colour, with a series of curiously-shaped dull black marks throughout its entire length, which give it a very pretty appearance. When at rest the food-plant is grasped by the claspers, the body stretched out at full length, the head being brought slightly forward, and tucked in amongst the legs. [For additional remarks and comparative notes see under next species, *A. mancuniata*.] (George T. Porritt, November 4th, 1871; Ent., December, 1871, V, 453.)

ACIDALIA MANCUNIATA.

Pl. CXVIII, fig. 8.

The following comparative notes on the larvæ of these species or varieties [*A. subsericeata* and *A. mancuniata*] may, perhaps, prove interesting. For the opportunity of comparing the two I am indebted to the kindness of the Rev. J. Hellins, of Exeter, who sent me the larvæ in July, 1870. They fed on *Polygonum aviculare*, and on August 25th I described them as follows:

A. subsericeata [see under that species].

A. mancuniata:—In habits and shape precisely like *A. subsericeata*, but perhaps a trifle more slender; ground colour dark brown, strongly tinged with chocolate, and without the ochreous markings so conspicuous on the eighth and ninth segments in *A. subsericeata*; head marked as in that species, but duller in appearance; dorsal line also similar to *A. subsericeata*, but the rust-like mark so conspicuous in that species is want-

ing in *A. mancuniata*, but in one variety it is replaced (though in a different position) by two distinct white chalk-like marks; ventral surface as in *A. subsericeata*.

At the time I had my larvæ, my friend Mr. J. P. Barrett, of Peckham, also reared a brood of *A. subsericeata*, and as his notes differ slightly from my observations, I append them. In a letter dated October 25th, 1870, he says:—"I received a drawing of *A. mancuniata* from Mr. Doubleday this morning, and should like to know whether your notes agree with mine. The figure was taken by Mr. Buckler in 1865 from Dr. Knaggs' larvæ. I think it is of a darker brownish tinge in general than my *A. subsericeata*, and the black dots are more conspicuous. The last segments are paler than the others, but appear to want the yellowish tinge that *A. subsericeata* possesses. In other respects I can see no difference either in size or shape." On receipt of this letter I forwarded my *A. mancuniata* larvæ to Mr. Barrett for comparison with his *A. subsericeata*, and in a letter dated October 28th he says: "I am now quite satisfied that there is but very slight difference between the larvæ of *A. mancuniata* and *A. subsericeata*; I believe that you would scarcely be able to pick out the *paler* larva you sent if it were placed in a batch of *A. subsericeata*. The chocolate-brown one might readily be distinguished, but I should not be surprised if *A. subsericeata* varies similarly. You mention in your notes that the larvæ of *A. mancuniata* are, perhaps, more slender than *A. subsericeata*. I have noticed that in this respect my larvæ varied considerably, but I am scarcely prepared to say, though I suspect such to be the case, that the more slender larvæ produce the smaller insects, viz. the males. The figure before mentioned" (Mr. Buckler's) "is taken from a larva as stout as any I have had. The chief point of distinction that I have noted is the ochreous marking on the latter segments, and with respect to this it varies much in intensity. A batch of larvæ that I had last year, belonging to *A. subsericeata*, scarcely possessed

that marking, whilst those (or some of them) I had lately were very conspicuously blotched." Subsequently, when in Huddersfield, Mr. Barrett saw my *A. subsericeata* larvæ, and found they varied very much from those he had reared; indeed, my *A. mancuniata* were more like his *A. subsericeata* than were my larvæ of that species. I offer no opinion as to the distinctness of the two species. (George T. Porritt, November 4th, 1871; Ent., December, 1871, V, 453.)

At the time that Mr. Hellins sent me two larvæ as variations of *A. subsericeata*, I remember making known to him that they were not the least like those of that species sent to me in October, 1862, by Mr. Crewe, nor yet like others I had in April, 1863; for both Mr. Crewe's examples and the last named, although they varied slightly, were all constant to one particular, viz. a pale yellowish or whitish mark on each side of the ninth segment.

It will be seen by the subjoined description that, from *A. subsericeata*, *A. mancuniata* is more distinct in the larval than in the perfect state, even the character of its markings being entirely different.

Description.—Larva about three-quarters of an inch long, tapering gradually towards the head, which is grey-brown, with a dark brown line on each lobe. Ground colour of the body pale reddish-grey; dorsal line scarcely paler, very thin, and enclosed by a broad brown line on either side, which gradually widens down to four-fifths of the segments, and then contracts towards the segmental divisions, and at the widest portions on each side is a rather large spot or blotch of blackish-brown.

The subdorsal lines are of grey-brown, very thin and double, with a blackish-brown oblong blotch on them, about the same distance from the end of each segment as those on the dorsal region.

The last four segments appear paler than the others, as the dorsal line on them is enclosed only by thin brown lines, and the subdorsal lines on them also

have no dark spots, except a slight indication of them on the tenth segment only.

A blackish-brown line on the spiracular region extends between the tenth and thirteenth segments.

The full-fed larva was figured on the 15th July, and on the 20th it changed, on the surface of the earth, to a very slender dark blackish-brown pupa, the tail of which was turned backwards.

The moth appeared on the 9th of August. (William Buckler ; E.M.M., January, 1866, II, 189.)

ACIDALIA IMMUTATA.

Plate CXIX, fig. 1.

I received eggs of this species from Dr. Knaggs on the 18th July, 1863, and the larvæ hatched on July 22nd. They chose for their food *Polygonum aviculare*, but did not attain any great size before hybernation ; through the winter they rested on the withered stems of their food-plant, and did not begin to feed again in spring till the young seedlings of the *Polygonum* had put out their second pair of leaves, when they seemed to find out that it was time to commence to eat again. They attained their full growth during the last week in May and the first week in June of the present summer, and spun themselves up in silken cocoons under some short moss which had grown upon the surface of the earth in their flower-pot. The first moth emerged on the 2nd of July, 1864.

When full-grown the larva is about an inch and an eighth long. In shape it is cylindrical, slightly puffed at the spiracles, tapering evenly towards the head, which is small and round ; the whole skin is ribbed in rings which go quite round the body. The ground colour is a warm stone-coloured tint, and there is a dusky dorsal line forming two small dots at each segmental division ; above the spiracles an irregular double dusky line ; spiracles black, placed in a stripe rather

paler than the ground colour, below which comes another dusky line, darkest on its upper edge and fading off below.

The larva described above resembles in structure and colouring those of *Acidalia fumata*, *A. promutata*, and *A. imitaria*, except that the two last are longer; and it is altogether different from the type furnished by the shorter, stiff, and flattish larvæ of *A. subsericeata*, *A. incanata*, *A. aversata*, *A. inornata*, and *A. osseata*. (John Hellins, E.M.M., August, 1864, I, 72.)

The egg of *A. immutata* is of a long cylindrical shape, flat at one end, more conical at the other, strongly ribbed, with transverse reticulation; colour pale buff, speckled with strawberry-pink. (J. Hellins, July, 1868; E.M.M., September, 1868, V, 97.)

On the 21st of July, 1870, I received a few eggs (or rather larvæ, as the eggs had hatched on the way) of *Acidalia immutata* from the Rev. J. Hellins, of Exeter; and subsequently the Rev. E. N. Bloomfield, of Guestling, near Hastings, sent me a further supply of eggs.

The young larvæ fed until the autumn on *Polygonum aviculare*, when they began to hibernate, having attained a length of half an inch, and being of average thickness in proportion. Head a little broader than the second segment, rather flattened and slightly notched on the crown; body of nearly uniform width, but tapering very slightly anteriorly; skin very finely, but almost inconspicuously, ribbed transversely; ground colour pale olive-brown; head brown, marbled with grey; medio-dorsal stripe very indistinct; on the anterior segments it is composed of a very fine double line, darker than the ground colour; these lines conjoin and become darker and more conspicuous posteriorly, forming a distinct black stripe on the tenth, eleventh, and twelfth segments; there are also four square black marks at equal distances apart on the dorsal surface, each of which is divided into two equal parts by the medio-dorsal line; the subdorsal lines are brownish-grey, and the spiracular lines grey;

ventral surface olive-green, thickly variegated with darker, and having two almost imperceptible dark green central lines. In other specimens the belly is greyish in the centre, gradually becoming darker as it approaches the spiracular region, where it is smoky-black.

When at rest the food-plant is grasped by the claspers, and the head curved inwards. (George T. Porritt, September 15th, 1871; Ent., October, 1871, V, 408.)

ACIDALIA REMUTATA.

Plate CXIX, fig. 2.

Eggs were obtained from a specimen of this insect which I captured on the 15th June, 1870; they were red in colour, and hatched on the 27th of the same month.

By August 9th the larvæ had attained to an inch in length, when I described them as follows:

Body rather rough to the touch, slender, uniformly cylindrical, and of nearly uniform thickness throughout; head the same width as the second segment, and notched on the crown; the face flat; skin finely ribbed transversely, both dorsally and ventrally; segmental divisions not very conspicuous; ground colour dark olive-brown, approaching to dull black ventrally; head light brown, variegated with darker, and with a black V-shaped mark, the apex of which is pointed upwards, on the upper part of the face; the medio-dorsal stripe is composed of a very narrow, interrupted and indistinct greyish line; there are no perceptible subdorsal lines, but along the spiracles are several greyish-white marks, which are most conspicuous on the posterior segments; on the eleventh segment, at each side, between the medio-dorsal and spiracular line, is a black spot; the usual dots minute, black; a slaty-grey stripe extends along the centre of the

belly, gradually shading off into the blackish ground colour.

My larvæ fed on *Polygonum aviculare*, and when at rest, the food-plant was grasped by the claspers, and the body stretched out at full length, with the head raised to a considerable height; when disturbed they fell to the ground at full length rigidly stiff, not attempting to roll into a ring. (George T. Porritt, July 12th, 1871; Ent., August, 1871, V, 360.)

ACIDALIA STRIGILATA.

Plate CXIX, fig. 4.

On the 28th of August, 1870, I received from my friend Mr. J. P. Barrett, of Peckham, eight young larvæ of this insect, obtained from eggs deposited by moths captured by him during the previous month at Folkestone. They fed on *Polygonum aviculare* until autumn, when they began to hibernate, having attained the length of about three-quarters of an inch. At the beginning of April, not being able to procure knot-grass for them, dandelion was substituted, on which they at once commenced to feed, showing a preference for the withered leaves. By May 12th the only larva I had left had reached an inch and a quarter in length, and on June 2nd, it being nearly full-grown, I took down the following description :

Length nearly an inch and a half, cylindrical, very slender, and tapering slightly towards the head. Head not notched on the crown, about as wide as, perhaps a little wider than, the second segment; the face slightly flattened, and the cheeks globular. Skin ribbed transversely, which gives it a rather rough though uniform appearance.

The ground colour is grey, tinged with green; the head grey, faintly variegated with very pale brown. Of the longitudinal stripes, the most distinct is the narrow, dull green, medio-dorsal line; the subdorsal

and spiracular lines are very inconspicuous, and seem to be composed of confused, wavy, faint brown lines; spiracles very small, brown. On the centre of the back, and on the extreme anterior edge of the sixth, seventh, eighth, and ninth segments, is an intensely black square mark, divided into two distinct spots by the medio-dorsal line passing through the centre; slightly in front of each of these marks are two other equally black but smaller dots, one being a little to the right, the other to the left, and placed at the posterior edge of the segments. The belly is pale greenish-grey, with a still paler central stripe, and on each side of this stripe are one or two very faint, pale brown, zigzag, longitudinal lines.

In the middle of June it spun its cocoon (which was more firmly constructed than those of other species of the genus I have had) at the foot of the knotgrass on which it had been feeding. (George T. Porritt, July 13th, 1871; E.M.M., September, 1871, VIII, 91.)

ACIDALIA IMITARIA.

Plate CXIX, fig. 5.

The egg of *A. imitaria* is somewhat pear-shaped, but flattened at the smaller end; strongly ribbed, and irregularly reticulated between; colour glistening white, with small blotches of delicate pink. (J. Hellins, July, 1868; E.M.M., September, 1868, V, 97.)

One beaten from clematis by Mr. Jeffrey, of Saffron Walden, May 17th, 1871.

This larva is very remarkably slender and snake-like, in length an inch and a sixteenth, the thoracic and the posterior segments short and the rest very long, each of these being subdivided into about twenty-seven rings by deep and close wrinkles.

The colour is a very pale, rather greyish-buff tint. The dorsal line begins on the second thoracic segment

as a whitish line between two faint brown ones, and on the other it begins in that way, but the lines soon meet and become a brown line. The subdorsal is also brown, and is bordered above by a much paler stripe than the ground colour, which widens towards near the middle and attenuates towards the end of each segment. There is a spiracular line of brown rather fainter than the subdorsal, and this is followed by a puffed stripe of paler, nearly white. The spiracles are black. The tubercular dots are very minute, of dark brown, and the bristles also very short and fine.

N.B.—At the beginning of each segment the whitish dorsal line is distinct, and marked on each side with a short line of dark brown.

The ventral surface is a little darker and greyer, having a central pale stripe, and two brown ones on each side, the inner ones the darkest and running not parallel, but so as to enclose the central line in an elongated pear shape. A dark line runs down the ventral proleg, and the anal proleg is half brown behind.

This larva, when alarmed, suddenly throws itself into a spiral shape of two coils, and sometimes bends itself together head and tail, and jumps from the ground for an inch or two with surprising elasticity. (William Buckler, 1871; Note Book I, 82.)

This larva astonishes me by its extraordinary length and slimness; it rests with its four claspers attached almost close together, and its body elevated at an angle of 45 degrees, and swaying backwards and forwards with every breath of air, or with the motion of the room, or the trembling of the hand; I do not allude to the undulating movement from side to side, which is a normal habit of Geometers when not perfectly at ease.

The head is semi-prone, and scarcely as wide as the second segment. The body is uniformly slender, with a raised lateral skin-fold interrupted at the divisions of

the segments; there are also two almost imperceptible ridges, one on each side, equidistant between the lateral skin-fold and a median line of the back; the body is also transversely wrinkled or divided into sections, from sixteen to twenty on each segment; the number doubtless uniform in the species, but not in the individual; after the ninth segment these sections are manifestly fewer and wider than on the anterior and median segments; there are many short stiff scattered bristles about the head and body, more particularly about the posterior extremity of the latter. The colour of the larva is pale putty-colour, almost white, with a medio-dorsal smoke-coloured stripe, which grows gradually paler as it approaches the head; lighter and darker stripes are discernible on the sides of the body; the lowest on each side is the darkest, and is undulating; the spiracles are black, and below the skin-fold, more especially on the third, fourth, and fifth segments, is a vague blotch of black.

The larva feeds on *Stellaria media* (common chick-weed); and my kind friend Mr. Doubleday, who sent it to me, accompanies the insect with the following note:—"Like the larvæ of all the *Acidaliæ*, they are difficult to keep through the winter, even upon plants growing in pots; only four out of twenty which I had survived the winter; and this morning I found three of them had gone down." It was full-fed, and buried in the earth on the 18th of May, 1872. (Edward Newman; Ent., July, 1872, VI, 139.)

ACIDALIA EMUTARIA.

Plate CXIX, fig. 6.

Through the kindness of Messrs. Fenn and A. H. Jones, I am enabled to give some account of the earlier stages of this species.

The egg-laying female was captured on the 13th July, 1866, in a cultivated marsh, flying amongst the

reeds which line the sides of the dykes. This locality would point to some marsh plant being its natural food, but we reared our larvæ in confinement upon *Medicago lupulina*, *Lotus corniculatus*, and *Polygonum aviculare*.

My larvæ hatched on the 22nd of July, 1866; hybernated when about one-third grown; began to feed again about the end of February, 1867; moulted twice during April and May; spun up in the second week of June; and the moths appeared on the 7th and 10th of July, full-sized specimens, and one of them especially deserving Haworth's name of *subroseata*.

The eggs are of an elongated pear-shape, the stalk-end being cut off flat. (N.B.—I notice that the eggs of several species of *Acidalia* exhibit this truncated form at one or both ends.) They are ribbed longitudinally, and finely punctured; when first laid their colour is pale bluish-green, afterwards changing to a straw-colour with spots and irregular splashes of pink.

The little slender larvæ, when first hatched, are pale greenish, with pinkish heads, afterwards becoming very plainly coloured—pale ochreous-grey, with a few dingy black lines and markings.

One of my four larvæ died early in winter, but the other three bore the cold very well; whilst in the same outhouse the extreme frost slew some of the more tender species of hybernating larvæ—*Agrotis ripæ* and *A. lunigera*, for example. I had one fright about them, however. One has heard of the grass growing under the feet of a sluggard, and it is a fact that during the winter, while they were resting almost as motionless as the withered stalks of their food, two of my three larvæ became decidedly tinged with bright green, and, on examination with a lens, I found that this tint was caused by the young growth of a species of moss! (*Tortula* — ?).

However, it luckily proved to be less than skin deep, and was without difficulty got rid of at the first spring moult.

When full-fed the larva is about an inch in length, following the *A. imitaria* type, *i. e.* long, cylindrical, slender, and tapering slightly towards the head; the skin evenly ringed; the head a little flattened above, and rounded at the sides.

The colouring is so plain and dull in many of the *Acidalia* larvæ, that one fears a detailed description may give the idea of something much more ornamental than the reality; and yet it is necessary to give the little details in order to show how the various species differ.

The ground colour of *A. emutaria*, then, is a pale ochreous-grey; the dorsal line is a very fine whitish ochreous thread, distinct at the beginning of each segment, but soon almost extinguished by the union of the blackish lines which border it, and which shade off towards the subdorsal line through a brown into the ground colour, making the region of the back look darker than the sides; just at each segmental fold there is a pair of brown or blackish wedge-shaped spots; the subdorsal line is also a very fine whitish thread, edged below with a black line, which is most distinct about the middle of each segment, whence also some very fine oblique lines slope downwards behind each spiracle.

The spiracles are black, and just below them comes a sooty-brown line shading off gradually into the pale grey of the centre of the belly.

Of the two larvæ which I retained for myself, one spun up against the side of the flower-pot, covering itself with a thin but opaque flat web, into which it drew a few bits of moss, etc.; the other spun up on the surface of the earth in the pot, forming an irregular oval cocoon as big as a horse-bean, and nearly covered with fine bits of earth and grains of sand; the pupæ I did not examine until after the exit of the moths. (John Hellins, 29th July, 1867; E.M.M., September, 1867, IV, 88.)

ACIDALIA DEGENERARIA.

Plate CXIX, fig. 9.

On the 8th of August, 1871, I had the pleasure of receiving from Mr. George Harding, of Bristol, the welcome gift of eight young larvæ of this species, hatched on the 29th July from eggs laid loose in a box on the 18th by a much worn female which had been captured the same day in the Isle of Portland.

Mr. Harding also informed me that the eggs were pink in colour, and became darker and more dingy just before hatching, and that the newly-hatched larvæ differed in no respect but that of size from their appearance when consigned to me, having fed from the first on *Polygonum aviculare*.

At this time, being ten days old, they were about three lines long, slender, and of a greenish-brown colour, and, when at rest, were generally in a looped position, but were remarkably timid, tucking their heads under and curling up into a close coil at the least alarm, and persistently remaining in this posture for a long time; their voluntary movements were very slow and measured.

By the middle of September they had changed their colouring to a rich cinnamon-brown above, and blackish beneath; on a close scrutiny for details at this time they presented exactly the same design as hereafter described in the adult state; they now began to be lethargic, and to show symptoms of hibernating, but, as the *Polygonum* was still procurable, I often disturbed them with fresh food to incite them to eat, in the hope of getting one or two to feed up before winter; this at one time seemed probable, though with a change of colder weather they baffled my design by ceasing to feed, and insisting on sleep.

In this state, and reduced to six in number, on October 29th they were transferred to a pot with

growing plants of dandelion, *Veronica polita*, and *Plantago lanceolata*, covered with coarse muslin and kept in a window seat facing west, in a room without fire; by this date they had grown to eight lines in length, and were rather darker than before.

By the middle of February, 1872, I observed the plants in a dying condition, and a few indications of mould generating amongst the withered leaves, which, however, had not attacked the larvæ, resting as they were on the sides of the pot. I now took them out and placed them in a new abode; and the weather soon after being severe, I put them in another room with a fire, in order to try them with bramble, and soon had the pleasure of seeing them nibble at it, and also at *Cerastium* and *Veronica*, though the bramble seemed to be preferred. Satisfied with this experiment, I then restored them to their former colder quarters, where they did very well, feeding a little from time to time whenever the severity of the weather relaxed a little, and by March 7th two of them had quite outstripped their companions in growth, and by the 13th had attained apparently their full size, still, however, feeding a little until April, on the 15th of which month they assumed the pupa state; another followed their example on the 26th, one on May 8th, one more on the 26th, the last on June 30th; the four earliest appeared in the imago state from June 14th to 24th, and a fifth moth appeared on the 14th of July.

When about to change, the larva drew around it with a few fine threads a leaf of bramble or *Veronica*, or any withered bit of leaf or moss it found on the surface of the soil, and changed therein.

After hibernation they seemed to have lost the power of curling up when disturbed, but now seemed to feign death by extreme rigidity, allowing themselves to be turned over and rolled about without betraying life by any movement; their natural posture, too, in repose on their food-plants was straight and stick-like.

I could not help noticing how closely, both in form and general appearance, these larvæ of *A. degeneraria* came to those of *A. inornata*.

When full-grown the larva of *A. degeneraria* is seven-eighths of an inch in length, broadest at the ninth segment, and from thence tapering gradually to the head (the smallest segment); the posterior segments taper but little to the rounded anal tip; the body is convex both above and below, and has a projecting rounded ridge along the sides, so that it appears somewhat flattened; the segmental divisions are well defined by the end of each segment projecting at the side, in breadth, beyond the beginning of the next; the skin is rugose, with about twelve subdividing wrinkles in each segment; the head indented on the crown.

In colour the head is chiefly blackish-brown, conspicuously marked on the crown of each lobe with pale cinnamon or bright rust-colour, which extends as a stripe down its outer side; a patch of the same colour is on the dorsal surface of the three following segments, being rounded at the sides on the second segment, triangular and pointing backwards on the third and fourth; with these exceptions, the rest of the back, as far as the end of the eighth segment, is deeply suffused with dark brown, the remainder being again of bright rust-colour, strongly contrasting with the darker hue of the middle segments; on the back of each segment, from the fifth to the ninth inclusive, are double darker brown markings, somewhat like Vs pointing backwards, and standing one a little in front of the other at the hinder part of the segment; their limbs are curved outward soon after their commencement, and by degrees finely attenuated as they reach the next segment in front, each arm of a V being thus like a miniature willow leaf; in front of these, and embraced by their arms, is rather an elliptic shape of similar dark brown, and then a black square mark, close to the segmental division; both of these shapes

are distinctly divided in halves by the thin pale greyish-ochreous dorsal line, which then vanishes, but reappears as a pale spot or two within the base of the hinder V mark; the subdorsal line is of the same pale colour, and also appears only for a little just at each end of a segment, where it intersects a dark brown streak at the side of the back, slanting in a course parallel to the limbs of the Vs; on the hinder rust-coloured segments the markings are more tender, and on the last three are but imperfect diamond shapes of brown, the tubercular blackish dots being visible on them; a faint thin line of ashy-grey separates the colouring of the back from the blackish belly, which has on each segment three ashy-grey marks, together in form resembling a lyre, and two dots of the same grey colour at each end; the spiracles are black, and the tubercular warts and their short bristles are very minute and rather numerous at each end of the body.

The only variations that occurred were, that one individual from first to last continued to be rust-coloured, and that another became after hybernation wholly suffused with dark brown.

The pupa is three-eighths of an inch in length, plump, and tapering rapidly near to the anal tip, which ends in a blunt curved spike proceeding from a little flattened knob; its colour is chestnut-brown. (William Buckler, August, 1872; E.M.M., October, 1872, IX, 115.)

ACIDALIA EMARGINATA.

Plate CXIX, fig. 10.

I have several times had the eggs of *Acidalia emarginata*, but it was not until last year that I succeeded in rearing the larvæ to maturity, the specimens being the result of a batch of eggs received from Mr. F. D. Wheeler, of Norwich, on the 29th July, 1874.

The eggs are oblong-oval, and when fresh are orange-colour, but before hatching change to purplish-red; this event took place the day following their arrival.

The newly emerged larva is olive-green, with wainscot-brown head. Being supplied with *Polygonum aviculare*, they fed and grew slowly until hybernation, which portion of their existence extended over a long period, as they ceased feeding in the autumn, and did not recommence until early in May following. By the middle of June they were full-grown, and may be described as follows:

Length about three-quarters of an inch, and of average bulk in proportion; head about the same width as the second segment; it has the face rather flat, but the lobes rounded, and is notched on the crown. When viewed from above the body seems flat, but seen from the side the under surface is rounded; the ninth segment is the widest, and from it the rest gradually taper towards the head; the tenth, eleventh, twelfth, and thirteenth are of about equal width; all these overlap considerably, thus rendering the divisions very distinct; this overlapping, too, makes the skin at the side appear as a conspicuous lateral ridge. The skin is tough and has a rough appearance, owing to its being transversely ribbed throughout.

The ground colour is dirty ochreous, in some specimens strongly suffused with a dingy smoke-colour; the head is of the same colour, and from it extends a pale dorsal line, this line being bordered on each side of the tenth to thirteenth segments with an irregular, broad, and very dark stripe; on segments two to five these stripes are paler and narrower, whilst on segments six, seven, eight, and nine they become conspicuous black X-like marks; the side of the lateral ridges is tinged with reddish-ochreous, and there are various brown freckles between this and the dorsal line. The ventral surface is of the same tint as the

ground of the dorsal surface, and is freckled with brown.

The larvæ began to spin loose cocoons in the corners at the bottom of the cage on the 21st June.

The pupa is about three-eighths of an inch long, smooth and shining; the colour reddish-yellow, with the wing-cases greenish.

The first imago appeared on the 15th July, and was speedily followed by the remainder. (George T. Porritt, May 3rd, 1876; E.M.M., June, 1876, XIII, 13.)

CABERA EXANTHEMATA.

Plate CXX, fig. 3.

There is such a meagre description of the larva of this insect in Newman's *British Moths* that I think I shall not be open to the charge of repetition in giving a more complete one.

Female specimens taken in the middle of June, 1870, deposited eggs, which hatched in about ten days; the larvæ fed on willow, and were full-grown at the end of July.

When the markings were noticeable it became apparent that there were two distinct varieties, which may be described as follows:

Var. 1.—Length about an inch, of average thickness and uniformly cylindrical throughout. Head a little broader than the second segment, slightly flattened and not notched on the crown. Skin rather puckered; ground colour light green, of different shades in different individuals. Head of the same colour, marked near the crown and on the lower part of the cheeks with deep purple. A narrow green pulsating vessel forms the medio-dorsal line, and dorsally, on each segment, from the fourth to the eleventh inclusive, is a conspicuous purple arrow-head mark, the apex of each being close to the posterior part of the segment; the apex of each of these marks encloses a black spot

bordered with whitish; subdorsal lines yellowish-white, in some specimens very indistinct or wanting; an interrupted, irregular, dull purplish band forms the spiracular line. Spiracles and the usual dots black. Belly uniformly green, with the segmental divisions yellowish. Legs purple; ventral legs purple on the outside only.

Var. 2.—Brighter green than in var. 1, and the purple dorsal arrow-heads wanting, but having the distinct black dots on the posterior of the segments; the dorsal line is more distinct than in var. 1; the subdorsal lines are yellowish, and the spiracular lines formed by a series of interrupted purple marks, most distinct on the anterior segments. Head without the purple marks on the crown, but marked with that colour on the cheeks as in var. 1. (George T. Porritt, 11th May, 1871; Ent., June, 1871, V, 317.)

CORYCIA PUNCTATA.

Plate CXX, fig. 4.

C. temerata [*C. punctata* of Stainton's Manual] occurs in this neighbourhood (Exeter), flying in May and June near wild cherry trees, or along blackthorn hedges, and I have once or twice succeeded in rearing it from the egg.

The ♀s certainly prefer to deposit their eggs in the crevices of the bark of their food-plant, or at the axils of the small shoots; and if they have not the opportunity of doing so will lay but sparingly, or even refuse to lay any eggs at all.

The larvæ are hatched in about fourteen days, and are at first of a deep yellow colour; they soon change to green, and after a time put on a broadish dorsal stripe of pale yellow; this at the last moult changes to the dorsal row of bright red spots which, contrasting with the rich velvety green of the ground colour, make the larva so handsome to look at.

The only variety of the larva I ever saw I captured on blackthorn in August, 1863; it was of a pale bluish-green ground colour, the sides and belly being more of a whitish-green; the bright red dorsal spots of the type were replaced by a very indistinct, interrupted, reddish-brown line, and on either side of this there was, on each segment, a pale whitish dot, while the usual red spots on each side of the head were absent. Fortunately, Mr. Buckler, after having taken a figure and description of the larva, bred the moth during the next summer, and thus settled the question of its species beyond doubt. (John Hellins, E.M.M., April, 1865, I, 263.)

AVENTIA FLEXULA.

Plate CXXI, fig. 1.

It is not often that I have taken on myself to make any remarks on the position of a species in any of the lists which from time to time are put forward, but in this case I cannot help saying a few words.

It certainly seems that the *imago* has been a puzzle to systematists, for we find its position varied from one division to another repeatedly; but I think that a knowledge of the larval state would have prevented all this uncertainty.

Staudinger, to my mind, has come nearest the truth, in placing *Aventia* at the end of the *Noctuxæ*, and among *Catocala*, *Toxocampa*, etc.; but I think he is wrong in letting *Toxocampa* come between *Catocala* and *Aventia*; and in my description below I shall italicise those points in the larva of *Aventia* which induce me to place it next to *Catocala*.

The full-grown larva is seven-eighths of an inch in length, *widest at the ninth and tenth segments*, the head full but rather less in bulk than the second segment; the anal flap rounded; *the body above is convex*, but *each segment a little swollen in the middle* and scored across with two deep wrinkles, both at its hinder end;

below the spiracles is a rather inflated projecting ridge, fringed with a row of fleshy filaments; some of these filaments are simple, others are branched like the "chevaux de frise" one sees sometimes on enclosure walls; the belly is flat; the anterior legs well developed; the first two pairs of ventral legs much shorter than the other two pairs, though each pair is progressively longer than the preceding, the anal pair being the longest; the dorsal tubercular warts are prominent, each furnished with a fine short hair; on each segment the hinder pair is much larger than the front pair, and on the ninth and twelfth segments largest; on the twelfth they are placed on a transverse prominent ridge.

The colour is of a more or less pale dull bluish or greyish green, or else this colour slightly tinged with brownish-ochreous, rather paler on the sides; the dorsal line darker green,—being, in fact, a series of spear-points faintly edged with whitish green, and by short black streaks at the end of each segment; the subdorsal marking is a paler tint of the ground, to be seen plainly only just at the segmental divisions, but its course is indicated well enough on the other parts by a fine sinuous line of black above, and a line of darker green below; the ninth and twelfth segments are darker in tint than the others; slight curves of blackish dots or dashes are on the back of the second, third, and fourth segments along the subdorsal region; the head is more whitish-green than the body, and is marked with spots and curves of black on each lobe and about the mouth; the tips of the tubercular warts are black, on bases of whitish-green, and a broad streak of this pale colour is on the side of each segment beyond the fourth; the filaments are greenish-white; the belly a dull, pale bluish-green; the anterior legs are spotted with black; a black streak runs down the front of the fourth pair of ventral legs; the spiracles of the ground colour are ringed with dark brown.

The habit of the larva is to lie close by day for hours

together, with its legs spread out flat to their full extent upon lichens, on which at night it feeds.

I am indebted to several friends for opportunities of studying this species. Mr. Harwood sent me in 1868 the first I ever saw, which he had beaten either from oak or aspen, and then I took it to be a young *Catocala*. The Rev. B. Smith and Mr. W. Machin kindly sent me others beaten from lichen-covered thorns, cherry, and yew, in the three following years, and from one of them I was able to obtain a moth, the larva pupating in a folded hawthorn leaf after spinning the edges of the leaf closely together. The date when this larva was full-grown was May 23rd, 1871, and the moth appeared June 21st.

Since the above was written, I append a brief mention of a fine example of this larva which Mr. Harwood has just sent me:—It is a little over an inch in length; the third segment is tumid, and beyond the fourth there is on each of the other segments a slight transverse swelling which bears the hinder pair of tubercular warts; it has but few simple filaments, all the rest being more or less branched.

Its colour is brownish ochreous-green, and with fewer black marks than usual, for which, in this instance, a rather deeper tint of the ground colour is substituted.

This larva, when disturbed on its arrival, walked in a position like that of *Ophiodes lunaris*, as figured by Hübner. (William Buckler, June 11th, 1873; E.M.M., July, 1873, X, 42.)

The pupa is a little over three-eighths of an inch in length, and rather stout in proportion; the head is rounded; the body cylindrical, or of uniform thickness to within the three last segments of the abdomen, from whence it tapers to the anal point, which ends in a diverging group of five rough minute recurved bristles. Its colour is pitchy black and shining, the segmental divisions of the lower part of the abdomen ringed with pinkish-brown. The wing-cases are long

and with rather less polish than the other parts, and as they meet the ends of the leg- and antenna-cases their margin is hollowed into a slight concave form.

It reposes in a whity-brown tough silken cocoon, spun to the upper surface of a hawthorn leaf after it has been drawn together by uniting the edges of the leaf, which then soon assumes something of a fusiform look, but yet with the appearance of a mere withered leaf. The moth came forth from this pupa on July 7th, 1873. (William Buckler, July, 1873; Note Book I, 120.)

STRENIA CLATHRATA.

Plate CXXI, fig. 6.

Last year (1875), at the end of May, the Rev. P. H. Jennings, M.A., of Longfield Rectory, kindly sent me a few eggs of this species; they were oblong-oval, and indented on the upper surface; the colour grass-green.

On the 8th of June they hatched, and the newly emerged larvæ were dingy green, with the extremities tinged with yellow, and the head pale brown. On being supplied with the common white Dutch clover, they fed well until the 19th of July, by which time they were full-grown, and a description was taken as follows:

Length about three-quarters of an inch, and of average bulk in proportion; the head has the lobes globular, is shining, rather hairy, and slightly notched on the crown; body cylindrical, and of nearly uniform width throughout; skin smooth, clothed with a few, almost imperceptible, very short hairs; segmental divisions distinct. The ground colour is bright green, darkest along the sides; the head green, with the mandibles brown; two parallel white lines extend through the centre of the dorsal area, enclosing between them an almost hair-like, white dorsal line

through the centre of a band of the ground colour; the subdorsal lines are also white, as are also the broad spiracular lines, and there is another finer white line between the dorsal and subdorsal ones; segmental divisions yellowish; the spiracles very minute, black; ventral surface green, longitudinally striped with numerous very fine darker lines.

Changes to pupa below the surface of the ground.

The pupa is three-eighths of an inch long, rather stout, but tapering sharply towards the anal segment, which finishes with a fine point; the eye-, leg-, and wing-cases prominent; colour dark mahogany-brown.

Part of the imagos emerged in the middle of the following month (August), but most remained over the winter, appearing as moths at the end of May and beginning of June, 1876. (George T. Porritt, 10th July, 1876; Ent., August, 1876, IX, 178.)

LOZOGRAMMA PETRARIA.

Plate CXXI, fig. 7.

A captured moth laid me some eggs on the 10th of May of this summer (1864).

The eggs were at first pale straw-coloured, soon turned bright red, and afterwards became dingy.

The larvæ hatched on the 28th of May, and fed throughout most freely on common fern (*Pteris aquilina*); they rested at full length, but when disturbed twisted into knots and jumped about angrily; they went to earth during the last week in June.

The larvæ assimilate well in appearance to their food-plant, and must be hard to detect; when full-fed their length is rather over an inch, shape cylindrical, and of uniform size throughout, except that the segmental folds look contracted, and the head is rather flattened. The ground colour is olive-green, the belly paler, more olive-grey; some individuals had a slight reddish tint. At first sight the whole larva

seems to be covered with very slender chocolate-brown longitudinal lines—I could count at least twenty-four all round the body, but on examination it is seen that these are arranged in pairs; thus there is a double dorsal and three double subdorsal lines, the lowest being darkest and thickest. The spiracles are black, and below them is a creamy white line; the belly is striped somewhat like the back, only that the lines are more diffuse and not so numerous; the segmental folds are red. (John Hellins, July, 1864; E.M.M., August, 1864, I, 71.)

SELIDOSEMA PLUMARIA.

Plate CXXII, fig. 3.

Several specimens of this species which I took in the New Forest, on the 31st of July last year (1877), deposited eggs. These began to hatch during the third week in August, and the larvæ fed well until autumn on the common ling. By the first week in December the largest specimen was about an inch long, but the majority were from half to three-quarters of an inch. They fed sparingly on withered ling shoots and leaves through the winter, and by the end of March the largest was nearly full-grown.

Length about an inch and a quarter, and moderately stout in proportion; head narrower than the second segment, into which it can be partially withdrawn; it has the face flat, and there is a slight depression on the crown. Body of nearly uniform width throughout, and cylindrical; the segments overlapping each other, however, and each being divided into sections by transverse ribs, together with a somewhat prominent ridge along the spiracles, give it a rather uneven appearance; the anal segment ends in a rather sharp triangular appendage, and the anal legs, being set widely apart, are very conspicuous; skin smooth, but tough in texture.

General colour uniformly pale stone-grey; head of the same colour, with a dark crescentic mark surmounting each mandible, and another dark brown crescentic mark above these; the mandibles are brown, of a still darker shade. A double, very dark brown, almost black, line extends through the dorsal area; on the anterior segments it is paler and more uniform, but after it reaches the fifth it becomes swollen and darker in the middle of each segment, which gives it a conspicuous and rather interrupted appearance; subdorsal and spiracular lines pale grey, the latter rather prettily edged above and below with chocolate-brown, the brown being most noticeable on the anterior segments; the spiracles, and four very distinct dots on the dorsal area on each segment, intensely black.

Ground colour of the ventral surface of a yellower grey than the dorsal area; it has a broad central pale grey band, enclosing a fine double reddish-brown line; outside the band, but adjoining it, on the sixth, seventh, eighth, ninth, and tenth segments, is a conspicuous dark smoky mark; and between the central band and the spiracular region is another faint pale line.

About the middle of April the first went below the surface, and the moths emerged at the end of July. (George T. Porritt, October 4th, 1878; E.M.M., November, 1878, XV, 137.)

FIDONIA ATOMARIA.

Plate CXXII, fig. 4.

Two larvæ found feeding on *Lythrum salicaria*, kindly sent me in 1868 by Mr. W. H. Jeffrey from Wicken Fen, produced this species on the 28th of May, 1869.

The larvæ arrived, and one of them was figured, on the 14th of August, 1868. Both being alike, and differing from some of the varieties of this variable

species, I did not at the time recognise them ; perhaps the locality of Wicken Fen diverted me from any suspicion of their being this heather-frequenting species.

The larva was an inch or a little more in length, and moderately slender. The ground colour was a dull yellowish pale green, minutely freckled with brownish ; this describes the dorsal stripe, which is edged with brownish and is relieved on either side by a yellow line ; then there is another freckled stripe with darker edges similar to the dorsal stripe, and on this are the brown tubercular dots ; the subdorsal line is yellow, and is followed by another stripe of brownish freckles, and then come three dark greenish or blackish very fine lines, followed immediately by the spiracular stripe of bright yellow ; the spiracles at its upper margin are flesh-colour outlined with black ; the belly is similar in tint to the back, but has a broad paler central stripe edged with brownish, and a fine narrow line of the same on each side. The head, anal segment, and anal legs are freckled with reddish or brownish-red. In this larva none of the lines are entire, but are composed of interrupted atoms. (William Buckler, May 28th, 1869 ; Note Book II, 143.)

FIDONIA BRUNNEATA.

Plate CXXII, fig. 6.

In October, 1867, Mr. Buckler sent me five eggs of this species, which had been kindly given to him by Dr. Buchanan White of Perth. On receiving them I examined them carefully under my microscope, and made the following description :

The egg is oval in outline, but flattened, the upper side being even depressed in the middle ; the whole surface covered with reticulations—generally hexagons, but some only pentagons, in shape ; and at each angle

where the lines of the reticulation meet there is a little raised bright white knob (a peculiarity I have not yet observed in any other egg), the whole egg looking as if set with tiny pearls on a ground colour of shining salmon-pink.

About the end of February, 1868, the eggs grew darker, and between March 2nd and 8th four larvæ emerged, the fifth dying unhatched. After a little hesitation they began to eat buds of whortleberry (*Vaccinium myrtillus*), but somehow, within a few days, two of them died. The two survivors, however, grew on steadily, and from being dark brown at their first appearance, after a moult or two began to assume a striped dress; the ground colour was now pale grey—almost white; the dorsal and supra-spiracular lines almost black, with an intermediate subdorsal line of brown; and the spiracular stripe tinged with yellow.

About the 24th of April the larger of the two larvæ seemed full-grown. At that time it was rather over half an inch in length, of uniform bulk, cylindrical, the head horny, the skin smooth, but puckered along the spiracles. The colouring was disposed in a multiplicity of fine lines, which I now give in due order.

The dorsal line, widening in the middle of each segment, dark green, closely edged with almost black threads; then a thin white line; then the subdorsal line of pale pinkish-brown outlined with darker brown; then another thin white line; then three olive-brown lines (the middle one palest, and the lower one darkest), partly showing distinct, and partly run together, so as to form a stripe just above the spiracles.

The spiracular line broad, white, but tinged with yellow in the centre of each segment. The belly of a dirty white, with some oblique dashes, and lines of brown.

This larva went to earth at the end of April, and

the moth from it appeared on the 1st of June. (John Hellins, June 23rd, 1868; E.M.M., September, 1868, V, 108.)

SCORIA DEALBATA.

Plate CXXIII, fig. 2.

My notes on the earlier stages of this species are not so satisfactory as I could wish, for they were jotted down in a busy time; but, as far as they go, I believe them to be correct.

On the 2nd of July, 1864, I received indirectly from Mr. Wilks (late of Ashford) some eggs, which began to hatch on the 7th; I scarcely know any larva which varies so little in tint throughout its growth; of course, as the bulk increases, more lines and mottlings appear, but they are all of the same ochreous and grey tints throughout. Mr. Stainton, in the Entomologist's Annual for 1862, has described the larva just before hybernation, when he says it was seven-twelfths of an inch in length; but the three which I succeeded in retaining (some dozen others escaped from my not being able to attend to them in time) grew to a full inch in length before they ceased feeding; all through the winter I noticed that, except in the coldest weather, they remained extended on the lino covering of their flower-pot, as though very fond of fresh air.

On the 14th February they began eating again, and grew slowly till the middle of April, when they changed skin for the last time. About the middle of May they seemed to have attained their full size, and began spinning about the 20th.

When full-grown this larva is a longish, stout-looking smooth looper, tapering considerably from the hinder segments towards the head; the length an inch and a third; the head flat and rounded at the sides; the anal flap large.

The general colour is ochreous or brownish grey, but ornamented with so many waved and irregular lines that it is hard to describe. The head is pale ochreous; down the centre of the back is a double fine dusky line, which, with the first subdorsal line (composed of a double fine thread also), forms a series of irregular figures by alternately contracting and expanding; on the anterior and posterior segments the dorsal line becomes closer and darker. Below the first subdorsal line is a stripe of yellowish or reddish-buff, then comes another waved fine double thread; then the yellowish spiracles, scarcely distinguishable in a drab stripe, which is bordered below with a dusky line, followed by a reddish-buff line; the belly drab, with central and subventral whitish lines. The usual spots are represented by fine black dots, and the central segments in one specimen were suffused with a smoky hue.

About the 20th of May these larvæ began to spin, and soon formed for themselves beautiful spindle-shaped cocoons of yellow silk, attached to upright blades of grass. And here, unfortunately, I can say no more, for after waiting some time for the perfect insects I examined the cocoons closely, and found that, by some mischance, the pupæ had been killed. But although I failed, I think the species might be easily reared if kept in the open air, and fed on growing plants of dock, chickweed, knotgrass, and the coarse grass which, in its localities, is doubtless the favourite food of this species. (John Hellins, October 4th, 1865; E.M.M., January, 1866, II, 190.)

LYTHRIA PURPURARIA.

On the 5th July, 1883, Herr Heinrich Disqué sent me with the dead parent moth about twenty-four or twenty-five eggs of *L. purpuraria*. The shape of the egg is elongate-oval and rather flattened, though

rounded at either end, yet one end is rather rounder and wider than the other, and there is a slight depression on either side; the embryo larva lies round the circumferent margin where the egg is thickest.

On the 10th two larvæ hatched, and were whitish, very slender, and twisted in a coil when disturbed. The whitish body was marked on each side of the back with a darkish dull green subdorsal stripe, and the head striped. They became very pale as they lay up to moult; but after the second moult the sides of the body seemed composed of blackish stripes, with a narrow dorsal stripe of whitish between them, a spiracular stripe of white, and a stripe of pale green on the flat belly. By August 3rd they were five lines long, very slender, three in number, committing ravages on the leaves by eating large portions out of them. The dorsal line begins of a creamy white on the thoracic segments, and from thence is light green, then darker green, but on the eleventh and twelfth segments is again light green and stouter; the subdorsal is also creamy or greenish-white on the second segment only, but from thence can be with difficulty distinguished from the very dark blackish-green of the back, which forms a length-stripe; below the subdorsal is a stripe of black, followed by the inflated spiracular stripe of greenish-white; the belly is lightish green, having twin lines of darker green on either side, and on a ridge along the middle a paler line though faint; the head is greenish white in front, and with the dark side-stripes of the body continued low down on each lobe; papillæ greenish-white; anal plate dull black; all the upper surface of the body is dull or velvety, but on the belly it glistens a little.

On the 10th they were laid up to moult, just as the plant began to collapse from the swarms of plant-lice attacking it, which covered the entire plant, and were perpetually running over and worrying the larvæ; and on the 12th I found two had dropped off, apparently dead, and the third was hanging down in

lifeless manner. On the 21st Mr. Hellins sent me the one larva he had reared to full growth, which he had reported on the 17th to be approaching thereto.

I figured it at once, when it measured 20 to 21 millimetres, and was of slender proportion, the rather flattened head in a line with the body, the mouth at the end, the second segment short, the sides of the third and fourth rather tumid, the ninth the stoutest segment, from whence it tapers slightly to the fourth, and also behind to the anal flap; in colour the head is green toward the middle of the face, and is striped on either side with blackish-green, and a subdorsal line of pale primrose-whitish, a velvety black stripe narrowing towards the mouth, and a lateral stripe (a continuation of the spiracular stripe of the body) of primrose-whitish, having a central fine black dotted line; from the crown is a pale whitish-yellow dorsal line, which soon melts into the green of the face; the mouth is pale greenish; the antennal papillæ are green ringed with black; the body is very dark green above on the back, blending imperceptibly into black at the side, handsomely relieved by the spiracular broad stripe of primrose-whitish; the ground of the second segment is velvety black, traversed by dorsal and subdorsal lines of primrose-whitish; of these lines on all the other segments the dorsal alone continues visible uninterruptedly towards the anal flap, as the subdorsal becomes from thence so suffused with blackish-green that it seems lost on the anterior segments, and only the faintest trace of it can be detected as a green line with fine black edging on some of the hinder segments; the tubercular dots are very small and black, only to be seen with the aid of a lens; this stripe from one end of the larva to the other well separates the dark colouring of the upper surface from that of the deep bluish-green of the belly, which has three deeper green stripes on either side, the middle one of these the broadest, and followed closely by a narrower line of the same colour, and the middle of

the belly shows a paler central greenish line, and also those on either side, but only faintly.

The spiracles are situated on the broad pale yellowish-white stripe; they are white, delicately outlined with black.

On the 23rd the larva began to shorten, and soon afterwards it entered the earth.

N.B.—The proper food of this species is sheep's sorrel (*Rumex acetosella*). (William Buckler, August, 1883; Note Book IV, 168.)

ASPILATES GILVARIA.

Plate CXXIII, fig. 6.

I owe to the kindness of Mr. A. H. Jones the supply of eggs which enabled me to follow out the transformations of this species, after previous failures. On several former occasions I had reared larvæ to half-growth, and then lost them, for want, as I supposed, of knowing the right food to give them; and now, after this more successful attempt, I am still unable to speak with certainty about the food, whether there is any one plant to which the larva is more attached than to any others.

I received the eggs on August 31st, 1869; the larvæ hatched on September 12th; they attained a length of not quite the third of an inch before hybernation, having fed on *Thymus serpyllum*, *Achillea millefolium*, *Potentilla reptans*, and *Medicago lupulina*. I kept them outdoors, and on Christmas Eve, as I was moving their flower-pot, a large one ten inches across and full of earth, to an open shed, I let it fall from a height of about three feet to the ground, where it broke to pieces, and its contents—earth and the plants on which the larvæ had fed—lay scattered over about a square yard of the gravel path. Luckily I did not lose my temper, but—Mark Tapley-like, feeling quite jolly under the circumstances—I quietly got together

all the earth and plants, sweeping the path clean with a soft brush; and bringing all the mixture indoors, I spread it thinly over two large newspapers on the floor of my room. I next scattered a handful or two of blades of grass over the surface, arranged a cordon of grass all round the edges, and then left things to settle down. In the course of the evening, some three or four hours after, I got away from the Christmas family party, and lighting a short candle, lay down on the floor of my room to examine the blades of grass; and in this way, much to my delight, I recovered twelve *A. gilvaria* out of about fifteen, besides all four larvæ of *Gnophos obscurata*, which had shared their food and fortunes. I now re-planted their food in another pot, and turned them on to it again, apparently none the worse for their adventure. However, in the early spring many of them died off, and I was afraid I should once more have to record a failure; but, fortunately, when the pining sickness had done its worst, there remained three larvæ in good health; these began to feed again, and now chose and finally fed up on *Veronica serpyllifolia*, a plant or two of which had by chance grown up in their flower-pot; but for a long time they made little growth, for on the 14th of May, 1870, I find it noted that they were still very small; after that date the growth was more rapid, and in June they moulted; about the end of June they moulted again for the last time, and during July fed up to full growth; early in August they changed to pupæ, and the first moth came out on the 19th of August.

The egg of *A. gilvaria*, like those of others of the genus, is long brick-shaped, not ribbed, but pitted in rows from end to end, the little pits being irregular in size; the colour at first yellowish-green, afterwards reddish. I have notes of two batches, in one of which the eggs were deposited touching one another end to end in a long string, but in the other somewhat *en échelon*, each egg overlapping about one-third of the

length of its neighbour as they were placed in a slanting row.

The newly hatched larva is very pale brown on the back and belly, with a dark brown subdorsal line and a whitish stripe along the spiracles. When the larva is about one-third of an inch long, its colour is for the most part pale ochreous, the back showing paler, with a fine dorsal line of brown; there is also a brown subdorsal line, followed at an interval by a broader purplish-brown stripe. After this, when the larva begins to grow, the ochreous tint becomes colder, and so continues till after the last moult.

When full-grown the length is about one and a quarter inches, the figure rather slender, cylindrical, being stoutest at the tenth segment, and thence tapering almost imperceptibly to the head, which is nearly as wide as the second segment, and is flattened and narrowed a little in front; anal flap ending in two short points, whilst from under it projects a pair of longer and more slender points, slightly curved inwards, and projecting quite one-sixteenth of an inch; the skin smooth, but transversely wrinkled on the hinder part of each segment, and along the spiracles; the larva when handled feels tough and stiff. Although the general colouring is pale ochreous, yet there are several lines and stripes to be distinguished, and the difficulty is to speak of these with sufficient clearness, and at the same time not give too strong an idea of them. The ground colour pale greyish-ochreous, with a pinkish tinge along the sides; a broad paler stripe down the back, having a brownish dark line through its middle, most distinct on the front segments, and being edged with a fine brown line; a broad, pale, greyish-buff subdorsal stripe, beginning on the head, and continued to the extremity of the anal points, bordered above by a fine brown line; next a broad lateral stripe (or band), sprinkled closely with brown freckles, and bearing two fine pale lines, the lower of which is whitish throughout the four last segments,

and on the hinder part of each of the others; then the pale, puffed, spiracular ridge bearing the reddish-yellow spiracles ringed with brown; under the ridge, just beneath each spiracle, is a longitudinal dark brown dash; belly greyish-ochreous with two faint dusky lines; the usual dots wide apart, blackish in colour; the lateral band ceases on the front of the thirteenth segment, leaving the anal flap and the long points pale.

One of my larvæ was rather darker than the others, with the ground of the back browner, and the lateral band formed of purplish-brown freckles and specks; but even the darkest looked cold-tinted and pale.

When at rest, the larva remains stretched out at full length, but curls up the front segments when disturbed, and if further annoyed drops from its food, and curls its whole body up tightly in the same plane, bringing the anal legs and flap tightly down on the inner coil, and in this position will allow itself to be trundled like a wheel.

When about to change, it takes advantage of some small interstice between two bits of earth, or sticks or stones, and spinning a few threads, draws some small loose particles together to hide the opening.

The pupa is long and slender; the head, wing-cases, and last segment of the abdomen are very dark, shining brown; the rest of the abdomen of a pale tint of warm red-brown, with spots and transverse streaks of the darker colour. (John Hellins, July, 1871; E.M.M., October, 1871, VIII, 116.)

ABRAXAS GROSSULARIATA.

Plate CXXIV, fig. 1.

Dark Variety of the Larva.—On the 14th of June, 1878, Mr. S. L. Mosley showed me examples of a remarkably dark form of this well-known larva, which he had received from Mr. J. E. Robson, who informed him

that a colony of the form usually occurred a few miles north of Newcastle-on-Tyne. Mr. Mosley kindly gave me one of the larvæ, and I preserved it. It differs from the strikingly marked usual form in being almost uniformly sooty-black; there is no trace of the reddish lateral stripe below the spiracles; and the yellow or cream-colour only shows a little on the second segment and on the ventral area as a narrow central stripe, interrupted, except between the legs and prolegs, at the segmental divisions. The only other markings are two small pale spots on the *front* of the fifth, sixth, seventh, eighth, and ninth segments, and laterally on the tenth and eleventh segments. The appearance altogether is so different from the usual form, that at first sight I had no idea what the larvæ were; and on placing my preserved specimen in the cabinet along with the broad black-bordered variety of the imago, it seemed to correspond with it exactly. Unfortunately for that theory, however, these black larvæ at Newcastle only produce the most ordinary form of the imago. Mr. Robson has since informed me that the larvæ are not all sooty-black, but vary in every degree,—from the ordinary colour to uniformly black, even more so than the specimen I have described. Mr. Robson has bred a great many of them, but never got a variety of the imago from them. (George T. Porritt, E.M.M., January and February, 1879, XV, 187 and 205.)

LIGDIA ADUSTATA.

Plate CXXIV, fig. 3.

The eggs were laid during the third week in July. The caterpillars were hatched on the 1st of August. When full grown they usually rest in a straight position along the stem of their food-plant, *Euonymus europæus* (common spindle-tree), to which they have a marked resemblance in colour.

The head is slightly larger than the second segment;

the face almost white, mottled with reddish-brown, and surrounded by a band of very dark brown, which becomes lighter in shade as it approaches the second segment; on each side of the head, in a line with the spiracles, and adjoining the second segment, is a patch of very dark brown. The second segment is smaller than the third, and the third smaller than the fourth, from which to the eleventh the body of the caterpillar is of uniform size, and then decreases. On the anterior dorsal area of the fifth, sixth, and seventh segments there is a small square brown patch, edged on both sides with white; this marking occurs again, but very indistinctly, on the tenth segment. The sides of the fifth and sixth segments are ornamented with an irregularly shaped patch of various shades of brown, interspersed with small white marks. The legs are brown; the first pair of claspers, together with the skin-fold above them, are also brown, the latter variegated slightly with white; the anal flap and second pair of claspers are tinged with the same colour. The spiracles, which are very indistinct, are white, edged with brown.

The caterpillars descended to the earth about the 25th of August, and spun slight cocoons just below the surface. (P. H. Jennings, September 7th, 1874; Ent., October, 1874, VII, 229.)

Singular Variation of the Larva of Ligdia adustata.—The bright green or light apple-green variety of this larva I have seen described once or twice; but the descriptions do not all give the same number and position of the red markings. Some larvæ figured and described by Mr. Buckler last autumn had—in addition to the brown head, red legs, and lateral blotches mentioned (after Guenée) in the Manual—on the anterior part of each of the sixth, seventh, eighth, eleventh, and twelfth segments a bright red elongate spot, bordered on either side by a black and then a white line; they had also thread-like subdorsal and spiracular white lines.

But the following variety, captured here (Exeter) by Mr. D'Orville, I have never seen mentioned before; in fact, at first we took it to be a new species. The ground colour above is a grey-brown; a broad ochreous-yellow dorsal stripe, widest in the centre of each segment, and contracted at the segmental divisions; very thin subdorsal and spiracular white lines; on the front of each of segments four, five, six, and seven are two dorsal white spots, and on each segment ten black dots; belly and sides, for first five segments, are of the same colour as the back, but for the remainder are ochreous-yellow. The lateral blotches on the fifth, sixth, and seventh segments are dark brown, followed by smaller spots on the hinder segments; the head also has a dark brown spot on each lobe. (John Hellins, April 6th, 1865; E.M.M., June, 1865, II, 16.)

HYBERNIA LEUCOPHÆARIA.

Plate CXXV, fig. 2.

Some Varieties of the Larva.—In February, 1863, Mr. H. Doubleday kindly sent me a batch of eggs; these were at first light green in colour, afterwards changing to a bluish-black-green.

The larvæ were hatched on the 28th of March, being then dark dingy green in colour and short in figure; they fed inside buds of oak, which I partially opened for them with a pin, and by the 14th of April they had become about a quarter of an inch in length, and were furnished with a few bristles; all their dark colour was gone, and they were now of a very pale whitish-green. As they grew bigger their skin seemed to grow harder, as though to fit them for feeding exposed, and at last there appeared about four varieties. These Mr. Buckler has kindly figured, together with some other larvæ captured at different times.

When full-grown—about the end of May or beginning of June—they had somewhat of a square-built figure, being stoutish, and of uniform size throughout; in fact, they can by no means be called elongate, although most of their congeners are well described by that word.

The variety most commonly met with has the ground colour of a very pale yellowish-green, or very pale olive-green, with a yellowish dorsal line, double, but almost running into one at the segmental divisions, and a subdorsal line rather paler. Some specimens have in addition numerous dots of pale yellowish-white. This seems to be the variety described (from Guenée) in Stainton's Manual.

The variety coming nearest to this is one which I never saw, except in the batch bred from the eggs sent me by Mr. Doubleday. It had the ground colour of a pale pea-green, with dorsal and subdorsal lines like the last, only on each of the fifth, sixth, seventh, eighth, and ninth segments it had a longish dash of dark brown immediately below the subdorsal line.

The third variety was also peculiar to the brood from Epping. It had the ground colour of a very pale drab, dorsal and subdorsal lines pure white; on each side of the second segment, behind the lobes of the head, was a blotch of dark brown; down the back, in the centre of each segment, was a dark brown triple wedge-shaped mark, and at each segmental division a black spot; the subdorsal line bordered below, throughout its length, with dark brown dashes.

One might indicate several more varieties, but I shall include the rest under one, as they have the same markings, and differ chiefly in depth of colour.

Ground colour yellowish-green, full green, sometimes dark olive; dorsal and subdorsal lines varying also with the ground colour, in the darkest specimens becoming much suffused, and interrupted at the segmental divisions by a dark brown transverse band; second segment with the two large round dark spots;

on the back of each of the other segments a dark brown mark, compared by Mr. Buckler to two leaves pointing forward, with a short stem between them, and preceded by two black dots; subdorsal lines bordered below with dark dashes. (John Hellins, April 13th, 1865; E.M.M., June, 1865, II, 16.)

HYBERNIA AURANTIARIA.

Plate CXXV, fig. 3.

On November 6th, 1868, Mr. J. R. Wellman captured three pairs of moths in copulation, and very kindly sent on to Mr. Buckler the eggs laid by the females during the next two or three days. The larvæ were not hatched till just about the middle of March, 1869; were fed by me on birch; came to their full growth and spun up about the middle or end of May; and the moths appeared November 4th to 13th.

The egg is flattened and somewhat brick-shaped, but with one end more conical; the shell is stoutly ribbed, and reticulated, its appearance under a lens reminding one of coarse basket-work; the colour is at first green, afterwards puce, then reddish, with a long central blackish spot; and lastly, just before the hatching, smoky.

The newly hatched larvæ are small in proportion to their full-grown bulk; smooth, dark brown on the back, with a yellowish dorsal line, and a more distinct yellow spiracular line; the head brown, a fine pale yellow transverse streak on the second segment; the belly dusky. After the first moult the brown disappears, and the colour throughout becomes olive-green. The next moult results in a pale olive coat, with the middle of the back still paler; but after the third moult the back begins to show decidedly yellow again; the sides are tinged with brown, and the spiracular line also recovers its yellow; and from this

time a nearer approach is made to the appearance exhibited at full growth.

When full-grown the larva is rather over one inch and one-eighth in length, in shape moderately slender; viewed from above, it appears of nearly uniform stoutness throughout, but viewed sideways the segments seven to ten are rather stouter than the rest; the head is broad, flattened in front, and rounded at the sides, so as to be equal in width to the second segment, which, together with the third and fourth, is a little flattened also; the fifth is more cylindrical, and hence has the appearance of being a trifle thinner than the rest; the skin is tough, furnished with a few bristles, and the back of the second segment is glossy, suggesting a sort of plate there; a pair of rather conspicuous warts on the twelfth segment.

Probably there are variations more or less in the colouring, but the larvæ I had were alike, and might be roughly described as being of a dark purplish-brown with yellow markings; but to pick out the arrangement of the markings was no easy matter. The ground colour of the back was pale, dull, ochreous-yellow, and through it a number of fine brownish lines, not parallel throughout, but approaching and receding, so as to form a pattern; of these, two very fine ones through the centre of the back, enclosing a thread of the pale ground; on either side of this pair another darker brown line, and then again another wavy one, touching the broad, deep, purplish stripe which occupied the side from the head to the twelfth segment, on which it mounted up the back, and meeting the stripe from the other side, formed there a Λ mark pointing forwards, and bearing on it the warts of the same colour; below the broad stripe a pale yellow thread, and below this a blackish-purple thread; in the spiracular region, the front of each segment sulphur-yellow, the hinder part dull ochreous; here also could be seen indications of two fine purplish lines, showing at the beginning and end of each

segment, but leaving a clear space for the black spiracles; another line of the same colour below, thickening under each spiracle; the belly dark purplish-brown, with a central pale yellowish stripe, opening widest and enclosing a short black streak in the middle of each segment, and edged with black; a very fine pale yellow line also through the dark purplish-brown of each side of the belly; the head horny, and dull reddish in colour, with a transverse band of dark greyish-brown across the face; legs and hinder part of anal segment a dull brownish-ochreous.

The cocoon is formed of brownish silk inside, slight but close in texture, and outside of fine particles of earth, and placed just below the surface.

The pupa is stoutish in front, tapering rapidly behind, ending in a stout spike with two fine points; in the male the wing-cases are short and the antenna-cases distinct, showing pectinations; the skin smooth and shining, reddish-brown in colour. (John Hellins, July, 1871; E.M.M., September, 1871, VIII, 90.)

ANISOPTERYX ÆSCULARIA.

Plate CXXVI, fig. 1.

On the 3rd of April, 1872, I received from Mr. W. J. Skelton, of Faversham, eggs of this species. Some of the young larvæ had emerged on the way, and the remainder of the eggs hatched immediately. The larvæ grew rapidly on hawthorn, and by the middle of May were going down.

The full-grown caterpillar may be described as follows:

Length about an inch, slender, cylindrical, and of uniform width throughout; head globular, slightly broader than the second segment; skin soft and smooth. Ground colour bright green, strongly tinged with yellow; head uniformly green. A dark green

line, very narrowly edged with grey, forms the dorsal stripe; the subdorsal and spiracular lines are greyish-white; and between the subdorsal and spiracular lines is a very fine pale grey line. The segmental divisions are yellow, and the spiracles black. Ventral surface uniformly bright green, with the segmental divisions yellow.

By the end of May all the larvæ had gone down, and the imagos from them are now emerging; nineteen males had emerged when the first female put in an appearance. (George T. Porritt, March 11th, 1873; E.M.M., April, 1873, IX, 272.)

Mr. J. G. Ross, of Bathampton, kindly sent me a batch of eggs of *A. æscularia* on the 3rd of April, 1877, a portion of which was at once dispatched to Mr. C. V. Riley; with me the larvæ did not hatch till the 25th, while Mr. Riley, in a letter dated the 23rd, said the parcel had reached him with the larvæ hatched and dead. I suppose the temperature in the steamship was higher than in my room, and expedited the hatching. My larvæ ate oak, and were full-fed during the first week in June, but a week later again I beat a few from an oak tree, some of which were not full-fed for several days after.

The female moth seems to deposit her eggs in patches (there were more than fifty together in one patch sent me by Mr. Ross); and they are arranged very closely and evenly, touching one another, firmly cemented together, and covered over with the long fibre-like scales from the maternal anal tuft; the egg is oblong, standing upright on end, almost cylindrical, but somewhat squared by being squeezed closely against the other eggs with which it stands, the upper end convex, the lower more flattened; the shell smooth and glossy; the colour olive-brown, browner on the top, without much change.

The larva escapes by eating a round hole through the top of the egg, and is at first yellow in colour, the internal vessels showing faintly blackish down the

back, and there is a fine blackish subdorsal line; the usual dots very small, black, and bearing pale yellowish short bristles; at first there is no appearance of feet on the ninth segment. As the larva feeds, the middle portion of the body becomes greener, while the head and tail are more yellowish, but after a little growth the green spreads throughout. When the larva is almost half-grown it plainly shows some rudiments of legs on the ninth segment.

When full-grown the larva is rather over an inch in length, very even in bulk; the head flattish, but with rounded outline to the lobes; under the anal flap are two short, blunt points; on the ninth segment a pair of feet, perfectly formed, but useless for walking, being about one-sixteenth of the size of the pair on the tenth segment. The general appearance of the colouring is yellowish-green, owing to the number of green and yellow lines which run intermixed down the body; the dorsal line is a pale yellowish thread, running between two dark green lines, darkest at the segmental divisions, and themselves again edged with pale yellowish; then on a pale yellowish-green ground are some pale yellow freckles; then comes the subdorsal line, yellowish, edged with decided green; then more yellow freckles; then a waved, rather broken, supra-spiracular line of yellow, edged above thickly but irregularly with green, reaching highest at the beginning and end of each segment, and lowest just in the middle above each spiracle; the spiracular region broadly and decidedly green, each black-ringed spiracle with a small yellow halo (and in some individuals behind each spiracle is a conspicuous spot of darker green); the subspiracular is a stouter undulating line of deeper yellow, edged in parts with dark green; the belly rather bluish-green; the head greenish with a tinge of very pale brown.

The cocoon is neatly formed, of long oval shape, and of tough texture, being lined with close-woven yellowish silk, and covered with fine earth; in fact, it

looks like a little knob of earth ; it is about three-eighths of an inch long, and a quarter of an inch broad.

The pupa is rather over five-sixteenths of an inch long, very plump and full, being for the greater part of its length nearly an eighth of an inch across ; the eye-cases prominent, the abdomen tapering off quickly, but with a blunt end, on which is a flat blackish knob, furnished with two short widely diverging sharp spines ; the colour golden-brown, tinged with greenish on the back ; the eye-cases, etc., more brown ; the skin finely punctured, but glossy. (John Hellins, September 11th, 1877 ; E.M.M., October, 1877, XIV, 113.)

CHEIMATOBIA BRUMATA.

Plate CXXVI, fig. 2.

Once more I have looked at and figured this ubiquitous larva of the month of May, and again noticed the variations of the ground colouring, but that the lines of yellow more or less pale are constant in their arrangement, and that the spiracles are red of a brownish kind, and always situated actually *on the yellow line* where it is widest. (William Buckler, 1881 ; Note Book IV, 12.)

CHEIMATOBIA BOREATA.

Plate CXXVI, fig. 3.

Two or three full-grown larvæ on birch were sent me on the 8th of June, 1881, by the Rev. J. Hellins, and they have again shown me how distinct this larva is from its congener, *C. brumata*. For not only is the proportion more thick and stumpy, and the head more or less black in *C. boreata*, but the spiracles are black and *just above the yellow line*, and the anterior legs are also black. These are good distinctions, that

I was much struck with when I reared a small brood from eggs in 1868. (William Buckler, June, 1881; Note Book IV, 11.)

OPORABIA DILUTATA.

Plate CXXVI, fig. 4.

On the 7th of May, 1881, I received from Rev. John Hellins nine larvæ of this species, feeding on elm, hawthorn, and other trees, all in their last coats and nearly mature, two of them entering the earth next day.

The larva is seven-eighths of an inch in length, about an inch when full-grown; it is stout in proportion, almost uniform in substance throughout; the head is rounded, and fitting partly within the second segment; the body above appears very cylindrical, though viewed sideways it tapers a little from the head to the fourth segment in the muscular base of each anterior leg increasing progressively, and also tapering a little from the eleventh segment to the thirteenth; the segments are moderately well defined on the back, rather more deeply cut and more plump on the belly; the ventral and anal legs well developed.

In colour the head is of a lightish green, smooth, and but slightly glistening; the colour of the back as far as the spiracular region is a more or less bright velvety green, becoming yellowish-green near each segmental division, the fold itself yellowish; the subdorsal region bears two equidistant, pale, rather sinuous fine lines, but little broken, either whitish or yellowish, but *extremely faint*; the tubercular dots are whitish or yellowish-greenish, and conspicuous when they are surrounded with deep rose-pink or crimson; the anterior pair of the trapezoidals are often within markings of one of those colours about the middle of the back of each segment, where relatively a blotch of the same kind of red appears between the lowest of

the equidistant lines and the spiracular whitish ridge which runs through the lower part of the blotch; this ridge is rather more distant from the lower line than the two lines are from each other, and continues to the beginning of the anal flap. The spiracles are orange, finely outlined with dark crimson; the situation of each is within the blotch, and relieved by a small halo of green just above the whitish ridge, which from inflation is more noticeable; the colour of the belly is of a blue and paler green, blending to white in the middle, whereby the three ventral white lines show but indistinctly. The deep rose-pink or crimson dorsal stripe is so interrupted that it shows only about midway on each segment, and is intersected either with one or with two short transverse stripes; if with two the shorter is in front; very often the area they occupy is faintly tinged with light pinkish; in some examples the dark pink shows only as a smooth interrupted dorsal stripe, more or less faint or nearly obsolete, and occasionally mere spots, but when present it is always strongest on the penultimate segment; in others the pale yellowish or whitish fine lines are so faint as to be scarcely distinguished, as are sometimes also the tubercular dots, when the larva appears to be of a plain velvety green above and a whitish-green beneath, though still a trace of the whitish or yellowish spiracular ridge remains, especially on the posterior segments (two magnified segments with fig. 1, 1881, show all needful particulars).

The moths from the foregoing larvæ emerged on October 11th, November 4th, 10th, and 13th, 1881, all ♀ with the exception of one ♂. They were of a very light grey type, the ♂ the lightest. I sent a batch of eggs to Mr. Hellins.

On turning out the pot the cocoons were found to be about half an inch long, of a blunt oval general figure, composed externally of grains of earth, and smoothly lined with dirty grey silk inside.

The pupa is of a dumpy shape, being stout in pro-

portion to its length, which is no more than from three-eighths to seven-sixteenths of an inch; the abdomen tapers rather abruptly towards the tip, which bears a single tapering spike which at its fine point has two most minute diverging pairs of hooklets, affording a firm hold on the lining of the cocoon. The pupal surface is moderately smooth and glossy, and of brownish-red colour, darkest on the abdomen.

The larvæ above described were reared by Mr. Hellins from eggs he received from Mr. C. G. Barrett at Pembroke. (William Buckler, October, 1881; Note Book IV, 62.)

OPORABIA FILIGRAMMARIA.

Plate CXXVI, fig. 5.

On the 27th May, 1881, I received five larvæ from the Rev. John Hellins, which came from Mr. R. Kay, of Bury, Lancashire. They were on heather and weeping willow.

They were about half an inch long, of uniform cylindrical substance. The head and plate on the second segment are brown, the head marked with darker brown on each lobe. The body is velvety, rather olive deep green, with a darker green dorsal stripe, a subdorsal line of bright canary-yellow, followed below closely by another much finer and thinner ragged line of the same yellow, and at a greater distance below by a spiracular line of paler bright yellow, equal in thickness to the subdorsal line, especially on the last four segments; the dorsal stripe is very faintly edged with yellowish, especially at the beginning of each segment; the tubercular warty dots are pale yellowish-greenish, each with a short bristle. The same dark green of the body extends broadly below the spiracular line, and is followed beneath by a broken stripe of faint pale dirty yellowish or whitish;

the belly itself is less pale but whitish-green, quite a contrast with that of the back and sides.

On the 29th I received two more larvæ a little larger, about three-quarters of an inch long, of a rich dark olive-brownish velvety green, with *bright* yellow ragged lines, the upper two lines deeper yellow than the spiracular line; and on the 7th of June I received from Mr. Kay fourteen more larvæ, most of them very small, and all obtained from heather of a darker hue than this plant is in the south of England; and although they fed quite greedily on sallow, weeping willow, etc., yet they preferred to retire to the heather until they were nearly full-fed; with which plant their colouring was in harmony, and it is noticeable that after dieting on sallow their colouring became perceptibly lighter than before. Many of them died on the earth in an aborted pupa state, others in the larva state shrivelled, one was ichneumoned, a few spun a few threads amongst twigs of heather and pupated within them, and a few entered the earth and therein made slight cocoons, but holding tolerably well together.

Five moths in all were bred, viz. one ♂ and two ♀s on the 21st of August, one ♀ on the 24th, and one ♂ on the 8th of September.

The pupa is three-eighths of an inch long, of rather dumpy figure, but not otherwise remarkable, the abdominal segments tapering to the tip, which is furnished with a small tapering spike having two minute diverging hooks at the fine extremity, and its colour is very dark brown with rather a glossy surface.

In 1882 I received on the 26th February, from the Rev. J. Hellins six larvæ from eggs laid by one of the ♀ *O. filigrammaria* mentioned above that I had forwarded to him at the time they were laid on leno. These larvæ were of different sizes, large and small, reared on rose-leaves and whitethorn. The largest one at this date (February 26th) was 18 mm. long and in its last stage, extremely dark velvety olive-brown,

which later on became rich olive-green, and it was full-fed before the middle of March.

Two others of the length of 15 mm. (on February 26th) were stoutish, and uniformly so, with each lobe of the head brown, the anal plate and anal legs brownish, the dorsal line rather darker green than the bright, deep green of the ground; the dorsal line is only relieved *plainly* on each side with yellow just at the anterior of each segment, and beyond only indistinctly so; the subdorsal line, the thinner line below, and the spiracular line are bright primrose-yellow; the tubercular dots are of the ground colour, now almost indistinguishable; the spiracular line inflated, the spiracles round, blackish.

Two others, 10 mm. long (on February 26th), of uniform thickness, were of rich deep green colour, face green and lobes of the head dark brown; a *darker* green dorsal line between two lines of greenish-yellow; the subdorsal, the festooned line, and the spiracular line bright, pale yellow, the tubercular dots yellow, the middle of the belly paler green; when grown to 12 mm. they lay up to moult.

One 5 mm. long (on February 26th) of uniform, moderate stoutness, had the head black, a narrow, dark brown plate across the second segment, and on the anal flap and on the hinder halves of the anal legs; deepish green body; subdorsal line, a fainter line below it, and the spiracular line of yellow, which last edges the side of the anal plate; it lay up for moulting on the 28th February.

The above all began to be full-fed from the middle of March at different dates up to the 26th, when the last ceased feeding.

No moths resulted from any of them, the pupæ having dried up. (William Buckler, March, 1882; Note-book IV, 64 and 84.)

LARENTIA CÆSIATA.

Plate CXXVII, fig. 3.

[The following description was given by Mr. Hellins for comparison with *L. ruficinctata*.]

Some years ago I reared *Larentia cæsiata* from the egg, but preserved no record of the egg, or of the young larva. At that time I bred the moths in the end of May and beginning of June, but I do not know for certain whether this shows there are two broods, or only that the moth has a long flight; Mr. J. Batty, who has more than once sent me the larvæ, tells me he believes there is but one brood of moths, most abundant in July; anyhow, from these the larvæ are hatched in August, feed chiefly on whortleberry, but will also eat ling, hybernate, and do not feed up till May, some even holding on till June.

The larva when full-grown is seven-eighths of an inch long, not so stumpy to look at as *L. ruficinctata*, more cylindrical, tapering less rapidly to the head, which, however, is small and rounded; the bristles emitted by the dots shorter than in *L. ruficinctata*.

In colour there are two varieties known to me:

1. Ground colour on back deep red-chocolate; a dorsal row of seven Λ s pointing forward on segments five to eleven, with imperfect ones on the fourth and twelfth, much resembling those of *L. ruficinctata*, being outlined with dark brown, and the interior being also yellow in front and pink behind, but they are both more extensive in size and brighter in tint; the segmental divisions are tinged with green; the dorsal line is almost continuous, but varying in colour, being brownish-red or more pinkish, in agreement with the surrounding skin; at the segmental divisions it is bordered by two short whitish dashes, as are also two pairs of fine lines which run on

- either side of it, so that at the divisions there is quite a marked feature in these white dashes; the spiracular line is clear and distinct, in colour white or pale yellow; the spiracles are black; the head dark reddish freckled with greenish; the belly dark brown,
2. Ground colour a deep bright green, dorsal markings very bright by contrast; head as before; belly full green; spiracular line white or pale yellow; anal flap and anal legs purplish. This is a very beautiful form of the larva, and seems to be developed at the last moult; an example now feeding was quite reddish-brown till it moulted.

The pupa, enclosed in a slight cocoon, but apparently more complete than that of *L. ruficinctata*, is about half an inch long, cylindrical, and rather slender; the eyes rather prominent; the skin very glossy; in colour almost olive on the wings; golden on the abdomen; the eyes, abdominal rings, and end of tail dark brown.

I should much like to hear some decisive statements on the question of this species being single or double brooded. (John Hellins, 18th May, 1875; E.M.M., June, 1875, XII, 6.)

LARENTIA FLAVICINCTATA.

Plate CXXVII, fig. 4.

I was very glad to receive eggs of *Larentia ruficinctata* in August, 1874, from Mr. Carrington, and in March, 1875, having failed to bring my larvæ through the winter, I was still more glad to have my loss made good by Mrs. Hutchinson; and I am now able to give a tolerably full account of this species, and to compare some of its stages with *L. cæsiata*. The result of this comparison will be to show that they stand very much

in the same relation to one another as exists in the genus *Melanippe* between *M. rivata* and *M. subtristata*.

I received eggs of *L. ruficinctata* on August 15th; the larvæ hatched on the 21st, and at first fed well on flowers of various stonecrops and saxifrages, but when the flowers were past, would not touch the leaves; however, Mrs. Hutchinson found that the leaves of *Saxifraga hypnoides* (a species I could not obtain) were readily eaten, and on that plant kept her larvæ through the winter, and on February 19th she kindly sent me some of them, then just moulting for the last time; these spun up during the last week of March and the first ten days of April, and the first moth came out on the 17th of May; from the moths of this first flight the larvæ are found full-fed (and have been sent to Mr. Buckler) in July; and the second flight of moths is out at the beginning of August; *L. ruficinctata*, therefore, is double brooded, one brood going through all its transformations in the period between the middle of May and the beginning of August, and the other taking up the rest of the twelve months, chiefly in the larval stage.

The egg is rather long-oval in outline, full, with one end blunted; the shell pitted all over with irregular reticulation; the colour (when I received the eggs from Mr. Carrington) light bright red, afterwards dingy.

The young larva is pale olive, with broad dorsal and finer waved subdorsal darker lines; head shining black, the blackish dots each set with a long bristle, somewhat clubbed at the tip; in about a month (with the second brood, that is) the dorsal pattern begins to appear, the colour otherwise being dark brownish; the larvæ that came to me in spring were about half-grown, with the dorsal pattern well developed.

The full-grown larva is six-eighths of an inch long, in figure thick-set, tapering from the fifth segment to the head, which is small and rounded, and tapering, but not so much, from the tenth to the tail;

when viewed sideways, rather flattened; divisions well marked; skin wrinkly; the usual dots distinct as minute raised warts with longish hairs. In colour there are three varieties known to me:

1. Ground colour on back dark purplish-grey, with a dorsal row of seven Λ s pointing forwards on segments 5—11, and sometimes an eighth and ninth Λ —but small and imperfect—on segments four and three; these marks are outlined by very dark velvety brown lines, and of the space enclosed by them the apex is pale yellow, and the base pale rose-red, the dorsal line appearing here as a short stripe of deeper opaque red; on segments two, three, twelve, and thirteen the dorsal line is continuous and dark reddish; the head darker than the ground, and freckled; the belly dull reddish-brown; the spiracular region tinged with ochreous; the small round spiracles blackish.
2. Ground colour rather subdued green, with the dorsal markings rather brighter than in 1.; the head freckled with brownish; belly pale green; spiracular line ochreous.
3. Ground colour pale olive-green, but varied with a suffusion of dark rich red on either side of the back, most intense where it touches the pale yellowish spiracular line; the belly dull greenish.

The pupa, enclosed in a very slight cocoon on the surface of the soil, is barely half an inch long, smooth and cylindrical, tapering off gradually to the tail, which ends in a spike with a fine forked spine; the skin very glossy; the colour pale golden-brown, darker towards the tail. (John Hellins, May 18th, 1875; E.M.M., June, 1875, XII, 5.)

LARENTIA OLIVATA.

Plate CXXVII, fig. 6.

Several years ago I bred this species, but took scarcely any notes of it, and was therefore very glad to receive from Mrs. Wollaston, at the end of August, 1873, some eggs which she had obtained from a moth taken at Teignmouth.

The larvæ hatched, but not all at once, during the second week in September, and were kept outdoors on a growing plant of *Galium mollugo*; the winter being mild, they continued to feed slowly all the time, and seemed to be content with withered leaves when green ones failed them; by the last week in April they were full-fed, and most of them became pupæ during the first week in May. The larva of this species, like that of *L. pectinitaria* (*miaria*), is extremely sluggish, as might, indeed, be concluded from a glance at its form.

The egg of *L. olivata* is rather small for the moth, of an oval form, plump; the shell glistening, with no *raised* reticulation, but yet covered with the little facets, as it were, which should be enclosed by reticulation; colour at first pale straw; then a palish vermilion-red; at last turning to a pale livid hue.

The young larva is pale vermilion-red, with blackish head, but this gay colour does not last long, soon giving way to the dingy appearance worn for the remainder of this stage, and the description of the full-grown larva will suffice for it altogether.

The full-grown larva is rather over five-eighths of an inch in length, very stumpy in figure, rugose and warty, with segmental divisions distinct, head not so wide as the second segment, with the lobes rounded, although narrow, the front and hind segments tapering very slightly.

The ground colour is a pale ochreous, mottled with

deeper brown, and marked longitudinally with lines of darker brown; the dorsal line begins blackish on the second segment, becomes dark brown after that, and is continuous up to the fourth; then it becomes a series of dashes on the front part of each segment up to the tenth; thence again it becomes continuous; on either side of the dorsal line come a subdorsal and lateral similar line, continuous to the end of the fourth, and from the tenth to the thirteenth, but on the intermediate segments interrupted and turned aside by the warts; in this manner the subdorsal line is pushed in towards the dorsal on the middle of each segment, giving somewhat the look of a curved X, only that the limbs of the letter do not touch; the lower or lateral dark line is also waved in its course by similar obstructions; the usual dots are large tubercular warts of the ground colour, and furnished with stiff bristles; and on segments 6 to 9 there are, besides, pairs of conspicuous, transverse, oval warts paler than the ground; the spiracles are inconspicuous, being small and blackish; the head brownish with dusky freckles, and set with bristles; the belly more mottled than the back, and with traces of a central, and a pair of lateral, dusky lines.

In its usual position of rest the larva keeps the head and thoracic segments all humped together.

The cocoon is very slight, formed on the surface of the soil, under a leaf or stem for covering, and with particles of earth, etc., drawn in.

The pupa is three-eighths of an inch long, the thorax swelling above the line of the back, the eyes somewhat projecting, the abdomen tapering off gradually, and ending in a small blunt spike furnished with two large and six small spines with curled tips, by which the pupa is attached to the silk of the cocoon; the colour is bright reddish, the abdomen deeper reddish, the spike dark brown. (John Hellins, June 2nd, 1874; E.M.M., September, 1874, XI, 86.)

The following list of parasites, bred from larvæ or pupæ of the species included in the present volume, has been kindly prepared by Mr. G. C. Bignell, F.E.S.—G. T. P.

HOST.	PARASITE.	By whom bred.
<i>Ourapteryx sambucaria</i>	* <i>Apanteles formosus</i> Wesm.	G. C. Bignell.
	<i>Microgaster alvearius</i> Spin.	— Winkley.
<i>Ellopiæ fasciaria</i>	<i>Limneria geniculata</i> Grav.	R. South.
	<i>Limneria ruficincta</i> Grav.	Mrs. Hutchinson.
<i>Selenia illunaria</i>	<i>Casinaria tenuiventris</i> Grav. ...	H. W. Barker.
	<i>Phæogenes stimulator</i> Grav. ...	H. W. Barker.
	<i>Banchus pictus</i> Fab.	G. C. Bignell.
	<i>Apanteles juniperatæ</i> Bouch. ...	G. C. Bignell.
„ <i>lunaria</i>	<i>Apanteles difficilis</i> Nees	G. C. Bignell.
	<i>Apanteles caberæ</i> Marsh.	G. C. Bignell.
	<i>Apanteles fulvipes</i> Halid.....	G. C. Bignell.
<i>Odontopera bidentata</i> ..	<i>Ichneumon ruficeps</i> Grav.....	J. Gardner.
	<i>Ichneumon cyaniventris</i> Wesm...	G. C. Bignell.
<i>Crocallis clinguaris</i> ..	<i>Ophion luteum</i> L.	G. C. Bignell.
	<i>Paniscus virgatus</i> Fourc.	G. C. Bignell.
	† <i>Mesochorus plagiatus</i> Thoms. ...	G. C. Bignell.
	<i>Apanteles juniperatæ</i> Bouch. {	J. Hellins,
	<i>Meteorus chrysophthalmus</i> Nees	G. C. Bignell.
<i>Ennomos alniaria</i>	<i>Meteorus deceptor</i> Wesm.....	G. C. Bignell.
	<i>Apanteles juniperatæ</i> Bouch. ...	G. C. Bignell.
(<i>tiliaria</i>)	<i>Meteorus deceptor</i> Wesm.	G. C. Bignell.
<i>Himera pennaria</i>	<i>Pimpla instigator</i> Fab.	W. H. Harwood.
	<i>Paniscus virgatus</i> Fourc.	G. C. Bignell.
<i>Phigalia pilosaria</i>	<i>Campoplex oxyacanthæ</i> Boie. ...	G. C. Bignell.
	<i>Meteorus deceptor</i> Wesm.	G. C. Bignell.
	<i>Apanteles juniperatæ</i> Bouch. ...	G. C. Bignell.
<i>Biston hirtaria</i>	<i>Apanteles fulvipes</i> Halid.	G. C. Bignell.
	<i>Apanteles difficilis</i> Nees	G. C. Bignell.
<i>Amphidasis prodromaria</i>	<i>Campoplex mixtus</i> Grav.	G. C. Bignell.
	<i>Campoplex mixtus</i> Grav.	G. C. Bignell.
<i>Amphidasis betularia</i> .	<i>Limneria carbonaria</i> Brischk....	G. C. Bignell.
	‡ <i>Mesochorus formosus</i> Bridgm....	G. C. Bignell.
	<i>Apanteles difficilis</i> Nees	G. C. Bignell.
	<i>Campoplex pugillator</i> L.	G. C. Bignell.

* The cocoon made by the ♂ of this species is at the end of a long stiff footstalk, and unlike any other cocoon I have seen; that of the ♀ is of the usual *Apanteles* form, which I obtained from *Tæniocampa stabilis*.

† Hyperparasite on *Apanteles juniperatæ*.

‡ Hyperparasite on *Apanteles difficilis*.

HOST.	PARASITE.	By whom bred.
<i>Amphidasis betularia</i> . (continued)	<i>Apanteles difficilis</i> Nees	W. H.
	<i>Apanteles juniperatæ</i> Bouch. ...	Harwood.
		W. H.
		Harwood.
<i>Hemerophila abruptaria</i>	<i>Pimpla turionellæ</i> L.	B. A. Bower.
<i>Cleora glabraria</i>	<i>Microgaster minutus</i> Reinh. ... {	G. C. Bignell,
		E. A. Fitch.
,, <i>lichenaria</i>	<i>Apanteles octonarius</i> Ratzeb. ...	J. E. Robson.
	<i>Anomalon perspicuum</i> Wesm. ...	E. Atmore.
<i>Boarmia repandata</i> ...	<i>Apanteles vitripennis</i> Halid.	G. C. Bignell.
	<i>Microgaster alvearius</i> Spin. ... {	G. C. Bignell,
		G. F. Mathew.
	<i>Microgaster flavipes</i> Halid.	G. C. Bignell.
,, <i>rhomboidaria</i>	<i>Apanteles vitripennis</i> Halid.	T. R. Billups.
,, <i>roboraria</i> ...	<i>Limneria carbonaria</i> Brisch. ...	G. C. Bignell.
<i>Tephrosia extersaria</i> ..	<i>Ichneumon jugatus</i> Grav.	G. C. Bignell.
<i>Gnophos obscurata</i>	<i>Limneria notata</i> Grav.	G. C. Bignell.
	<i>Apanteles bicolor</i> Nees	G. C. Bignell.
<i>Pseudoterpna cytisaria</i>	<i>Limneria tristis</i> Grav.	G. C. Bignell.
	<i>Apanteles abjectus</i> Marsh.	Mrs.
		Hutchinson.
	* <i>Apanteles immunis</i> Halid.	G. C. Bignell.
	<i>Macrocentrus abdominalis</i> Fab.	G. C. Bignell.
<i>Geometra papilionaria</i>	<i>Apanteles glomeratus</i> L. {	J. Arkle,
		G. C. Bignell.
	<i>Apanteles rubripes</i> Halid.	G. C. Bignell.
	<i>Meteorius versicolor</i> Wesm.	G. C. Bignell.
<i>Iodis lactearia</i>	<i>Mesochorus pictilis</i> Holmg.	G. C. Bignell.
	† <i>Apanteles caberæ</i> Marsh.	G. C. Bignell.
<i>Hemithea thymiaria</i> ...	<i>Anomalon clandestinum</i> Grav. ...	G. C. Bignell.
	<i>Casinaria tenuiventris</i> Grav. ...	G. C. Bignell.
	<i>Limneria obscurella</i> Holmg. ...	G. C. Bignell.
<i>Ephyra omicronaria</i> ...	<i>Apanteles popularis</i> Halid.	T. A. Chapman.
<i>Cabera pusaria</i>	<i>Zele discolor</i> Wesm.	G. C. Bignell.
	<i>Apanteles caberæ</i> Marsh.	G. C. Bignell.
<i>Corycia temerata</i>	<i>Campoplex pugillator</i> L.	G. C. Bignell.
<i>Mæsia belgiaria</i>	<i>Casinaria claviventris</i> Holmg. ...	G. T. Porritt.
<i>Aspilates citraria</i>	‡ <i>Apanteles fraternus</i> Reinh.	W. H.
		Harwood.
<i>Abraxas grossulariata</i> .	<i>Ichneumon trilineatus</i> Gmel. ...	G. C. Bignell.
	<i>Paniscus cephalotes</i> Holmg.	T. W. Hall.
		G. C. Bignell,
	<i>Casinaria vidua</i> Grav. {	C. Fenn,
		T. W. Hall.
		G. C. Bignell,
	<i>Mesochorus fulgurans</i> Hal. ... {	C. Fenn;
		T. W. Hall.

* From half-grown larva.

† Solitary parasites on *Geometræ*.

‡ Twenty-six parasites from one larva.

HOST.	PARASITE.	By whom bred.	
<i>Abraaxas grossulariata</i> (continued)	<i>Mesochorus sericans</i> Curt.....	G. C. Bignell.	
	<i>Mesochorus aciculatus</i> Bridgm...	G. C. Bignell.	
	* <i>Mesochorus graniger</i> Thoms. ...	G. C. Bignell.	
	<i>Mesochorus fuscicornis</i> Brisch ...	G. C. Bignell.	
	<i>Apanteles glomeratus</i> L.....	G. C. Bignell.	
	<i>Apanteles rubripes</i> Halid.....	G. C. Bignell.	
	<i>Apanteles callidus</i> Halid.	G. C. Bignell.	
	<i>Apanteles limbatus</i> Marsh.	G. C. Bignell.	
	<i>Exorista vulgaris</i> Fallén	G. C. Bignell.	
	<i>Lomaspilis marginata.</i>	<i>Limneria uncinata</i> Grav.....	G. C. Bignell.
<i>Hybernia rupicaprararia</i> ,, <i>leucophæaria.</i> ,, <i>progemmaria</i> †	<i>Campoplex erythrogaster</i> Foerst	G. C. Bignell.	
	<i>Meteorus pulchricornis</i> Wesm...	G. C. Bignell.	
	<i>Apanteles immunis</i> Halid.	G. C. Bignell.	
	† <i>Hemiteles areator</i> Panz.	G. C. Bignell.	
	<i>Casinaria tenuiventris</i> Grav. ...	G. C. Bignell.	
	<i>Limneria erucator</i> Grav.	G. C. Bignell.	
	<i>Limneria bicingulata</i> Grav.	G. C. Bignell.	
	<i>Limneria mæsta</i> Grav.	G. C. Bignell.	
	<i>Limneria clausa</i> Brisch.	G. C. Bignell.	
	<i>Mesochorus semirufus</i> Holmg...	G. C. Bignell.	
	<i>Apanteles formosus</i> Wesm.	G. C. Bignell.	
	<i>Apanteles immunis</i> Halid.....	G. C. Bignell.	
	,, <i>defoliaria</i> ...	<i>Limneria mæsta</i> Grav.	G. C. Bignell.
		<i>Apanteles salebrosus</i> Marsh.....	G. C. Bignell.
		<i>Apanteles solitarius</i> Ratz.....	G. C. Bignell.
<i>Anisopteryx æscularia</i>	<i>Macrocentrus abdominalis</i> Fab...	G. C. Bignell.	
	<i>Agrypon tenuicorne</i> Grav.....	G. C. Bignell.	
	<i>Cymodusa cruentata</i> Grav.	G. C. Bignell.	
	<i>Sagaritis incisa</i> Bridgm.	Mrs. F. Norgate.	
		<i>Meteorus pulchricornis</i> Wesm...	G. C. Bignell.
<i>Cheimatobia brumata.</i>	<i>Limneria crassiuscula</i> Grav.....	G. C. Bignell.	
	<i>Apanteles immunis</i> Halid.....	G. C. Bignell.	
<i>Oporabia dilutata</i>	<i>Meteorus pulchricornis</i> Wesm...	G. C. Bignell.	
	<i>Apanteles salebrosus</i> Marsh.....	J. Hellins.	
	<i>Apanteles immunis</i> Halid.....	W. Buckler.	
<i>Larentia flavicinctata.</i>	<i>Meteorus pulchricornis</i> Wesm. ...	G. C. Bignell.	
	<i>Lissonota anomala</i> Holmg. ...	G. C. Bignell, J. Hellins.	
,, <i>miaria</i>	<i>Apanteles fulvipes</i> Halid.	G. C. Bignell.	
	<i>Microgaster marginatus</i> Nees ...	G. C. Bignell.	

* Hyperparasite on *Exorista vulgaris* (Dipteron).

† Hyperparasite.

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PLATE CVI.

OURAPTERYX SAMBUCARIA.

1, 1 *a*, larvæ after final moult; 1, on ivy, 12th May, 1860; 1 *a*, on larch, 6th June, moth emerged 6th July, 1868.

EPIONE VESPERTARIA.

2, larva after final moult; on weeping willow, 20th June, 1861.

EPIONE APICIARIA.

3, 3 *a*, larvæ after final moult; on willow, 22nd June, 1861; and on willow, June 8th, imago July 4th, 1861.

EPIONE ADVENARIA.

4, 4 *a*, larvæ after final moult; on bilberry, willow, and wild rose, July 29th, 1861, and July 12th, 1862.

RUMIA CRATÆGATA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ after final moult; figured May 6th, 1860.

VENILIA MACULATA.

6, 6 *a*, larvæ after final moult; 6 *b*, enlargement of portion of larva; on red dead-nettle, July 11th, 1859, imago appearing 30th May, 1860; two larvæ on wood-sage, 24th July, 1872, ♂ and ♀ imagos appearing May 13th and 17th, 1873.

See p. 1.

ANGERONA PRUNARIA.

7, 7 *a*, 7 *b*, larvæ after final moult; on blackthorn June 8th, imago June 25th, 1861; from eggs on birch, after hibernation on willow and birch, May 2nd, 1867; May 9th, 1867; imago June 14th to 24th, 1867.

METROCAMPA MARGARITATA.

8, 8 *a*, 8 *b*, larvæ after final moult; on sloe and oak, May 14th and 18th, 1861; on beech and oak, May 23rd, 1872.

See pp. 1—3.

PLATE CVII.

ELLOPIA FASCIARIA.

1, 1 *a*, larvæ after final moult, on Scotch fir, May 1st, 1861, and May 19th, 1866.

EURYMENE DOLOBRARIA.

2, 2 *a*, 2 *b*, larvæ in various stages of growth ; September 19th, 1860, on sallow ; imago June 9th, 1861 ; on oak, July 24th, 1861, and August 24th, 1868.

See pp. 3—4.

PERICALLIA SYRINGARIA.

3, 3 *a*, 3 *b*, larvæ in various stages ; April 25th, 1860 ; on privet, May 7th, 1862 ; also another (not figured) on honeysuckle, May 6th ; pupa, May 26th.

SELENIA ILLUNARIA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages of growth ; on plum, May 19th, 1860 ; imago, June 29th, 1860 ; second brood, March 1861 ; one larva on dogwood, sloe, bramble, September 21st, 1861 ; imago March 1st, 1862.

SELENIA LUNARIA.

5, 5 *a*, 5 *b*, larvæ after final moult ; on oak, August 11th, 1862 ; imago, April 1st, 1863 ; one on birch, July 29th, 1865 ; ♀ imago, May 31st, 1866.

SELENIA ILLUSTRARIA.

6, 6 *a*, 6 *b*, larvæ in various stages ; on birch, July 18th, 1860 ; second brood, October 26th, 1860 ; on birch, June 15th, 1868.



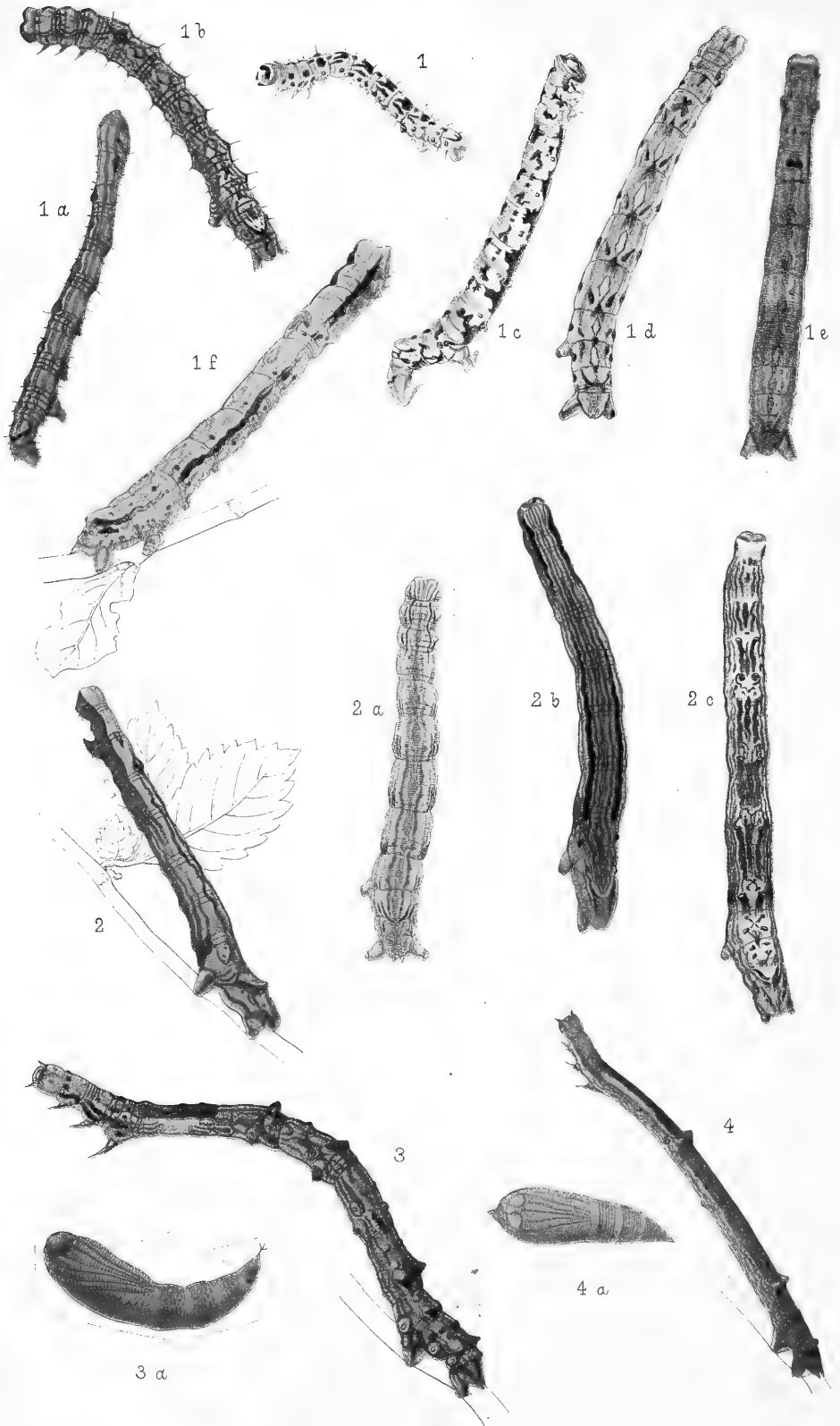


PLATE CVIII.

ODONTOPERA BIDENTATA.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, 1 *e*, 1 *f*, larvæ in various stages of growth; 1, on lichen, September 21st, 1871; 1 *a*, on broom, September 3rd, 1871; 1 *b*, on larch, October 22nd, 1868; 1 *c*, on plum, August 19th, 1874; 1 *d*, on oak, September 6th, 1861; imago, May 14th, 1862; 1 *e* or 1 *f*, on willow, September 9th, 1859; imago, May 26th, 1860.

CROCALLIS ELINGUARIA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ in various stages; on elm, May 19th, 1860; on willow, May 10th, 1862; imago, July 18th, 1862; 2 *b* and 2 *c*, on hawthorn, May 11th, 1865.

ENNOMOS ALNIARIA.

3, larva after final moult, 3 *a*, pupa; reared from the egg on birch and willow, July 21st; pupa, August 1st; imago, August 21st, 1860.

ENNOMOS TILIARIA.

4, larva after final moult, 4 *a*, pupa; on birch and willow, July 24th, ♂ imago, September 4th, 1866; several imagos, July 16th to 31st, 1867.

See pp. 4—5.

PLATE CIX.

ENNOMOS FUSCANTARIA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ in various stages, 1 *d*, pupa ; on ash, July 23rd and 26th, 1864 ; July 20th, pupa July 28th, imago August 22nd, 1866.

See pp. 5—6.

ENNOMOS EROSARIA.

2, 2 *a*, larvæ after final moult ; on oak, July 8th, 1861, and July 21st, 1866.

ENNOMOS ANGULARIA.

3, 3 *a*, 3 *b*, larva after final moult, 3 *c*, pupa ; on oak, May 30th, 1862 ; on birch, July 10th, 1862 ; imago, August 10th, 1862 ; and on birch, June 6th, pupa June 26th, imago July 8th, 1866.

HIMERA PENNARIA.

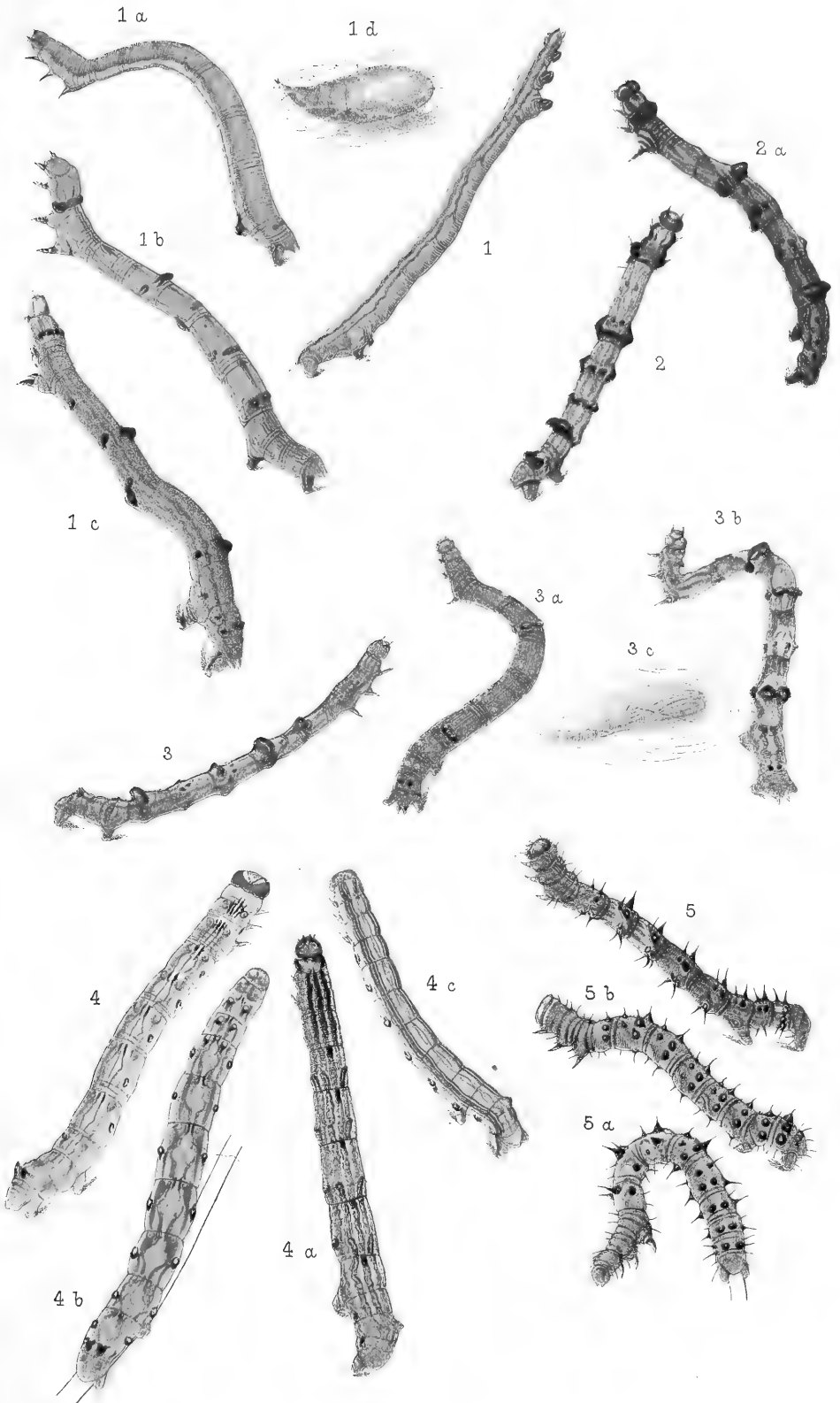
4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages ; on oak, May 26th, 1860, June 3rd, 1861 ; one on willow, May 23rd, 1861 ; one on willow, May 28th, 1862 ; imago, October 27th, 1862.

See pp. 7—9.

PHIGALIA PILOSARIA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ after final moult ; 5, on hawthorn, May 23rd, 1872 ; 5 *b*, on oak, June 7th, 1863 ; imago, January 31st, 1864 ; on oak and birch, June 30th, 1860 ; imago, March 11th, 1861 ; one on elm, June 7th, 1863.

See pp. 9—10.



A.J. Wendel lith.

W. BUCKLER del.

P.W.M. Trap imp.

PLATE CX.

NYSSIA ZONARIA.

1, 1 *a*, 1 *b*, larvæ in various stages ; on yarrow, July 6th, 1860 ; and on knot-grass, June 18th and 22nd, 1867.

NYSSIA HISPIDARIA.

2, 2 *a*, 2 *b*, larvæ after final moult ; on oak, May 20th and June 1st, 1866 ; 2 *b*, June 8th, 1864.

See pp. 10—11.

BISTON HIRTARIA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages ; on lime, June 30th, 1860 ; on sallow, July 23rd, 1864 ; imago, April 21st, 1865.

AMPHIDASIS PRODROMARIA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ after final moult ; 4, June 30th, 1859 ; imago, March 18th, 1860 ; 4 *a*, July 6th, 1874 ; 4 *b*, June 19th, 1860 ; imago, February 16th, 1861 ; 4 *c*, pale variety on garden currant bush, July 12th, 1861 ; ♀ imago, paler than usual, April 9th, 1862.

AMPHIDASIS BETULARIA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages ; 5, August 6th, on plum, young ; 5 *a*, on oak, August 31st, 1859 ; imago, June 23rd, 1860 ; 5 *b*, September 9th, 1860, from Rev. John Hellins ; 5 *c*, August 26th, 1859, the same individual as 5 at a later stage, fed on apple, plum, and sloe ; imago, June 18th, 1860.



A.J.Wendel lith.

W. BUCKLER del.

PWM Trap imp.



A.J.Wendel lith.

P.W.M. Tray imp.

PLATE CXI.

HEMEROPHILA ABRUPTARIA.

1, 1 *a*, 1 *b*, larvæ in various stages of growth ; on lilac, August 8th, 1860 ; 1 *a*, on red currant, July 25th and August 9th, 1864 ; imago emerged April 24th, 1865.

CLEORA GLABRARIA.

2, 2 *a*, 2 *b*, larvæ in various stages, 2 *c*, pupa ; on *Usnea barbata*, a shaggy lichen on oak-trunks, June 10th, 14th, 17th, 1875, pupa 28th, imagos July 11th to 21st, 1875 ; 2, from lichen on spruce-fir, May 25th, 1872.

See pp. 16—19.

CLEORA LICHENARIA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages ; on lichens on oak and thorn, June 30th, 1860 ; also on fibrous lichens on apple-trees, April 5th, 1862 ; 3 *b*, on apple-tree lichen, June 26th, 1874 ; 3 *c*, on apple-tree lichen at Leominster, May 23rd, 1867.

BOARMIA REPANDATA.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, larvæ in various stages ; on elm, May 7th, 1860 ; on willow, thorn, bramble, April 15th, 1860 ; imago May 27th to 29th, 1861 ; 4, on heather, May 23rd, imago June 25th, 1874.

BOARMIA RHOMBOIDARIA.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, larvæ in various stages ; on elm, blackthorn, imago June 30th, 1860 ; 5, on broom, May 19th, imago July 5th, 1864 ; 5 *c*, on privet, July 31st, 1862 ; 5 *d*, on ivy, from London, June 19th, 1864.

PLATE CXII.

BOARMIA ABIETARIA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ in various stages, 1 *d*, enlargement of portion of 1 *b*; on birch, May 23rd, full-grown June 12th, 1863; 1 *b*, from eggs on yew, May 1st, full grown, moths June 8th, 21st, 1877; 1 *a*, copied from Mr. Standish.

See pp. 20—24.

BOARMIA CINCTARIA.

2, 2 *a*, larvæ after final moult; on birch, July 1st, 1863, imago April 27th to May 10th, 1864; July 3rd, 1876, reared from eggs on birch; imago April 25th to May 22nd, 1877.

See pp. 24—27.

BOARMIA ROBORARIA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, larvæ in various stages; 3 *d*, on oak, May 14th, ♀ imago July 10th, 1869; also May 9th, 29th, June 3rd, imagos July 1st to 11th, 1871.

See pp. 27—32.

BOARMIA CONSORTARIA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages; on oak, July 20th, 1861, and August 12th, 1870; imago May 25th to 31st, 1871; 4 *a*, on birch, July 22nd, 1871.

See pp. 32—34.



A.J.Wendell lith.

P.W.M. Trap imp.

W.BUCKLER del.



A.J.Wendel lith.

F.W.M. Trap imp.

W.BUCKLER del.

PLATE CXIII.

TEPHROSIA CONSONARIA.

1, 1 *a*, 1 *b*, larvæ in various stages ; on birch, July 10th, 1862, and July 16th, 1871

See pp. 34—35.

TEPHROSIA CREPUSCULARIA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ in various stages ; 2, on willow, August 19th, 1861, imago March 14th, 1862 ; 2 *a*, on birch, June 8th, 1861 ; 2 *c*, five on larch, July 9th, 1867 ; 2 *b*, copied from Mr. Standish.

See pp. 35—37.

TEPHROSIA LARICARIA (BIUNDULARIA).

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, larvæ in various stages ; on larch, July 16th, 1859, July 6th, 1871, and May 23rd, 1863 ; 3 *c*, on birch, Henry Doubleday, July 9th, 1867 ; 3 *d*, July 3rd, 1877.

See pp. 37—38.

TEPHROSIA EXTERSARIA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages ; on oak and birch, August 7th, 1862, and August 10th, 1867 ; and on willow, August 24th, 1861.

See pp. 38—42.

TEPHROSIA PUNCTULATA.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, larvæ in various stages ; on birch, reared from eggs, June 28th and 29th, 1871, and July 16th, 1877 ; moth bred May 4th, 1878.

See pp. 42—43.



PLATE CXIV.

GNOPHOS OBSCURATA.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ in various stages of growth, 1 *e*, enlargement of portion of 1 *d*; on chickweed, February 15th, 1862; one ate buds of hawthorn, March 28th, 1862; imago emerged August 8th and 9th, 1862; 1 *d*, 1 *e*, on ribwort plantain from Cockermouth, April 10th and 22nd, imago August, 1862; 1 *c*, April 9th, on *Potentilla fragari- astrum*, imago out July 21st, 1868; another April 25th, moth out July 22nd, 1868; var. *pullata* on chickweed, May 3rd, 1860.

See pp. 43—45.

DASYDIA OBFUSCATA.

2, 2 *a*, 2 *b*, larvæ after final moult; on heather, June 18th, 1869; imago out July 24th, 1869; on heather and knot-grass, June 13th, 1870.

See pp. 45—47.

PSEUDOTERPNA CYTISARIA.

3, 3 *a*, 3 *b*, larvæ after final moult; 3, May 22nd, imago June 24th to July 11th, 1865; 3 *a*, on tops of furze, June 22nd, 1877; 3 *b*, on broom, May 19th, imago June 29th, 1864.

GEOMETRA PAPILIONARIA.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, larvæ in various stages of growth; on birch June 5th, 1860, and May 6th, 1868; 4 *d*, June 3rd, moth June 29th, 1868; 4, figured previous to hybernation, September 1st, 1865.

NEMORIA VIRIDATA.

5, 5 *a*, larvæ after final moult; on hawthorn tops from eggs, July 30th to end of August, 1864; imago emerged June 15th, 1865.

See pp. 52—53.

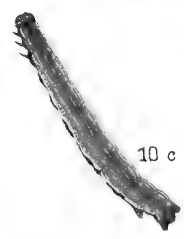
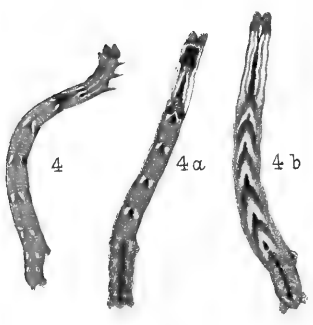
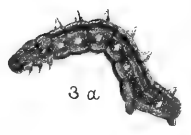
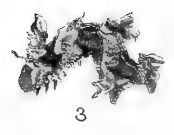
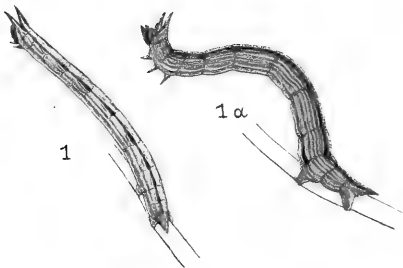


PLATE CXV.

IODIS VERNARIA.

1, 1 *a*, larvæ after final moult; on wild clematis, May 25th and June 12th; imago July 15th, 1863.

See pp. 53—55.

IODIS LACTEARIA.

2, larva after final moult; on willow, August 24th, 1860; imago emerged 28th May, 1861.

PHORODESMA BAJULARIA.

3, 3 *a*, larvæ after final moult, clothed and with its clothing pulled off; on tender leaves of oak, August 22nd, 1865; imago emerged September 19th, 1865; the remainder of the brood hibernated small in the larval state.

See pp. 56—59.

HEMITHEA THYMIARIA.

4, 4 *a*, 4 *b*, larvæ after final moult; on oak, 6th June, 1860, and June 18th, 1866; imago emerged July 11th, 1866.

EPHYRA PORATA.

5, 5 *a*, larvæ after final moult; on oak, July 4th, 1859; also 22nd September, 1866; pupa October 13th, 1866.

EPHYRA PUNCTARIA.

6, 6 *a*, larvæ after final moult; on oak, 6th July, 1861.

See pp. 62—63.

EPHYRA TRILINEARIA.

7, 7 *a*, 7 *b*, larvæ in various stages; on beech, 19th July, 1862; also 5th August, 1875; imago June 7th, 1876.

PLATE CXV—*continued*.

EPHYRA OMICRONARIA.

8, 8 *a*, larvæ after final moult; on maple, 18th July, 1866; imago emerged 26th May, 1867.

See pp. 63—64.

EPHYRA ORBICULARIA.

9, 9 *a*, 9 *b*, larvæ after final moult; on small round-leaved willow, 20th June, 1861; on willow, 10th and 11th September, 1875; imago emerged 20th June, 1876.

See pp. 65—66.

EPHYRA PENDULARIA.

10, 10 *a*, 10 *b*, 10 *c*, larvæ in various stages; on birch, 10th July, 1862.

See pp. 66—67.



PLATE CXVI.

HYRIA AURORARIA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ in various stages; on knot-grass, 7th August, 1865; and after hybernation, 18th May, 1866; pale varieties on knot-grass, 11th May, imago 6th July, 1867.

See pp. 67—71.

ASTHENA LUTEATA.

2, larva after final moult; on maple, 3rd October, 1860; also 24th August, 1861.

ASTHENA CANDIDATA.

3, 3 *a*, 3 *b*, larvæ in various stages; on hazel, 18th July, 1861; imago emerged 13th April, 1862; July 9th, 1870; on birch, 14th August, 1872, imago 28th May, 1873.

See pp. 71—72.

ASTHENA SYLVATA.

4, 4 *a*, larvæ after final moult; on alder, July 17th, 1874; also 4th and 9th September, 1875; moth bred 25th June, 1876.

See pp. 72—75.

ASTHENA BLOMERI.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, 5 *e*, larvæ in various stages of growth; on wych elm, 27th September to 3rd October, 1873; imago 28th June, 1874; 17th August, 1874, reared from the egg.

See pp. 75—79.

EUPISTERIA HEPARATA.

6, 6 *a*, 6 *b*, 6 *c*, larvæ in various stages; on alder, 11th July, 1866; imago 3rd July, 1867; 16th September, 1870; 29th July, 1872; imago 27th May, 1873.

See pp. 79—80.

VENUSIA CAMBRICA.

7, 7 *a*, 7 *b*, larvæ after final moult; on mountain ash, 11th August and 18th September, 1863.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



A.J.Wendel lith.

P.W.M.Trap imp.

W.BUCKLER *del.*

PLATE CXVII.

ACIDALIA RUBRICATA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after final moult; reared from eggs and preferred knot-grass; figured April 26th and May 9th; imago emerged June 22nd, 1865; on knot-grass May 6th, 12th, and June 8th, 1874.

See pp. 86—89.

ACIDALIA SCUTULATA.

2, 2 *a*, 2 *b*, larvæ after final moult; on knot-grass, April 22nd, 1865; also April 23rd, 1868; imago emerged June 11th, 1868; on *Potentilla fragariastrum*; and on hawthorn, April 15th, 1874.

See pp. 90—91.

ACIDALIA BISETATA.

3, 3 *a*, larvæ after final moult; 3 *b*, 3 *c*, enlarged details of segments; on dandelion, April 4th and 14th, and May 23rd, 1868; imagos appeared June 10th to 22nd, 1868.

See pp. 91—92.

ACIDALIA TRIGEMINATA.

4, 4 *a*, larvæ after final moult; 4 *b*, enlarged details of segment; on knot-grass July 16th, imago emerging August 13th, 1870; five on ivy and low plants, March 3rd, moths out May 28th to June 3rd, 1876.

See pp. 92—94.

ACIDALIA CONTIGUARIA.

5, 5 *a*, 5 *b*, larvæ in various stages; 5 *c*, enlarged details of segment; on heath and *Empetrum nigrum*, April 4th to 20th, imago emerging July 5th, 1866.

See pp. 94—95.

PLATE CXVII—*continued.*

ACIDALIA RUSTICATA.

6, larva; 6 *a*, enlarged detail of segment; on lilac and ivy, September 13th, 1865; after hibernation ate old dry bramble leaves; imagos emerged July 8th to 20th, 1866.

See pp. 95—97.

ACIDALIA OSSEATA.

7, 7 *a*, larvæ in various stages; 7 *b*, 7 *c*, enlarged details of segments; 7, 7 *b*, *A. osseata*, on dandelion, April 3rd, 1861; 7 *a*, 7 *c*, *A. interjectaria*, on dandelion, April 13th, moth out June 26th, 1868.

See pp. 97—99.

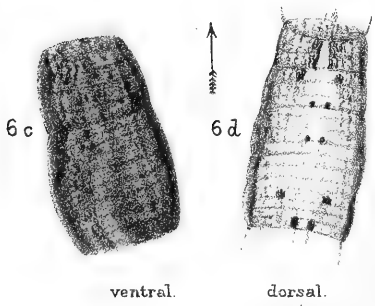
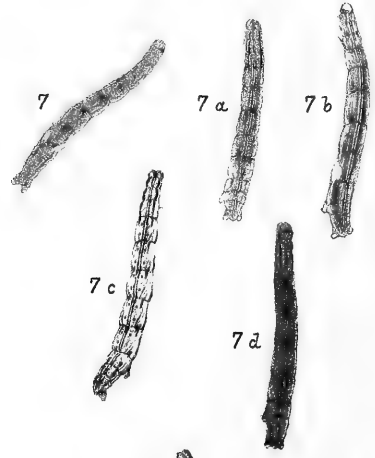
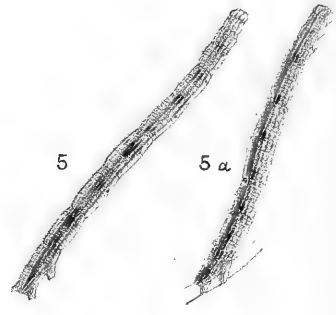
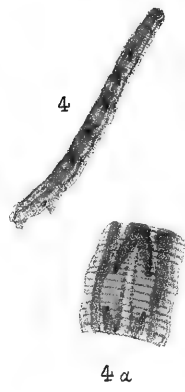
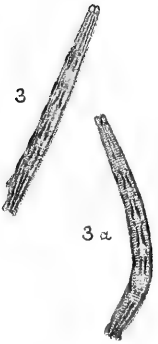
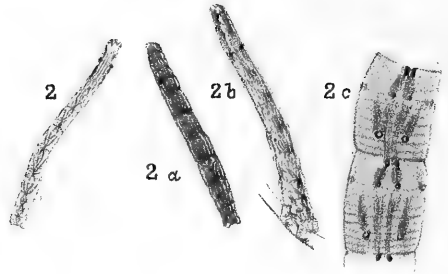
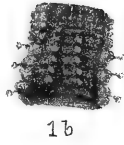


PLATE CXVIII.

ACIDALIA HOLOSERICEATA.

1, 1 *a*, larvæ in various stages; 1 *b*, enlarged details of segments; on *Helianthemum vulgare*, March 31st and April 13th, imagos appearing June 9th and 11th, 1868.

See pp. 99—101.

ACIDALIA VIRGULARIA.

2, 2 *a*, 2 *b*, larvæ in various stages; 2 *c*, enlarged details of segment; on dandelion, imago appearing October 11th, 1859; September 10th, 1872, imagos out September 26th to October 2nd, 1872; 2 *b*, on knot-grass, June 12th; imago out July 16th, 1869.

See pp. 101—106.

ACIDALIA CIRCELLATA.

3, 3 *a*, larvæ after final moult; on knot-grass, August 7th, imago appearing September 14th, 1865.

See pp. 106—107.

ACIDALIA ORNATA.

4, larva after final moult; 4 *a*, enlarged details of segment; on wild thyme and mint, August 3rd, 1865; bred by Rev. Joseph Greene, September, 1865.

See pp. 107—108.

ACIDALIA INCANATA.

5, 5 *a*, larvæ after final moult; on mugwort and yarrow, May 27th, 1864; 5, on sallow, June 29th, imago emerging July 27th, 1866.

See pp. 108—110.

PLATE CXVIII—*continued*.

ACIDALIA MARGINEPUNCTATA.

6, 6 *a*, 6 *b*, larvæ after final moult; 6 *c*, ventral aspect, 6 *d*, dorsal aspect, enlarged details of segments; from eggs in 1873, on knot-grass, bramble, etc., June 6th, 15th, 16th, 22nd, and 29th, 1874; imagos emerged July 27th to August 5th, 1874.

See pp. 110—114.

ACIDALIA SUBSERICEATA.

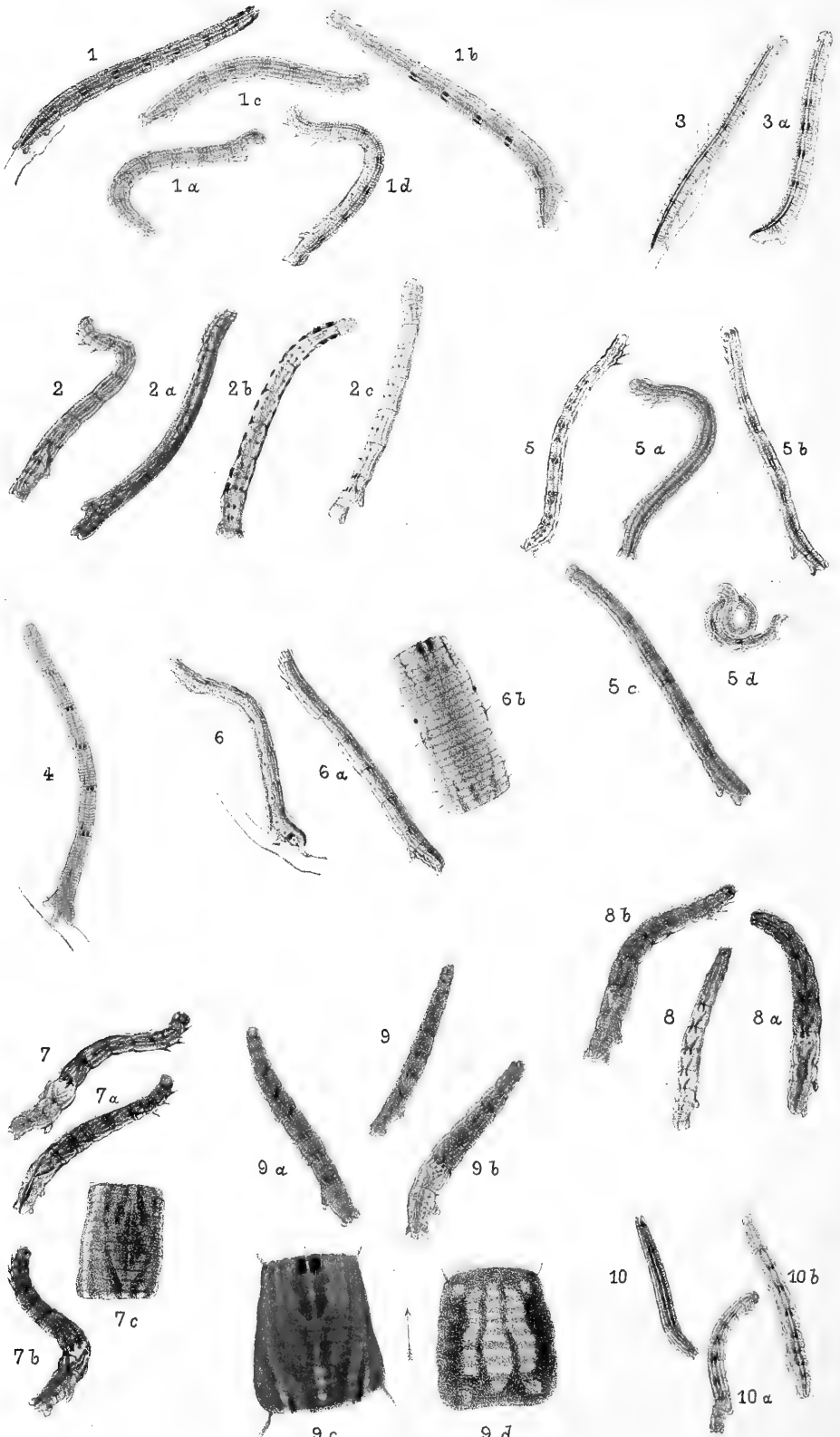
7, 7 *a*, 7 *b*, 7 *c*, 7 *d*, 7 *e*, 7 *f*, larvæ in various stages; on dandelion, October 9th, 1862; young and full grown, April 18th, 1863; 7 *a*, before hybernation, October 26th, 1865; 7 *b*, after hybernation, May 15th, 1866; imago emerged July 5th, 1866; 7 *c*, 7 *d*, 7 *e*, 7 *f*, four of six larvæ on knot-grass, August 18th to September 4th, 1866.

See pp. 114—115.

ACIDALIA MANCUNIATA.

8, larva after final moult; on *Polygonum aviculare*, July 15th, 1865; imago out August 9th, 1865.

See pp. 115—118.



AJWendel lith.

dorsal.

ventral.

P.W.M.Trap imp.

W.BUCKLER del.

PLATE CXIX.

ACIDALIA IMMUTATA.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ in various stages; on knot-grass and groundsel, May 11th, 1864; imago emerged June 18th, 1864; September 5th, moths out 11th and 17th, 1868; four on hawthorn, May 27th and 28th, imagos out July 7th, 1873.

See pp. 118—120.

ACIDALIA REMUTATA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after final moult; on willow, September 10th, 1860; and on willow, September 1st, 1865.

See pp. 120—121.

ACIDALIA FUMATA.

3, 3 *a*, larvæ after final moult; on whortleberry, (the natural food); on chickweed, April 5th, 1861; on knot-grass and wild strawberry, May 4th, 1867.

ACIDALIA STRIGILATA.

4, larva after final moult; on *Potentilla reptans*, May 26th; imago appeared July 6th, 1860.

See pp. 121—122.

ACIDALIA IMITARIA.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, larvæ in various stages; on groundsel; on knot-grass, June 15th, 1868; May 26th, 1864; imago out June 8th, 1864; 5 *b*, 5 *d*, from clematis, but chose knot-grass, May 10th, imago appearing July 9th, 1871.

See pp. 122—123.

PLATE CXIX—*continued.*

ACIDALIA EMUTARIA.

6, 6 *a*, larvæ after final moult; 6 *b*, enlarged details of segment; May 21st, 1867, on *Polygonum aviculare* and whitethorn blossoms.

See pp. 124—126.

ACIDALIA AVERSATA.

7, 7 *a*, 7 *b*, larvæ after final moult; 7 *c*, enlarged details of segment; on chickweed, April 17th, 1861; on buds of whitethorn, March 25th, 1862; also on knot-grass.

ACIDALIA INORNATA.

8, 8 *a*, 8 *b*, larvæ in various stages; on blackthorn, May 8th, imago appearing June 29th, 1861; on knot-grass, August 18th, 1864; on knot-grass, May 9th, 1865; and on *Viola odorata*, May 12th, imago appearing July 1st, 1870.

ACIDALIA DEGENERARIA.

9, 9 *a*, 9 *b*, larvæ in various stages; 9 *c*, dorsal aspect, and 9 *d*, ventral aspect, enlarged details of markings; from eggs reared on knot-grass up to October 29th, 1871, from thenceforward on bramble, *Veronica polita*, etc., March 14th to May 15th; imagos emerged June 14th to July 14th, 1872.

See pp. 127—130.

ACIDALIA EMARGINATA.

10, 10 *a*, 10 *b*, larvæ in various stages; on bindweed, 1860; June 21st to July 25th, 1864; June 14th, imago out July 7th, 1871.

See pp. 130—132.



A.J.Wendellith.

P.W.M.Trap imp.

PLATE CXX.

BRADYEPETES AMATARIA.

1, 1 *a*, larvæ after final moult; May 5th, 1860, on dock and sorrel; on dock, May 30th, 1864.

CABERA PUSARIA.

2, 2 *a*, 2 *b*, larvæ in various stages; on birch, July 21st, 1862; imago appeared June 13th, 1863.

CABERA EXANTHEMATA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, 3 *f*, 3 *g*, 3 *h*, larvæ in various stages of growth; on willow, October 6th, 1859, and September 17th, 1860; imagos emerged June, 1860 and 1861; August 19th and October 13th, 1861; imagos emerged May 10th and June 25th, 1862; on willow, August 31st, 1863; imago out June 5th, 1864; on alder, September 16th, 1870; imago out June 27th, 1871; 3 *f*, on birch, August 31st, 1870; imago out June 24th, 1871.

See pp. 132—133.

CORYCIA PUNCTATA.

4, 4 *a*, 4 *b*, larvæ after final moult; on small-leaved sloe, July 16th, 1859; July 8th, 1863; imago out May 11th, 1864; August 14th, 1863; imago out May 25th, 1864.

See pp. 133—134.

CORYCIA TAMINATA.

5, 5 *a*, 5 *b*, larvæ in various stages; one reared from egg, on hawthorn, July 11th, 1862; three on wild cherry and hawthorn, July 29th, 1864; imago emerged May 1865.

ALEUCIS PICTARIA.

6, 6 *a*, 6 *b*, larvæ in various stages; on blackthorn, June 24th, 1864; on stunted sloe, June 16th, 1869; imago emerged April 12th, 1870.

PLATE CXXI.

AVENTIA FLEXULA.

1, 1 *a*, larvæ in various stages; 1, on feathery lichens on thorn, May 7th, 1868; a larva not figured on soft lichens of hawthorn, cherry, etc., May 12th, 1869; 1 *a*, on lichens on yew, May 25th, 1871; imago emerged June 21st, 1871.

See pp. 134—137.

MACARIA ALTERNATA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after final moult; on blackthorn, September 4th, 1860, and July 31st, 1861.

MACARIA NOTATA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; on narrow-leaved sloe, July 18th, 1861; and on birch, July 21st, 1862.

MACARIA LITURATA.

4, 4 *a*, 4 *b*, larvæ in various stages of growth; on Scotch fir, August 8th and 18th, 1863, and September 8th, 1864; imago emerged May 12th, 1864.

HALIA WAVARIA.

5, 5 *a*, larvæ after final moult; on gooseberry, May 12th, and on currant, July 26th, 1862; imago July 1st to August 31st, 1862.

STRENIA CLATHRATA.

6, larva after final moult; on white clover, August 8th, 1867; imagos emerged May 20th to 24th, 1868.

See pp. 137—138.

LOZOGRAMMA PETRARIA.

7, 7 *a*, 7 *b*, larvæ after final moult; on fern (*Pteris aquilina*), June 18th to 29th, 1864; imago emerged April and May, 1865.

See pp. 138—139.





PLATE CXXII.

NUMERIA PULVERARIA.

1, 1 *a*, 1 *b*, larvæ after final moult; on willow, August 5th, 1859, imago June, 1860; on willow, July 13th, 20th, 1874; moths out May 14th, 1875.

MÆSIA BELGIARIA.

2, 2 *a*, larvæ after final moult; on heather, May 2nd, 1861, and May 27th, 1869.

SELIDOSEMA PLUMARIA.

3, larva after final moult; on heath and grass on heaths, May 12th; imago emerged August 5th, 1862.

See pp. 139—140.

FIDONIA ATOMARIA.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, 4 *e*, 4 *f*, larvæ in various stages of growth; on heath and ling, September 21st, 1860, imago emerging May 11th and 31st, 1861; on heather, August 4th to 21st, 1863, imago emerging May 11th to 16th, 1864; from Wicken Fen on *Lythrum salicaria*, August 14th, 1868, imago May 28th, 1869; 4, female; 4 *d*, male.

See pp. 140—141.

FIDONIA PINIARIA.

5, 5 *a*, larvæ after final moult; on *Pinus sylvestris*, October 1st, 1861; and on larch, October 13th, 1866.

FIDONIA BRUNNEATA.

6, larva after final moult; on whortleberry, April 28th, 1868.

See pp. 141—143.

FIDONIA LIMBARIA.

7, 7 *a*, larvæ after final moult; on broom, September 22nd, 1866, imago emerging May 26th, 27th, etc., 1867.

PLATE CXXIII.

MINOA EUPHORBIATA.

1, larva after final moult; 1 *a*, details of segment; on *Euphorbia amygdaloides*, July 12th, 1865; imago May 26th, 1866.

SCORIA DEALBATA.

2, 2 *a*, larvæ after final moult; on knot-grass, dock, chickweed, and grass, April 20th and May 9th, 1865.

See pp. 143—144.

STERRHA SACRARIA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, larvæ in various stages of growth; 3 *f*, pupa in cocoon; from eggs laid August 19th, hatched 29th, 1865; fed on *Polygonum aviculare*, September 18th and 19th, 1865; began to spin September 20th, all six in pupa September 30th; moths emerged, one October 15th, two 17th, one 19th, one 25th, and one 28th, 1865; a larva not figured, from a brood of eggs laid by ♀ captured at light, Vale of Neath, Glamorganshire, figured September 17th, 1867; 3 *f*, pupa figured October 5th, 1867.

ASPILATES STRIGILLARIA.

4, 4 *a*, 4 *b*, larvæ in various stages; on ling, broom, heath, and furze blossoms, March 7th to April 5th, 1862.

ASPILATES CITRARIA.

5, 5 *a*, 5 *b*, larvæ in various stages; on knot-grass, July 26th; imago September 1st, 1864; also May 17th, 1866, and July 15th, 1868.

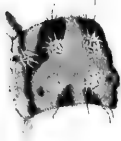
ASPILATES GILVARIA.

6, 6 *a*, larvæ after final moult; on wild thyme, yarrow, knot-grass, *Potentilla reptans*, and *Veronica serpyllifolia*, July 6th to 9th, imago emerging August 19th, 1870.

See pp. 147—150.



1



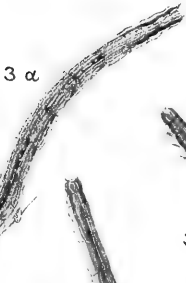
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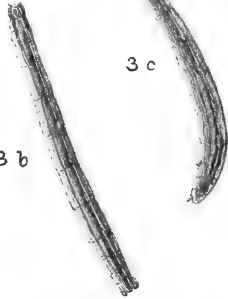
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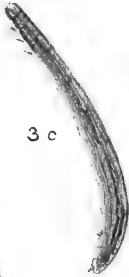
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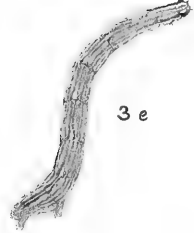
3 b



3 c



3 d



3 e



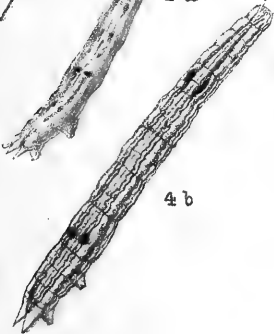
3 f



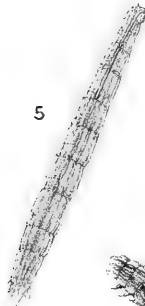
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4 alpha



4 b



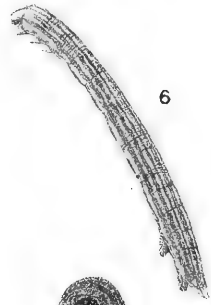
5



5 b



5 a



6



6 alpha



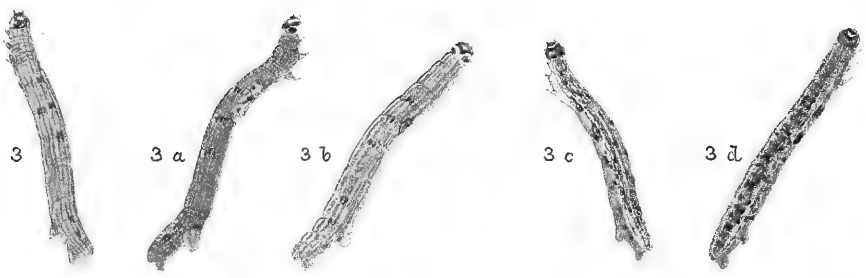
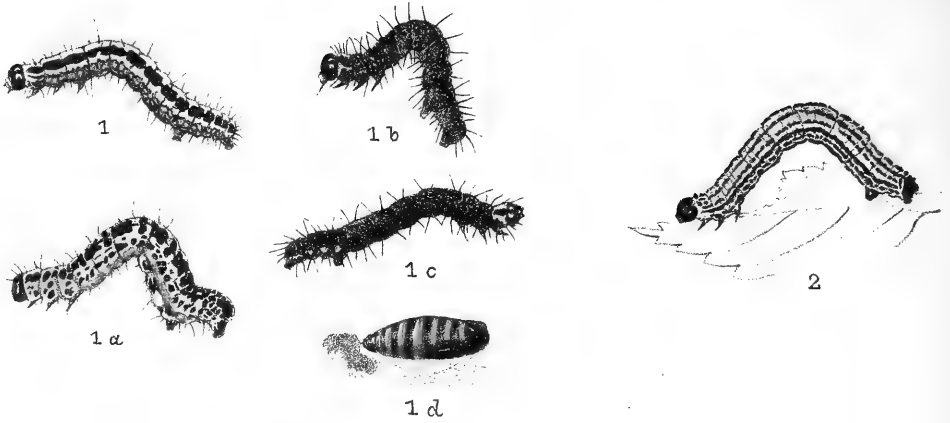


PLATE CXXIV.

ABRAXAS GROSSULARIATA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ in various stages of growth; 1 *d*, pupa; 1, 1 *a*, on currant, May 29th, 1862; 1 *b*, 1 *c*, varieties from Hartlepool, June 7th, bred July 11th to 16th, 1879.

See pp. 150—151.

ABRAXAS ULMATA.

2, larva after final moult; on elm and hazel, August 14th, 1862.

LIGDIA ADUSTATA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, larvæ in various stages; on spindle, August 23rd, 1860; also October 3rd, 1864; 3 *c*, 3 *d*, variety, September 22nd, 1864.

See pp. 151—153.

LOMASPILIS MARGINATA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages; on osier, August 24th, 1867, moth emerging June 11th, 1868; 4, on willow, August 18th, 1859, imago emerging July 1st, 1860; 4 *a* or 4 *b*, September 4th, 1860, imago emerging June 17th, 1861; 4 *c*, on willow, August 14th, 1863.

PACHYCNEMIA HIPPOCASTANARIA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages; on ling, June 27th, 1861; and on heath, July 30th, 1863, and August 15th, 1864; imago emerging April 26th, 1865.

PLATE CXXV.

HYBERNIA RUPICAPRARIA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after final moult; May 25th and June 11th, 1860, on blackthorn and white-thorn, imago emerging January 31st, 1861; on heath and bilberry, May 19th, 1864.

HYBERNIA LEUCOPHÆARIA.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, 2 *e*, larvæ in various stages of growth; on oak; May 20th and June 4th, 1862; May 6th, 1863; and May 24th and 26th, 1864; imago January 28th, 1864.

See pp. 153—155.

HYBERNIA AURANTIARIA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; on oak, birch, and hawthorn, May 10th, 12th, and 13th, imago November 3rd, 1869; and on birch, May 25th, 1861, imago January 3rd, 1862.

See pp. 155—157.

HYBERNIA PROGEMMARIA.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, 4 *e*, larvæ in various stages; on oak and willow, June 8th, 1861, imago March 7th, 1862; 4, 4 *a*, two dark ones on sloe, June 6th, 1862; 4 *e*, pale one on laurel, July 21st, 1863; 4 *d*, on maple and oak, June 6th, 1872; ♀ moth emerged February 5th, 1873.

HYBERNIA DEFOLIARIA.

5, 5 *a*, larvæ after final moult; on oak and birch, June 6th, 1860, and May 30th, 1864; imago emerged November 26th, 1860.



PLATE CXXVI.

ANISOPTERYX ÆSCULARIA.

1, 1 *a*, 1 *b*, larvæ after final moult; 1 *c*, enlarged segment; on sloe and hawthorn, May 22nd, 1861; imago February and March, 1862; one on birch, June 29th, 1861; imago March 15th, 1862; one on oak, June 11th, 1864; imago March 25th, 1865; from eggs on oak, May 25th and 26th, 1877; moths bred, March 14th and 16th, 1878.

See pp. 157—160.

CHEIMATOBIA BRUMATA.

2, 2 *a*, 2 *b*, larvæ in various stages; from eggs in March; fed on elm, blackthorn, and whitethorn, May and June; imagos November, 1859; on willow, June 6th, imagos October 27th and 30th, 1870.

See p. 160.

CHEIMATOBIA BOREATA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages; on birch, from eggs, March 30th, April 17th, 18th, and 25th, 1868; 3 *d*, head and anterior segments, enlarged.

See pp. 160—161.

OPORABIA DILUTATA.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, larvæ in various stages; on blackthorn, May 8th, 1859; imago October, 1859; one on chestnut, May 24th, five on birch, May 25th, 1861, and one on laurel; imagos emerged in October and November, 1861.

See pp. 161—163.

OPORABIA FILIGRAMMARIA.

5, larva after final moult; on willow, April 6th, 1863.

See pp. 163—165.

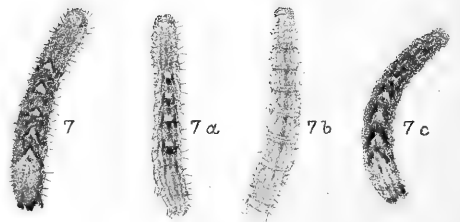
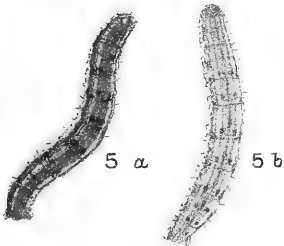
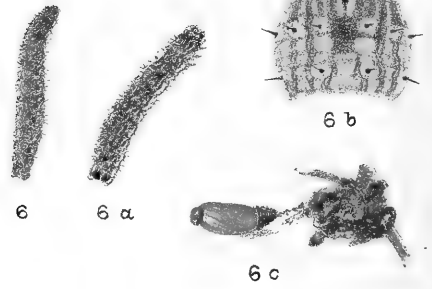
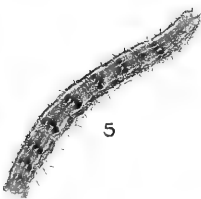
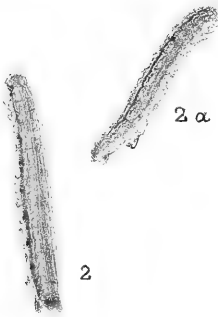
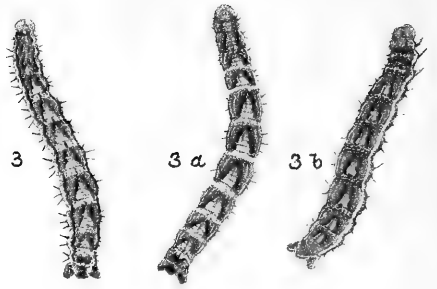
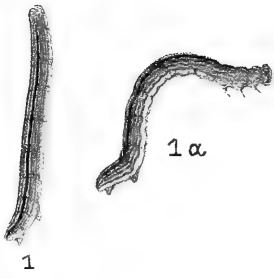


PLATE CXXVII.

LARENTIA DIDYMATA.

1, 1 *a*, larvæ after final moult; on primrose flowers; on heath, May 28th, imago July 17th, 1861; on chervil, May 11th, 1861; on chickweed, April 16th, 1861.

LARENTIA MULTISTRIGARIA.

2, 2 *a*, larvæ after final moult; on *Galium aparine*, June 26th, 1860, and June 8th, 1865.

LARENTIA CÆSIATA.

3, 3 *a*, 3 *b*, larvæ after final moult; on flowers and leaves of heath, April 5th, 1861; on bilberry, May 8th, imago June 12th to 20th, 1863.

See pp. 166—167.

LARENTIA FLAVICINCTATA.

4, 4 *a*, 4 *b*, larvæ after final moult; on yellow mountain saxifrage (*Saxifraga aizoides*), July 25th, 1860; and reared from eggs on *S. hypnoides*, figured March 16th to 25th, 1875.

See pp. 167—169.

LARENTIA SALICARIA.

5, 5 *a*, 5 *b*, larvæ after final moult; on *Galium verum*, July 26th, 1862.

LARENTIA OLIVARIA.

6, 6 *a*, larvæ after final moult; 6 *b*, enlargement of a segment; 6 *c*, pupa; on *Galium mollugo*, March 21st, 1860; three on *G. mollugo*, March 20th, imagos June 28th, August 2nd and 3rd, 1874; 6 *c*, pupa figured May 15th.

See pp. 170—171.

LARENTIA MIARIA.

7, 7 *a*, 7 *b*, 7 *c*, larvæ in various stages; on *Galium mollugo*, September 17th, 1860; two March 20th, 1862; imago May 23rd, 1862; 7 *c*, hibernating, February 4th, 1861.

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