IV. *On the Early Stages of* Albulina pheretes, *a Myrmecophilous Plebeiid blue butterfly.* By T. A. Chapman, M.D.

[Read February 7th, 1912.]

Plates XVIII–XXXVI.

In November 1910 I reported to the Society that the larva of *Latiorina orbitulus* was without the honey-gland so usual in the group of *Lycaenids* to which it belongs, agreeing therein with the larva of *Vaceiniina optilete*. There seemed some reason to suspect that the unrecorded larva of *Albulina pheretes* might be a third species in this section. I determined, therefore, if possible, to learn something of the life history of *A. pheretes*. In this I had some success last summer, and found that *L. pheretes* does possess the larval honey-gland and does not therefore belong to the group of *orbitulus* and *optilete*.

All that was previously known of the larva was told me by Mr. St. Quintin, to the effect that he had seen the imago ovipositing on *Phaca alpina*, and had got the larvae to about their second instar when his supply of the food-plant gave out.

By a slip of the pen Mr. St. Quintin led me somewhat astray in my search for larvae; the plant he meant was not *Phaca alpina*, but *Astragalus alpinus*, known also as *Phaca astragalina*. A search for larvae in June on *Phaca alpina* and on *Phaca frigida* was naturally unavailing, though I found afterwards that *Phaca frigida* at least was welcome to the imago to lay her eggs on.

It was not therefore till well into July that I found a locality where *L. pheretes* occurred sparingly, and obviously in association with a plant that proved to be *Astragalus alpinus*.

I had about the same time obtained some eggs from a butterfly taken in a locality where the *Astragalus* did not grow within a long distance. This specimen laid on *Phaca frigida*, and not unwillingly on *Trifolium pratense*.

In the Heuthal the butterfly was very strictly confined to two patches of the *Astragalus alpinus*, one specimen only being found at a considerable distance amongst *Phaca frigida*. Amongst various plants given to the butterflies

to tempt them to oviposit and by way of flowers for food, they refused to lay except accidentally on any plant but the food-plant (*Astragalus alpinus*), *Phaca frigida* and common red clover. The *Astragalus* was preferred, but clover was well patronised. Except a very few on flowers of the *Astragalus*, all the eggs were laid on the leaves and green petioles of the plants, apparently indifferently as to upper or under surface; but this was of course in confinement.

My attempts to rear the larvae might have had no more success than Mr. St. Quintin's, as the *Astragalus*, though it keeps alive, fails under the ill-usage of being brought to England to provide an adequate supply of pabulum, but that it so happened, that in view of this danger I tried my larvae with clover and various other plants, and found, that though they refused all my other offerings, they took to the leaves of *Colutea arboreseens* quite as readily as to their proper fodder.

I may observe here, that the amyrmecophilous larvae of *V. optilete* and of *C. orbitulus* have eccentric food-plants, Ericaceae and Primulaceae, but that *A. pheretes* is more normal to the group it belongs to in having Papilionaceous food-plants, and is also more normal in possessing a honey-gland.

The egg is about 0·60 mm. wide and 0·30 mm. high, rather flat above and below, the sides almost a semicircle in vertical section, but a little more rounded above than below. The colour is white, modified by green when fresh so far as the bases of the cells of the covering are seen, therefore (when the egg is new) always with a green tone as one looks down the nearest cells. Towards the top the cells are very deep, deeper than wide, and of a very honeycomb aspect, being sometimes arranged hexagonally; in other places they are square, as many as thirty-five together may be found arranged as squares towards the sides, where however they are shallower and the knobs at the angles more prominent.

The cells are about ·025 mm. across, and the white material has a solid look as if carved out of ivory. The depth of the cells is such that in some empty egg-shells the shell proper is eaten away by the escaping larva, beneath a width of several cells, whose walls are left as an open network.

The micropylar area is in a deep hollow, owing to the high walls of the surrounding cells, and is about 0·03 mm. across. The cells are very small, a third of the diameter of the general cells and all nearly round, with no definite "rosette."

Mr. Clark's photographs of the egg and portion including the micropylar area will supplement these notes. Photographs of the egg and similar area in *V. optilete* are added for comparison; the difference in size of the micropylar area is remarkable in two eggs otherwise so similar.

The newly hatched larva is a bare mm. long, of white or faintly straw or ochreous colour, with black head and black hairs—when full grown in this instar is perhaps rather white, but still with faint ochreous tint on the first segment, more definitely ochreous towards the middle segments, and again paler on the posterior ones, but darker than in front—in a few there is a tendency to almost yellowish colouring laterally, but not amounting to a lateral line or band. They eat small mines in the leaves, in the narrow leaves of *Astragalus alpina* they amount to the whole width of the leaflet, but in *Phaca frigida* and *Colutea* the mines are small circles about 1·6 mm. in diameter with a central hole only just large enough to admit the larval head. The measurements suggest that the length of the head and larval neck are together equal to half the diameter of the mine, viz. 0·8 mm. The larva makes a succession of these little mines and never attempts to enlarge one.

In the second instar the larva works in the same way and makes a mine differing only in its larger size and larger entrance opening, the width of the mine may be 3·3 mm. In the third instar mining may occur, but the usual method is to attack the leaf from above or below and eat the whole thickness except the opposite cuticle. The size and shape of these patches is irregular, but are often bounded by the secondary veins of the leaf.

In the second instar the larva reaches a length of 3 mm., and is green in colour, with dark (black ?) hair bases and head, a rather darker green dorsal line. The upper part of the slope pale, as if overshaded with white, in the middle of this the pair of lenticles on each segment are conspicuous, along the middle of the slope is a brownish line, thicker in the middle of each segment, suggesting what is perhaps the case, that it represents the diagonal markings of so many Lycaenid larvae. There is some difference of tint along the lateral region, like a faint superficial brownish wash, but nothing to call a lateral line.

In the third instar the larva is a clear apple green, fairly uniform until a lens is used, when there appears a darker green dorsal line; on the slopes are two diagonal white lines (downwards and backwards) and traces of a third, so that in three following segments the three lines form one. In another specimen, the general tone is ochreous due to the green being largely overlaid by brownish

especially the dorsal line or band and the median line on the slope noted in second instar, which to a great extent breaks up the white diagonal line.

There are a good many larvae intermediate between these two. One for instance has the brown most pronounced on the fourth, fifth and sixth abdominal segments and paler behind and fading to green only on the prothorax ; the pale green forms are, however, the most numerous.

One of these larvae observed feeding presented a rather astonishing and weird object. The larva was absolutely at rest and immovable on a leaf, a little over 4 mm. long and 1·5 mm. broad ; round its prothorax was on the leaf a halo consisting of the pale area of the mine the larva had nearly completed. Through the transparent leaf cuticle was seen the " neck " of the larva stretching from the margin of the prothorax to the black head, the neck looking like a transparent hose. The weird item was to have, in connection with the immobile larva and the apparently structureless and water-like hose, the head, at the end of the latter, and quite at a distance from the larva, moving rapidly to and fro and from side to side, the jaws actively at work devouring the parenchyma and extending the mine. As the latter was nearly completed, the larva left it a minute later. The neck was fully stretched, and the contrast between the robust thickset larva and the structureless neck, flattened to an almost invisible nothing in the mine, and the black active head working strenuously in the most purposeful way with so vague a connection with the larva, was quite uncanny. Notwithstanding the hundreds of mines, I happened to see this curious spectacle only on one occasion, yet it must occur as the normal process in the making of each mine.

In the third instar there is a great variation in colouring, several with the markings most pronounced are shown on Plate XX ; fig. 4 presents the most highly-coloured specimen ; others are simply green, much as in figures of fourth and fifth instar, but with the yellow lateral line still undeveloped. In the second instar a few specimens show traces of the darker markings seen in the third, and in the fourth they are present still more rarely and faintly. The few last instar examples seen showed no trace of dark marking ; they are, however, possibly present in rare instances.

The full-grown larva (described Sept. 10th), 14 mm. at rest, 17 when moving, in length, 4·3 mm. wide from thoracic 3rd to abl. 6th, tapering at each end, usual Lycaenid form, but rather rounded, of the *rutilus* character, rather than angular in cross section. There are no definite dorsal ridges, and the lateral flange is not very marked, but sufficiently to give a transparent margin when seen from above. The colour is a lively apple green with darker dorsal band (dorsal vessel ?). This area is flattened a little (between evanescent rounded dorsal ridges, part of the darkness is due to abundant black hair bases of very short hairs). The whitish oblique streaks are hardly to be made out. On the slopes the hairs are short, dark with black bases. Viewed laterally, there is a yellow lateral line, apparently sunk deep in the tissues, so far from the surface as to be invisible except on a perpendicular view. The head is small, black. A special feature that is not observed in previous stages is that the hair bases, both of the more conspicuous black hairs and of the smaller pale and inconspicuous but more numerous hairs, are white and glistening as if made of glass ; they are nearly globular, with fine radiating spikes. There is a honey-gland with a row of lenticles round it, but sparse, not, as often, crowded ; dimples are also seen outside the last spiracles, indicating position of fans, that have not been seen extended. The hairs are so inconspicuous that, without a lens, one might perhaps think the skin of the larva a little rough, but could hardly say how.

The prothoracic plate is small, depressed, and darkened by rather more numerous dark hairs, or rather, perhaps, that the hair bases are here dark, as they are in only a few other scattered instances.

It is noted on

September 13, that this forward larva has been laid up for pupation since description taken and seems close to change; it is at top of box, but appears to have little or no silken pad and no visible girth. There are also one or two that seem to be possibly forward. The mass have ceased feeding and are divisible into two distinct sets, the majority in third skin, but a small number in fourth, both sets torpid and apparently contemplating hibernation. Some of the third stage examples have been quiet for nearly ten days ; the whole of them now appear to be so.

As I had so few last instar larvae, the following note as another example may be desirable.

September 24.—A larva moulted into last skin three or four days ago, but now refuses to eat, and looks shrunk. It has the glassy stars forming hair bases like the previous ones; these are largely belonging to the less conspicuous

hairs of the slope. The more conspicuous hairs are four or five black ones on the dorsal flanges, *i. e.* on each side of the middle line; some hairs on the lateral flange, pale brownish in colour, are also more conspicuous.

The larva itself is a dirty green (not so bright and lively as the well-fed specimen), with an interrupted darker dorsal line, and a dark line across at each incision (shadow ?). The spiracles are darker points; there is a very marked lateral flange, but no difference in colouring, nor are there any oblique lines, but the cushioned hollows of the slope look slightly darker.

I note on—

October 13.—The majority have gone into hibernation, some in third instar and some in fourth. Some of the third instar have only been laid up during the last few days, but for the most part they became lethargic two or three weeks ago. The fourth instars, on the contrary, have only recently become quiescent, except one or two earlier individuals. There remain one or two of each instar, perhaps feeding, not at any rate laid up. There are also a full-grown larva still feeding, however, 13 mm. when sulking, 15–16 when active, 4·5 mm. broad and 3·5 high (sulking). The segments full and rounded, back flattened but no distinct dorsal flanges, the lateral flange marked, and thrown into greater prominence, by the brilliant line of yellow in it some way below the surface and, therefore, more or less indistinct, except on direct lateral view. There is a dark dorsal line or band; seen at some angles, it has a paler margin. On the slopes are two parallel pale oblique lines on each segment (2nd thor. to 6th and, partially, 7th abl.), sloping downwards and backwards.

The hairs and their bases are hardly visible without a lens. The hairs are very fine and small, longest on dorsal and lateral flanges, ruddy, almost brown, a less long and paler set on middle of slope, the rest very small.

Along the dorsum the hair bases are nearly all black, below this the pale glassy form is abundant.

The glassy bases seem less abundant as the larva gets older. I cannot say whether some of them change and become dark; I suspect not, and that the appearance is perhaps due to examining specimens in different lights.

There is a second specimen in last skin, not quite so large (13 mm.) and duller in colour, possibly has done feeding.

A third specimen, 10 mm. long, also appears to be in last skin.

In fourth instar length appears to be 7–7·5 mm. (before shrinking into quiescence for hibernation).

The only pupa I obtained did not quite fully get rid of the larval skin, and so some of the appendages did not fall properly into place, but it was sufficiently perfect to enable its principal features to be noted. It appears to belong to the Corydon group in having practically no cremaster, and the few silk threads, that can hardly be called a girth or even a pad, break down on the slightest disturbance. This must, of course, be accepted with the caution that my specimen was a weak untimely one, and that the silken work of a robust specimen might be stronger and more purposeful.

The pupa is green, and remains so, apparently, till the imago begins to mature; with only the very conspicuous brown glazed eyes as an exception, these are so coloured from the first. The dorsum carries a number of closely-placed, very short, brownish hairs.

Further details may be gathered from the photographs of portions of the mounted skin (figs. 33 to 38).

I placed various newly-hatched larvae on living plants of *Astragalus*, both indoors and out, but these all came to grief chiefly by the plants dying; I believe the young larvae wandered away (one or two were found) from the plants when they become unpalatable and before they died.

The only partial success was that on—

October 15.—I found a larva of *A. pheretes* on a plant of *Astragalus alpinus* (amongst grass, etc.) that has been out of doors since I put some newly hatched larvae on it, early in August. The larva seemed to be large in third instar, but was not very well seen as it was in a sort of nest of dead leaves of the *Astragalus*, about half an inch to an inch above the soil level, and closed in except on one side; there was no other place affording such a nest on the plant, though hiding places low in the grass were abundant enough.

It suggests itself that this may be a place selected for hibernation, as being far enough from the ground not to be too wet and yet affording sufficient hiding.

P.S.—The results in the Spring may be noted.

February 27.—Found all the larvae that went into

hibernation (some dozens), and were placed in cellar, dead, except five individuals of which two were of those in fourth instar and three those in third. These larvae had left the leaves on which they had laid up and were on muslin and paper in a jar, which was covered with muslin and paper, so that not much change of air probably occurred, and the outer jar contained a small glass of water, so that desiccation could hardly occur. On the other hand, there was hardly any mould anywhere. About a dozen larvae in this jar had died. In other receptacles under different conditions all were dead. These surviving larvae do not seem of any high vitality, and do not seem hopeful. Some opening buds of *Colutea* were, however, found and supplied to them.

March 6.—Found four of the above five larvae had died, but one seemed alive and well. It was put on the plant of *Astragalus* on which a living larva was seen late in the autumn and the plant brought indoors.

March 8.—The larva has taken its station on a very small young shoot of the *Astragalus*, and another larva, probably the one seen last autumn, is resting on the ground close by.

March 11.—The larva wintered indoors is making itself at home and eating a little on the young *Astragalus* shoots. The other larva appears to be dead, though it looked all right a few days ago.

March 26.—The larva looked very sickly for some days, and on 24th actually dropped off its perch, showing that it had made no silken carpet, and it lay on its side on the moss in the flower-pot where I placed it after looking at it and feeling some doubts as to its condition. This morning the empty skin, well distended as before moulting, lay on its side, as I had placed the larva, but the larva had emerged from it and had found some growing material about two inches distant.

March 29.—The larva is now freely eating the half-expanded leaflets of the *Astragalus*. It is 7·5 mm. long, and is much darker than any autumn specimen at this stage, almost as dark as the darkest autumn specimen at any stage; there is a dark dorsal band, then a greenish stripe, followed by the dark lateral oblique bands which dominate the rest of the slope and sides. The whole larva has a brownish-grey effect, with green only on the broad subdorsal band, which is not however continuous, but rather a series of large patches one on each segment. The larva is probably

(this proved to be so) in its last skin, if one may judge (1st) from its being in fourth stage during hibernation, and (2nd) by the density and length of the hairs, which will obviously stand considerable spreading as the larva grows.

April 1.—Is to-day eating down the (young and succulent) petiole instead of merely the leaflets. It is now more distinctly of a dark green colour, with an overlying grey tone, largely due to the hairs and dark hair bases, but also to the dorsal and oblique dark lines.

April 3.—Eleven mm. long, dark green with darker dorsal band and oblique lines, not so marked on second thoracic or seventh abl. segments as between, wanting before and behind these, a pale lateral line, looking like a yellow thread sunk some distance beneath the surface, line of honey-gland well marked, the fans on eighth abdominal are marked by whitish spots. These fans were seen on one occasion extended, a transparent green cylinder, with flat top, rather higher than wide, and with a number of fine hairs on top and just below, of a length about equal to thickness of cylinder. Any spiculation was not observable with a hand lens.

April 9.—Has grown considerably and feeds constantly, having much damaged the plant it is on. It is now 13 mm. long when moving. The yellow lateral line is brighter, and has a slight dark shade along its upper border. It does not look as if sunk so deeply below the surface.

April 10.—Put on *Colutea*, its own plant being practically exhausted, it set to, at once, to eat the leaves in their whole thickness, they are about $\frac{3}{4}$ of an inch long.

April 15.—Has got a good deal thicker, but has for the last two days been lethargic and keeping on the bottom of its jar. It seems desirous of finding a place to pupate, but moss and other provisions made for it do not please it; it now rests on bottom of glass jar.

April 21.—Has remained quite quiescent since last date (15th), the thoracic segments enlarging at the expense of the others, it is entirely without any spinning, nor though it wandered, apparently in search of suitable quarters, did I see it make any attempt at spinning. This afternoon it changed to pupa; it seemed to be a very slow process, lasting from about 3.15 to 4.30 p.m. The newly-changed pupa is quite green, with only a very small black spot for the eyes, less than a quarter of the glazed eye surface.

April 27.—Must have now acquired mature pupal colouring, although the wings are still so transparent that all the tracheae of the neuration are very distinct. The length is 8·5 mm.; the colour is green, rather dark, slightly approaching olive. There is a dark dorsal band down the abdominal segments, which is rather dorsal vessel than actual colouring. There is no trace of the oblique bands, that were quite conspicuous at first, after change, of much the same aspect as the dorsal band, which was then probably like them, persistence of larval colouring, rather than as now apparently structural. The glazed eyes are black, and there is a faint brownish tone about the head. The cast larva skin adheres to the last segment, much as in *corydon* and *thetis*. The waist is marked by a slight dorsal depression, but seen from above the waist does not exist. The width is about 3·8 mm. at third abl. segment, tapering very slightly forwards.

May 4.—The wings are assuming a brownish tone, and the tracheae are becoming obscured, but still visible near the base.

May 10.—The further change yesterday was only some increase of opacity and brownness, but this morning the wings are nearly black.

May 11.—Emerged at 10.25 a.m. and expanded wings rapidly ; a ♀, had no difficulty in leaving the pupa case, though that was quite loose and unattached.

I had at the same time as the *A. pheretes*, ova of *L. orbitulus* and *V. optilete*, and some comparative notes are of interest.

L. orbitulus fed up in a most healthy way on *Soldanella*, so much so as to imperil my stock of the food-plant.

The great mass of them went into hibernation in the third instar, but several went on into the fifth and last, and from this I bred one ♀ specimen, now in Mr. Bethune-Baker's collection.

V. optilete presented a variation in the duration of the egg-state that questions of temperature and climate do not seem to me sufficiently to account for. I sent eggs of *V. optilete* and *L. pheretes* to Mr. Tonge (from Pontresina), and both hatched almost immediately he received them. Of those kept at Pontresina, *L. orbitulus* and *A. pheretes* hatched a week to ten days after being laid, but those of *optilete* did not hatch, and were still unhatched when I returned home, and learned that those sent to Mr.

Tonge had already hatched and died. I therefore thought I must somehow have killed my store of eggs of *V. optilete*. They began, however, to hatch when they had been laid more than fourteen days, being a full week longer as eggs than the other two species, or their own brothers sent to England by post.

The larvae of *V. optilete* fed slowly and steadily and ate *Vaccinium myrtillus* as readily as *V. uliginosum*. They all fed up to third stage and went into hibernation, not one offering to feed up as an autumn specimen. The young larvae do not mine like those of *A. pheretes*, but eat out little pits, between the nervures.

The *A. pheretes* feed up at considerably different rates. A majority elected to hibernate in the third instar, a fair number went on into the fourth instar, and I imagined all these intended to feed up as autumn specimens. Most of them, however, selected to hibernate, and only three or four went forward; these were not very vigorous and only one succeeded in reaching the pupal stage and that not quite healthily. Their doing so, however, enabled me to follow through the life history.

It seems probable that neither of these three species can ever produce an autumn brood naturally; and it is curious that *V. optilete*, the lowest level species, if there be any difference, resisted all temptation to produce an autumn emergence, whilst *orbitulus* did so readily and *pheretes* very sparingly. It is necessary of course to remember the very warm August during which they were reared at Reigate.

It is important to call attention to the circumstance that the larva of *A. pheretes*, hibernates, preferably perhaps in the third instar, but nearly as commonly in the fourth, and it was one of the latter that I successfully hibernated. All other larvae of "Blues" of which I have accurate notes, that hibernate half grown, do so in the third instar, a habit to which *optilete* and *orbitulus* strictly conform.

Explanation of Plates XVIII–XXXVI

Plate XVIII shows the larva in third, fourth and fifth instars. The third and fourth instars differ little except that the dark colouring is more frequently distinct and even pronounced in the third instar. So that the figures of fourth instar would be equally good for the third, only that larvae of different colouring have been selected, only a few

even of the third instar are as well-marked as those figured, which give some idea of its aspect in different individuals.

The last (fifth) stage, differs from the preceding ones by the development of the starlike hair bases. These are colourless and in most lights sparkle like crystals (under a lens, they can hardly be differentiated without) with remarkable effect. One segment enlarged aims at showing their aspect—

Fig. 1, 2, 3, 4 Third stage enlarged × 5 or 6.
5, 6. Fourth stage × 5 or 6.
7, 8. Fifth stage × about 4.
9. One segment, last stage, more enlarged, inverted.

Plate XIX. Fig. 10. Egg, *A. pheretes* × 60.
Fig. 11. Egg, *V. optilete* × 60.

Plate XX. Fig. 12. Portion of egg of *A. pheretes* × 150, showing sculpture and very small micropylar area.
13. Similar portion of egg of *V. optilete* × 150 (same enlargement) showing much larger micropylar area.

Plate XXI. Fig. 14. Skin of first stage larva *A. pheretes* × 48.

Plate XXII. Fig. 15. Skin of second stage larva *A. pheretes* × 40.

Plate XXIII. Fig. 16. Skin of third stage larva *A. pheretes* × 20.

Plate XXIV. Fig. 17. Skin of fourth stage larva *A. pheretes* × 16.

Plate XXV. Fig. 18. Skin of fifth (last) stage larva *A. pheretes* × 13.
This photograph is marred by a few bubbles having got into the preparation.

Plate XXVI. Fig. 19. Prothoracic plate of second stage larva × 100. The filiform hairs are distinct, compared with Fig. 14, though the hairs around are much multiplied, those of the plate are diminished in numbers.
20. Honey-gland of second stage larva, the claspers are seen through the transparent upper skin, just above them is the seventh abdominal spiracle, the honey-gland is in the line joining these × 100.

PLATE XXVII. FIG. 21. Prothoracic plate of third stage larva. The left filiform (angular special) hair is very distinct, the right one is fainter, its base is 20 mm. (about $\frac{3}{4}$ inch) to the right, distinct enough when seen, these show the area of the plate, whose hairs are larger but hardly more numerous than in previous instar × 100.

22. Honey-gland third instar × 100. The gland, hairs, lenticles and skin reticulation are all very distinct.

PLATE XXVIII. FIG. 23. Honey-gland fourth instar × 100.

24. Honey-gland fifth instar × 100.

PLATE XXIX. FIG. 25. Prothoracic plate fifth instar × 100. The bases of filiform hairs are 50 mm. (2 inches) apart, hairs directed forwards. Small hairs with large stellate bases are numerous.

26. Shows character of hairs, a lenticle or two, and especially the skin reticulations and points in last instar × 100.

PLATE XXX. FIG. 27. Spiracular region (left) of the sixth abdominal segment in last instar × 100, shows lenticles numerous near spiracle.

28. Fan area (eighth abdominal segment) last instar × 100, half-way between spiracle and other side of picture.

PLATE XXXI. FIGS. 29 and 30. Spiracular regions of fourth abdominal segment, to show flat oval plates in intersegmental membrane in front, others occur across the dorsum, fifth instar × 100. The large dorsal intermediate area is not shown, these plates represent muscular attachment.

PLATE XXXII. FIG. 31. Head of larva in last instar × 100 shows antennae, jaws, and some other mouth parts × 100.

32. Left prolegs third abdominal segment last instar × 100.

PLATE XXXIII. FIG. 33. Abdominal segments of pupa × 16.

PLATE XXXIV. FIG. 34. Portion of head, with eye and antennal base, of pupa × 100.

35. Cremastral area of pupa × 60. There are a few hairs but no hooks. The genital area, with opening in eighth abdominal segment, extreme right of figure, indicates a ♀ individual.

PLATE XXXV. FIG. 36. Mesothoracic plate of pupa (left side) × 30. The marking off of left hind-wing plate (angular projection down to left) is obvious. Hairs, lenticles, network on thorax, but only reticulations on wing.

37. Fifth abdominal segment (and part of sixth) of pupa on ventral aspect, showing massing of lenticles × 100.

PLATE XXXVI. FIG. 38. A portion of fifth abdominal segment showing structure of lenticles × 400.