DESCRIPTION OF PREPARATORY STAGES OF AGRAULIS
VANILLAE, LINNÆUS.

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EGG—Conoidal, truncated, the top a little arched ; the sides more or less convex, varying ; the height to the breadth as 9 to 7 ; marked by 14 straight ribs, which are compressed and elevated, and run from base to top ; crossed by about 11 striæ, horizontal, rather prominent ; the spaces between the ribs and striæ are quadrangular, the shortest side being with the long axis of the egg ; these spaces are depressed and are either flat or slightly convex ; the summit is covered with rows of cells, concentric, those of the outer two rows large, hexagonal and irregular, of the third row small, hexagonal ; within these are 8 small cells, not depressed, irregularly rhomboidal and forming an eight-rayed star ; in the centre a minute star of six rays. Duration of this stage 4 to 5 days.

YOUNG LARVA—Length .14 inch ; cylindrical, thickest at 4, tapering slightly to 13, the segments well rounded ; color brownish-orange, glossy ; on either side the dorsal line on each segment after 2 is a row of short, conical, pale black tubercles, and two similar rows on either side, forming transverse rows of 6 tubercles, from the top of each of which springs a short black hair ; on 2 is a black dorsal collar, with fine tubercles ; feet brown ; head nearly globular, flattened on lower front face ; color brown ; slightly pilose. Duration of this stage about 2 days.

After First Moulting—Length .24 inch ; same shape ; nearly same color, less brown, more orange ; armed with six longitudinal rows of long, tapering, black spines, at top sub-conic, each ending in a fine, short, black bristle ; a few similar bristles about the spine from base up (for arrangement of the spines, which is uniform in all the succeeding stages, see description of the mature larva) ; on 2 a dark chitinous collar, broken at the dorsal line, and bearing minute hairy tubercles ; feet black ; head obovoid, the sides quite convex, the face flattened, the top depressed, and on each conical vertex a simple black process very similar to the body spines, but less tapering and much shorter, pointed at top and ending with a short fine bristle ; others disposed about it just as with the spines ; a few hairs, long and short, on front face ; color chocolate-brown. To next moult 2 days.

After Second Moulth—Length .3 inch ; color dark (or red-brown) orange, glossy ; between dorsals and first laterals a greenish-brown band, not well defined—rather a discoloration, and about segment 10 fading away ; the spines long, all black and shining, from black tubercles ; those of dorsal rows on 3 and 4 longest, those of first laterals on 2 and 3 nearly as long ; collar on 2 black ; head as at second stage, glossy black ; the vertices rather high, conical ; the processes two thirds as long as the dorsal spines on segment 3, irregularly tapering, slightly bent back, conical at top. Duration of this stage 36 hours.

After Third Moulth—Length .8 inch ; color now dark orange, glossy ; a medio-dorsal stripe of olive-brown ; a broad band of same hue fills the space between dorsals and first laterals from 2 to 13 ; the lower part of body also olive-brown, so that the orange is restricted to the dorsal area and lower part of sides ; in some examples the band is macular, orange showing in it ; head as before, but the vertices higher, and the processes longer and much recurved, resembling horns ; face black on front, behind the head orange, but from base of each horn a black stripe passes down the back of the head ; on the front are five minute orange spots, one at base of each horn, and three in a cross row below. Duration of this stage 36 to 40 hours.

After Fourth Moulth—Length .95 inch ; color red-orange, the medio-dorsal stripe greenish, the lateral band pale black, and broadened, so as to come to the outer sides of the tubercles of the two rows ; the base same color as the band ; the orange restricted to a narrow band running with the spiracles. Twenty-four hours after this moulth the length was 1.2 inch, and one day after this was 1.5 inch.

MATURE LARVA—Length 1.5 inch, greatest breadth .24 inch ; cylindrical, thickest at segments 3 to 5, tapering to 13 very gradually ; furnished with six rows of long, tapering black spines, bluntly conical at top, from which springs a short and fine black bristle ; a few similar bristles irregularly placed about each spine from base to top ; two of these rows are subdorsal, and on middle of either side is one, and one below spiracles ; the dorsals extend from 3 to 13, the first laterals from 2 to 12 ; the lower laterals from 6 to 13 ; over the feet on each side of 2, 3, 4 is a black tubercle with hairs ; the spines of dorsal rows on the anterior segments are longest, measuring .16 inch ; the first laterals are quite uniformly .11

inch, and the second laterals .9 inch; color red-orange, with a broad medio-dorsal band of greenish-black, and a broad, slate-black band which occupies the space between the dorsals and first laterals, and reaches to the farther sides of and embraces the tubercles of these rows; the base of body slate-black, so that the orange is restricted on dorsum to two narrow stripes lying between the dorsal and the two lateral bands, and to another stripe running with the spiracles (these bands widened much after the moult and as this stage proceeded), the whole upper surface highly glazed; feet and legs black; head obovoid, deeply cleft, with high conical vertices, on each of which stands a stout spinous recurved process, .15 inch long, black, in all respects formed like the body spines, except that it is less tapering, the upper two thirds being of about uniform size; the tip conical and giving out a short fine bristle; a few other like bristles about the sides; sides and back of head rounded, but the front much flattened; sparsely pilose; color of front black, with two vertical orange stripes, one on either side of and very near the suture; color of hind head, between the horns and down the sides greenish-yellow, the lower part of the side black; also a black stripe runs back from base of the horn. There was some variation in color at maturity; some larvæ had a gray line or stripe below spiracles; on one this line was white and extended the whole length, in another it disappeared at 5; the color of the dark band on upper part of side was greenish-black, or slate-black, varying with the point of view. From fourth moult to suspension 59 to 72 hours; from suspension to chrysalis 13 to 15 hours.

CHRYsalis—Length 1.05 in.; depth from dorsal to ventral side .34 in.; breadth at base of wings .26 in.; breadth across abdomen .2 inch; long, slender, the thorax much compressed laterally, and the wing cases very prominent, forming a narrow carinated hunch, which rounds abruptly on posterior end; head case high, cylindrical, compressed transversely, the top sloping on the ventral side at about 45° ; on each vertex a short (.05 in. long) ear-like process, excavated on the dorsal side, and crenated at the top; between these the top of head is twice incurved; at the base of head case, on dorsal side, a depression; the mesonotum large, prominent, compressed, carinated, followed posteriorly by a deep and broad depression; wing cases smooth, a little flaring at base, depressed in middle; abdomen slender and tapering; a row of minute medio-dorsal tubercles, and on either side of these a row of large, rounded ones, those of the

anterior segments largest of all, and compressed laterally; colors very variable; some examples are buff with greenish markings, or on the abdomen greenish-brown; the head and wing cases buff, the former with a slight red tint; on the depression at base of head case is a patch of clear pale pink on either side the dorsal line, and between, as also at the outer edges of these patches, is a little black; top of head case pink and black, the processes dark brown at top and on dorsal side; mesonotum buff mottled green, as is the dorsal side of abdomen; wing cases buff, with a greenish patch on middle and a stripe running with one of the interspaces of the wing next margin; on side of abdomen a reddish-buff stripe and below this a broad greenish-brown band; on ventral side a clear pink patch from end of wings down. Some were very black, the wing cases and anterior parts mottled in light and dark black; some had the wing cases, mesonotum and head case pink tinted, mottled all over with greenish-black; the ventral edges of wing cases clear pink-buff; in all examples the two pink spots at base of head case and the stripe on abdomen appear, and in all there is a black angular inscription like figure 3 or like V, on the ventral side of the wing case about one-third the distance from base to end.

On 24th June, 1879, I received from Mr. Jacob Boll, Dallas, Texas, several larvæ of *Vanillae*, some of which had hatched en route, others in stages up to near third moult, and feeding on *Passiflora*. These larvæ passed their changes with great rapidity. Eggs laid 19th June hatched 22nd or 23rd; larvæ passed first moult 25th, second moult 27th, third 29th, fourth 1st July, pupated 5th, and the imago appeared 12th July. So that the whole round in one case was 23 days. In another but 21, the time between the moults from first to fourth being 40, 42 and 59 hours. I had *Passiflora* growing near by, so that food was plenty and the weather was hot, and these changes proceeded as they might have done in the tropics. The only species of butterfly which I have known to pass its stages so rapidly has been *D. Archippus* of the midsummer brood. The larvæ of *Vanillae* have six rows of spines, longer and slenderer than in *Argynnis*, and the bristles which surround them are much shorter and finer than in *Argynnis*. And the head spines are of same character as those of the body. When ready to suspend, the larva spins a button of white silk, and hangs at first straight, the anterior segments bent on segment 5 at a right angle. After a few hours the back curves in somewhat, and the head is lowered till at last it is almost in line with the body. The whole

upper side turns dead white, except that here and there a faint bit of red or dusky black is seen. When the skin splits it is on 3, the rent extending to 2 and 4, and it is shifted off just as in *Grapta*. At first the pupa is unformed, but the wing cases creep up one segment, the dorsum becomes hunched, and the head case and mesonotum swell out as in *Limenitis*. Every one of these chrysalids finally took a twist to one side, bending on the last segments instead of hanging straight down, as is usual with the species of *Nymphalidæ* known to me.

The curious differences in color of the chrysalids I have noted in the description. Later in the season by four months, I received about forty chrysalids from Prof. Gibbs, from S. Carolina, which varied in same manner as the Texan examples, but the dark varieties much predominated.

On two occasions single examples of *Vanillæ* have been taken here at Coalburgh, but it cannot be a permanent resident. It abounds in the Southern States, where brood after brood must follow from early in the season till late in the fall. Fortunately it seems in the larval state to feed on nothing but *Passiflora*, or it might become a pest.

Abbot figured this species in *Insects of Georgia*, with larva and chrysalis. The larval body bears considerable resemblance to nature, but the spines look like feathers; they are red, moreover, instead of black. The shape of the chrysalis is good, but the color is not like any which I have seen, being dark brown instead of black.

FUNGOID DISEASES OF INSECTS:—A RECLAMATION.

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The following extract is from the *American Entomologist*, vol. iii., p. 138 (June, 1880):

“ . . . in which article, by the way, may be found the first suggestion that we are aware of in this country, of the practical utilization of fungus diseases, so that Walsh really anticipated LeConte in this suggestion.”

The article of the late B. D. Walsh referred to (*Practical Entomologist*, ii., p. 116, Aug., 1867) contains this passage in reference to a gigantic