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# The Canadian Entomologist.

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No. 10

## HISTORY OF THE PREPARATORY STAGES OF VANESSA MILBERTI, GODART.

BY W. H. EDWARDS, COALBURGH, W. VA.

**EGG.**—Conical, the base flattened, the top rounded; ribbed vertically, the ribs being either 8 or 9 in number; these rise from the surface at about one third distance from base, increase in elevation gradually, and end at the summit about the little flattened space which contains the micropyle, with its rosette of minute reticulations; the ribs meet the summit at an angle of about  $45^{\circ}$ ; in the last part of their course they are thin, and are grooved on both sides to the surface; between them are many fine horizontal striæ; color green. Duration of this stage probably 4 or 5 days.

**YOUNG LARVA.**—Length  $\frac{1}{16}$  inch; color yellow-green; cylindrical, nearly even from 2 to 10, the segments well rounded; marked by rows of fine black tubercles, each of which gives out a black hair in length about equal to the diameter of body and nearly all straight; these tubercles are flat, like circular disks, and the hairs are barbed (as seen under a high power); 2 has a sub-oval chitinous black dorsal patch with two rows of tubercles, six in front row, and two behind, these last standing between the second and third from each end of front row; the hairs longer than elsewhere and bent over head; on 3 and 4 each is a straight cross row over dorsum of eight tubercles, four on either side mid-dorsal line, and the third tubercle from top has two hairs; after 3 and to 13 are six tubercles each, disposed differently, four being on the front part of the segment, but not in straight line, the lower one of either side being a little behind the upper one, and the third tubercle lying between the two others, on the last part of the segment; these form three longitudinal rows from 3 to 13; on extreme end of 13 is an oval chitinous patch with several tubercles, the hairs straight and horizontal; below the spiracles from 4 to 12 are two short hairs each, from minute tubercles, the posterior one

raised a little above the other ; on 13 but one ; on 2 are three lateral tubercles, each of which gives two hairs, and placed, one above, one in front of, and one below, the spiracle : on 3 and 4, in line with the lower tubercle of 2 and the lower of the pair on the segments after 4, is a single tubercle and hair ; over the prolegs are two short hairs each, and in same line, on 5, 6, 11, 12, is one hair ; head rounded, a little depressed at suture, color black, shining ; surface much covered with fine tubercles and bent black hairs. (The tubercles and hairs of this species are similar, and similarly placed, to those of *V. Antiopa*). Duration of this stage about two days.

After First Moulting.—Length at 12 hours,  $\frac{1}{16}$  inch ; the middle of dorsum green cut by a brown line ; the junctions of segments also green ; the rest of upper half black-brown, below this and the under side yellow-green (some examples are darker than others, more brown, less green) ; above the spiracles is a yellowish wavy line from 5 to 10 inclusive, and with the spiracles a brown line ; there are several rows of spines, one dorsal and three on either side ; these are disposed as described in last stage, are low, rounded, with a small cone on summit ; from the apex a single long black hair, and five or six short hairs around the basal part ; on the cross-ridges of each segment after 2 are many fine points, each with a short hair ; 2 has a blackish dorsal patch, with many hairs, bent forward ; feet brown ; pro-legs green ; head cordate, shining, black, thickly covered with fine low conical tubercles, varying in size, each with its hair. Duration of this stage about two days.

After Second Moulting.—Length at 6 hours,  $\frac{1}{16}$  inch ; color black over dorsum to middle of side ; a mid-dorsal black line, with a pale gray-green line or stripe on either side of it ; on the cross-ridges many white points, each with long whitish hair ; in some examples the lower part of the black area is mottled with green-yellow ; in one was a greenish patch on mid-dorsum on front of each segment after 2 ; the lower half of side green-yellow ; on this area, with the spiracles runs a blackish line overlaid by a yellow line ; under side yellow-green ; the spines now long, slender, tapering to a point, with a bristle at top and eight or ten about the sides ; color of the five upper rows black, of the lower laterals yellow ; head as at second stage, the tubercles more numerous, and more prominent, the one on each vertex a little largest, some white, some black, the hairs all black. Duration of this stage less than two days.

After Third Moul.—Length 12 hours after the moult,  $\frac{1}{16}$  to  $\frac{1}{16}$  inch; scarcely different as to color and spines from previous stage; black, the lower part and under side olive-green; the white hairs over surface give a hoary appearance to all the black area; the tubercles on head still more numerous, varying in size, more decidedly cone-shaped, the one on vertex largest. Duration of this stage less than two days.

After Fourth Moul.—At 12 hours,  $\frac{1}{16}$  inch. Two days later full grown.

MATURE LARVA.—Length  $\frac{1}{16}$  inch; slender, of nearly even thickness from 2 to 11; the upper surface black, thickly dotted with fine yellow-white points or tuberculations, larger and smaller (some of the smaller white), the former placed on the cross-ridges of the segments, the others irregularly scattered on and between the ridges; each of these gives out a white hair; under side yellow-green; a black stripe passes between the pro-legs; 2, 3, 4 are black, and 5, 6, 11 to 13 have much black; in line with lower lateral spines a bright yellow line or stripe in long crenations, one of which extends the breadth of the segment, and another similar line is above spiracles, the two curves meeting at the spines; under these is a russet space making a pretty wide band, not evenly colored, and varying in individuals; a fulvous patch, always small, often a mere dot, above and back of each spiracle; occasionally the upper yellow line is reduced to a patch on each segment, and sometimes this is enlarged and conspicuous; spiracles sub-oval, yellow rings with black centres; feet black, pro-legs green; on 2 is a dorsal collar bearing several small white spinose processes, and many white hairs, which are bent forward; the spines are in seven rows, one dorsal, three on either side, being upper, middle and lower lateral; the dorsals run from 5 to 12, the first laterals from 3 to 12, the middle from 3 to 13, the lower from 5 to 12; the lower laterals are greenish-yellow, with bristles of same color, the 5 upper rows are black, from blue-black bases; all these spines are slender, tapering to point, with a white bristle at tip, and a few short black ones about the sides; along base are bunches of small green irregular tubercles, with hairs; head sub-cordate, black, shining, with many conical tubercles, large and small, mostly white but some black, the one on vertex a little larger than others, each with its hair; these hairs are black on upper part of face, white on lower. The black changes to dark brown as the larva progresses, and the russet band loses its distinctive color, becoming olive-green. Duration of this stage about four days.

**CHRYSALIS.**—Length from  $\frac{1}{16}$  to  $\frac{1}{14}$  inch; breadth across mesonotum  $\frac{1}{16}$  to  $\frac{1}{10}$  inch; across abdomen  $\frac{1}{16}$  to  $\frac{1}{12}$ ; head case much produced, the sides either excavated from extreme ends of the processes, or not at all, but tapering to end; these processes conical, rather short, the space between a little excavated; mesonotum prominent, rounded, slightly carinated, with a very small three-sided pyramidal process at summit; the excavation below mesonotum angular, the wing case considerably elevated, the process at base sharp, triangular; abdomen conical, marked on dorsal side by three rows of tubercles, corresponding to the three uppermost rows of spines in the larva; the mid-dorsals low, rounded, the others prominent on middle segments, those on mesonotum small, but all the sub-dorsals are sharp and conical; color variable; many examples are soiled white, with slight brown stripes on abdomen, one dorsal, one ventral, one on either side, the ventral extending from head case to posterior end; the whole surface specked and finely streaked with brown; and the whole, except the last 4 or 5 segments, bronzed more or less strongly; some examples have the wing cases unicolored, others clouded in two shades; other examples are wholly light brown, and largely bronzed; others are dark brown, the whole dorsal area lighter, and mottled and streaked with yellow-white; in these last is often no bronzing except of a few tubercles below mesonotum; others are blackish throughout, the bronzing confined to the tubercles last spoken of. Duration of this stage in July  $5\frac{1}{2}$  days. Following one individual:

Egg hatched,	July 3rd.
1st moult	" 5th-6th, in night.
2nd "	" 8th, 10 a. m.
3rd "	" 9th-10th, in night.
4th "	" 11th, 4 p. m.
Suspended	" 15th, 6 a. m.
Pupated	" 15th, 6 p. m.
Imago out	" 21st, about noon.

From hatching to pupation, 12 days; to imago,  $17\frac{1}{2}$  days. The last imago came out on 24th July.

*Milberti* does not live at Coalburgh, or so far as I know, to the south of this; but is a common species in certain localities throughout the Northern States from New England and New York west; also in Colorado and Rocky Mts. northward, and in the Pacific States, and even British

America. I used to take a few specimens in August in the Catskill Mts., but the species was rare there. I have had many eggs sent me from Truckee, Cal., and from Rochester, N. Y., the latter by Mr. H. Roy Gilbert. The larvæ sent me by Mr. Gilbert in former years refused our native broad-leaved nettle, and starved to death on it, so that I was obliged to import several roots of the food plant, *U. dioica*, from Rochester, and grow it in my garden. I desired to see whether or no this species in larva behaved like other of our Vanessans. Although so common, very little has been published of *Milberti* at any stage, or of its larval habits. Say, under the name *Furcillata*, figures the butterfly, 1825, and says it was several times observed in the North-west territory during the progress of the Long Expedition, but says nothing of the larva. Boisduval & Le-Conte, 1833, also figure the imago, and say of the larvæ merely that they live in cluster on a species of *Urtica* in the neighborhood of Philadelphia. Kirby, 1837, repeats Say, adding Canada as a locality. Harris, 1862, briefly describes the caterpillar and chrysalis; says the butterflies are rare about Boston, but common in north-west Mass. and N. Hampshire, and appear in May and again in July and August. Prof. Lintner, Proc. E. Soc. Phil., 3, 61, 1864, describes the mature larva, in part at least from an alcoholic specimen, and the chrysalis; and says there are two annual broods of the butterfly (at Schoharie, N. Y.), in April and August; that the larvæ are usually very abundant on *Urtica dioica*, but that nearly all are destroyed by a parasite. Mr. Wm. Saunders, C. ENT., 1, p. 76, 1869, describes the adult larva, and says that the first brood of the butterfly appears (London, Can.) toward end of June, and again in August, but says nothing of larval habits. Mr. Scudder, in Syst. Rev., 1872, says of *Milberti*, that the eggs are laid in clusters on some of the terminal leaves of the nettle, that the caterpillars feed in close company during the earlier stages, but subsequently scatter. Mr. Henry Edwards, Proc. Cal. Ac. N. Sci., 1873, briefly describes the mature larva and chrysalis. Mr. T. L. Mead, in Report on Wheeler Expedition, 1875, says that *Milberti* larvæ were common about Denver early in June on nettles, and that almost every plant had many on it, in various stages of growth, while the females were still depositing their egg clusters. Mr. Scudder, in "Butterflies," 1881, p. 138, figures the butterfly, says there are two broods (in N. E.) in June and September; and on p. 99, gives figure of cluster of eggs on under side of nettle leaf; says the eggs are laid upon the under surface in large open patches, in which they are rarely if ever piled upon one

*another*, sometimes several patches upon the same leaf. On page 152, it is also stated that the species is *triple-brooded in Canada*. Finally, Prof. Fernald, But. Maine, 1884, briefly describes the mature larva, adding that the spines are arranged as in *V. Antiopa*, which, as I shall show, is in some degree erroneous. That is all I have been able to find of the history of this common butterfly, and that is very little.

The egg of *Milberti*, in shape and ornamentation, is like that of *Antiopa*. The young larva is like the young of that species also in every particular, so far as I can discover. Every hair in the one has its counterpart in the other. Of the second stage of *Antiopa* I cannot now speak, but of the third and subsequent stages, comparing them with *Milberti*, there is a difference in regard to the dorsal row of spines. In *Antiopa* these begin at segment 7 (head being No. 1) and end on 12, whereas in *Milberti*, as in *Vanessa Urtica* and *Polychloros*, also in all our species of *Grapta* observed, the dorsal spines begin at 5 and run to 12. (A table of the spines of *Vanessa* and allied genera may be found in Weismann's Studies, English Ed., p. 448, with interesting remarks on the relationship of all these species).

I received 7th May, 1885, from C. F. McGlashan, Esq., Truckee, Cal., a great cluster of eggs, on nettle leaf, mailed 30th April. There seemed to be about 200 eggs, but they were piled so that it was not possible to count them. The bottom layer was right side up, and the eggs square on their bases, so far as could be seen; at each layer above there was wider departure from this, till at the top the eggs were more or less on their sides. In the thickest part the cluster was five layers deep. These eggs failed to hatch. On 2nd July, the same year, I received three similar clusters of eggs from Mr. H. Roy Gilbert, of Rochester, N. Y., piled up in same way. I had a large plant of *Urtica dioica* in flower pot, the branches nearly two feet long, standing at an open window in my room. On the upper side of a leaf of this I pinned one cluster. In about six hours thereafter the larvæ were hatching, and a few hours later had gathered at the base of the leaf, on upper side, and were nibbling at and through the leaf. There was no web or shelter. The next day the larvæ were on same leaf, and had eaten it almost wholly, leaving the frame. There was still no web. The same afternoon they left this leaf, and had got on the end of the next branch and were eating the terminal leaves, still without web or any shelter. They were in a dense mass, and when not feeding, their heads were all protruded, and at the least alarm, as the

shaking of the leaf, all the heads wagged together. This would be a natural protection against ichneumon flies, etc. I have observed the same simultaneous wagging in young larvæ of *M. Phaeton*, as an ichneumon fly was hovering over them. This habit my larvæ kept up through the second stage. The first moult was passed while they were all piled together. The habit in feeding during the second and third stages was as in the first, no web, no shelter, all in bunches. But after third moult part of the larvæ protected themselves in the manner of *Grapta Comma*, eating off the main ribs at the base of a leaf on under side, whereby the leaf drooped. The edges were drawn together pretty closely and nearly to tip, and several larvæ might be found therein. One small lot of larvæ were on upper side of a leaf at the base, and had drawn the edges together for a half inch from base, making an imperfect shelter, but the ribs were not cut and the leaf stood in natural position.

At fourth moult I had a fresh plant ready and the larvæ were transferred. They scattered about, bent and closed leaves as in previous stage, and in some of these were three and four individuals, in others but one. But sometimes the leaf was not bent, and was closed from end to end nearly, a single larva lying therein.

The weather was clear while I was feeding this brood, and at no time was there any spinning of a web, or spinning at all beyond what was necessary to close the leaves. From what I saw, I should say that the larvæ in the early stages were highly gregarious, that after third moult they were much less so, and after fourth (and last) had lost most of that habit. But had the weather been cloudy, or stormy, they might have acted differently, and protected themselves more or less by a web.

I asked Mr. Gilbert to observe what he could of *Milberti* in natural state. He wrote 15<sup>th</sup> July: "The eggs, so far as I have observed, are always eight or ten inches below the top of the nettle, and usually in cluster on under side; *but on one occasion I found them loosely scattered over the upper side*, covering nearly half the leaf. In rough, windy or showery weather, the young larvæ may spin a web on under side of the natal leaf. I have seen this twice, and it seemed to me only a temporary expedient to avoid the rain and to secure a safe foothold. But they generally go to the top of the plant and spin a web which covers the terminal leaves, and by additions come to extend for three to five inches down. My opinion is that if the weather be rough when the larvæ are hatched, they rest on the natal leaf; if fair, ascend. When very young there are



no stragglers, but towards maturity the larvæ scatter, the main body of the family keeping together till nearly grown. The 'nettles,' as we designate a certain spot, is a patch of that plant covering more than three quarters of an acre, lying on each side of a lane. I have seen perhaps forty families of these larvæ feeding there at one time, but never under the shade of trees which cover much of that ground. The larvae were always out in the sun. I have found the larvae will starve rather than eat the broad-leaved nettle."

Again, 17th July: "I visited the nettles yesterday. Found but one group of larvae, they about  $\frac{3}{4}$  inch long. A bright-colored bug (Hemipter) with a long beak was active in picking off the larvae. I found four in a bent and closed leaf with one larva of *G. Comma*; six in a similar leaf; two in a leaf that was closed but not bent, two unprotected on the under side of a leaf, and one in plain sight on upper side. Found also a bunch of eggs just hatched, and the larvae had crawled to under side of the leaf and lay like a flock of sheep, heads up."

Again, 20th: "Found one group of about 200 larvae, all on upper sides of two opposite leaves, and a few inches below a web at top of the plant. These larvae measured  $\frac{7}{8}$  inch" (at or about 3rd moult).

"Another group, measuring  $\frac{3}{4}$  inch" (after 4th moult) "were hidden in closed leaves on different stalks. Part of these closed leaves had the ribs cut, and these were crowded; the closed but uncut leaves had from one to four tenants. I have often noticed and know that after the last moult, the larvae scatter and feed openly. Can see a family several rods away where they are numerous."

I separated several of my larvae at one stage or other of their growth and gave leaves of our common broad-leaved nettle. At first they refused the food, then nibbled a little, and finally eat some leaves. But none of these larvae reached pupation, nor even passed a moult. They dwindled away and died. The same thing happened with larvae sent me in 1884. Mr. Gilbert reports a similar experience, as before said.

Specimens of the butterfly from the western plains and to Pacific have not the bright coloration seen at the east. They have a faded look.

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#### ELAPHIDION VILLOSUM, FABR.

BY FREDERICK CLARKSON, NEW YORK CITY.

There is in the study of Entomology a fascination and delight that captivates the imagination, and renders the enthusiast liable to construct

theories based upon such slender foundations that they fail to reach the dignity of assured facts. This, I think, may be said of much that has been written concerning the habits of this beetle. The record which I have thought proper to make relates to veritable facts, but whether in the particular instance referred to they are to be regarded as extraordinary and not of common occurrence, may be a problem yet to be solved. I trust that in offering this paper I may not be thought presumptuous in differing with so distinguished Entomologists as Drs. Harris and Fitch, yet as my observations do not bear out the conclusions which they have reached, and apprehending that the best interests of the science are served by that record or enquiry which relates to the discovery of facts, I make no apology to these fathers in the science for transcribing in relation to this subject views somewhat dissimilar to theirs.

Dr. Harris says that if a burrow be split open in winter, it will be found to contain the larva, which in the spring assumes the pupa form, and in June or July is changed into a beetle. He is in accord with Dr. Fitch concerning the periods of transformation, and holds similar views with him as to the habit of pruning. Dr. Fitch, I think, unduly exalts the instincts of these beetles as illustrated in their larval habit of pruning the twigs and branches of the oak, contending, as he does, that the twig or branch is eaten away by the young larva for a small space, and left supported only by the bark that the autumn winds may fell it to the ground, and that the environment of its new condition is necessary to the transformation of the included larva. This is substantially what each writer has to say upon the subject, though Dr. Fitch's report is very lengthened and rather extravagant in imaginative conclusions.

These oak pruners were very abundant in Columbia County, this State, in the season of 1878. The September winds brought showers of twigs and branches to the ground. I examined many of them, and found each to contain the larva, nearly full grown, in tunnels measuring from ten to fifteen inches long. I gathered five goodly sized branches just after they had fallen for the purpose of illustrating the burrows in my cabinet of nest architecture. The branches remained on a table in a room having very nearly the condition, thermometrically, of the temperature without, until the early part of November, when I opened them for the purposes already stated. I was astonished to find that every burrow contained the beetle; the transformation, therefore, from the larva to the imago was completed in less than eight weeks—how much less I know not—and

without the surroundings as narrated by Drs. Harris and Fitch. I am therefore inclined to the opinion, born of these facts, that the transformation, barring strong winds, is as likely to occur in the tree as on the ground, and that the branch is eaten away by the young larva not for the extraordinary reasons as cited, but for the more probable one, to prevent the flow of sap, which, if not checked, may render the wood fibre unwholesome to the larva, or possibly affect injuriously the later condition of pupa and imago. It would appear, moreover, that the beetle is developed in the autumn, and remains within the burrow during the winter.

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## MONOGRAPH OF THE EMBIDINA.

(Continued from page 178.)

BY DR. H. A. HAGEN, CAMBRIDGE, MASS

### 10. *Embia Mauritanica*.

*E. Mauritanica* Lucas, Explor. Alger., vol. iii., p. 111-114; Neur. pl. 3, f. 2, a-n. Cuvier, Edit. Masson, Neur., pl. 106, f. 8 (copy of Lucas' figure).

*E. Mauritanica* Lucas, Ann. Ent. Soc. Fr., 1859, ser. iii., vol. vii., p. 440-444.

I have never seen this species, and give the substance of the very detailed description of Mr. Lucas.

Winged imago: Length of body 13½ mill.; exp. of wings 16 mill. Body rufo-fuscous, rufous-villous; head longer than broad, flat, smooth; depressed transversally behind the eyes; frontal part reddish; eyes reniform, black; antennæ 15-jointed, smooth and not villous (as in *E. Savignyi*), a little paler than the head; the joints after the 6th successively longer; labrum and palpi dark rufous; max. palpi thinner than in *E. Savignyi*, the two apical joints longer; labial palpi also more slender and the apical joint longer; prothorax a little longer than in *E. Savignyi*, with a transversal sulcus in the apical third; mesothorax anteriorly between the wings on each side with a yellowish transversal tubercle; metathorax similar. Legs dark rufo-fuscous, with the usual dilatation of the femur and the basal joint of tarsi of fore legs. Wings as long as

abdomen, light reddish brown, smoky, with pale longitudinal bands ; sector trifold, four transversals in the cell, and one in the space below (after the figure). Abdomen light rufous brown, smooth above and below, somewhat hairy besides ; appendages two-jointed, hairy, the apical one thinner, longer ; the apical ventral segment below is to the left strongly truncated and excavated ; in consequence of this asymmetry the basal joint of the left appendage is very short, broad, flattened and somewhat abortive. Mr. Lucas found the same asymmetry in each of the dozen of specimens collected by him. To decide the sex of his specimens he cut open the abdomen of several of them, and found all to be females.

Wingless larva (after Lucas) : Length of body 13 mill. ; breadth 2 mill. Rufo-fuscous ; head ovoid, smooth, sparingly villous, above somewhat depressed ; eyes reniform, dark fuscous, not prominent ; antennæ rufo-yellowish, with yellowish hairs, as long as head and prothorax (after the figure), 18-jointed, joints about alike, successively shorter, the last as long as the first, but thinner, rounded on tip ; palpi yellowish. Prothorax very short, anteriorly with a transversal sulcus ; mesothorax twice longer, anteriorly with a much deeper transversal sulcus ; base narrower ; metathorax very short ; no traces of wings (after the figure). Legs (after fig.) yellowish, the basal joint of the tarsi of fore legs dark fuscous, with the usual dilatations. Abdomen with nine dorsal segments ; appendages rufous, the basal joint a little longer ; the figure of the end of abdomen shows the last dorsal segment triangular.

Habitat.—Around Alger, especially near Milah and Constantine, the winged specimens living gregariously in sandy places in June on the stems of a dry *Scilla maritima* ; very agile ; 12 specimens collected. The larva is not very rare around Alger during the winter, living in small silken tunnels under humid stones ; the larva is carnivorous and very agile.\* Mr. Lucas, in his paper, Ann. Soc. Entom. Fr. 1859, l. c., states that he collected, April, 1850, at Medeah and Bogar, province Alger, some larvæ which were placed in boxes, but by chance forgotten till 1858. He found

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\* McLachlan, Embid., p. 376, says rightly : Hagen, Stett. Zeit. 1849, p. 56, said that nothing had then been recorded as to the habits. He (McLachl.) has overlooked the fact that my paper was written and delivered in 1848, and commenced to be printed in the same year. The continuation of Embidæ was printed February, 1849, before Lucas' work was published. The report of Lucas by Schaum, in 1851, contains nothing about the habits of Embidæ, nor any other report, as far as I know, before Lucas' second paper in 1859.

the walls of the box clothed with a very fine white silk, the network consisting of very small meshes and representing circular tunnels, in which the dead larvæ were found. Mr. Lucas has observed in the field threads of silk arranged near the entrance of the tunnels, and believes them to serve as traps or to give notice of the presence of insects. He believes the *Embia* to be carnivorous. The larvæ live isolated.

Concerning the larva, Lucas, Expl. Alg., p. 114, states that obliged to leave for Constantine in March, he put several larvæ in separate boxes together with some insects as food. After his return in October, he found all dead; only one had transformed to a winged imago. This interesting observation is the only one known of the transformation of the wingless form into the imago state. But then the nymphal skin with the empty wing cases must have been in the same box. Though the observation of an eminently distinguished observer can not be doubted, still it is impossible that the imago could have transformed out of the wingless form without having before passed through a nymphal form with visible wing cases. Mr. Lucas' observations are extremely interesting, in so far as he has stated the existence of winged females. The description of the internal female organs makes his statements entirely sure.

*E. Mauritanica* is very near to *E. Savignyi*. It is apparently a misunderstanding when Mr. Lucas, Ann. Soc. Ent. Fr. Bull., p. 98, states that I have united the two species in the Synopsis Embid., p. 21-22. Both species are there enumerated as different, and nothing is said about their relations. As I have never seen *E. Mauritanica*, I can state, after a careful study of the description and the figures, that both species must be very nearly related. It is to be assumed that Mr. Lucas has seen Savigny's type, described by Rambur, in the Jardin des Plantes. If he had seen other specimens I believe he would have mentioned the fact. Therefore his statements represent probably the comparison of his species with the type of Savigny. After all *E. Mauritanica* seems to differ by much darker colors, the lack of villosity of the antennæ of the imago (those of the larva are hairy), by the length of the last joint of palpi, by the asymmetry of the left appendage, and by less transversals of the wings.

11. *Embia Persica*.

*E. Persica* McLachl., Jour. Linn. Soc. Lond., vol. xiii., p. 382.

Female? Length of body  $9\frac{1}{2}$  to  $10\frac{1}{2}$  mill.; exp. of wings  $13\frac{1}{2}$  to 15 mill.

Nigra subnitida; caput vix in medio piceo tinctum; pronotum brunneum; antennæ nigrae, basin versus pallido cinctae, 24-articulatae, articulis duobus ultimis flavidis; alae angustae, fuliginosae, albedo 5-striatae; venis fuscis. (McLachl.)

Hab.—Shahrud, Northern Persia. Three specimens collected by Mr Christoph in McLachlan's collection.

I have never seen this species; the detailed description must be compared in the original. There is no asymmetry noted, which is probably the reason that the author has considered them to be all females, with an appended? The species seems to be different from all described ones, but related to the two foregoing species.

## 12. *Embia Solieri*.

*E. Solieri* Rambur, Neuropt. p. 313, No. 4.

Larva, dry: Length about 9 mill. (or a little less than *E. Savignyi* Ramb.) Body rufo-fuscous, villous; head about quadrangular, a little depressed; eyes small, black, not prominent; antennæ reddish-yellow, a little longer than the head, villous, 18-jointed; 1st joint cylindrical, thicker than the others; 2nd short, 3rd longer, the rest globular. Prothorax narrower than the head, somewhat enlarged behind, about as broad as long, with a deep, transversal sulcus after the first third; mesothorax oblong; metathorax quadrangular; no traces of wing cases. Abdomen robust, broad, dark rufous, villous, a little shining; segments alike, twice broader than long, the last dorsal triangular, obtuse, symmetrical. Appendages (rudiments only present) reddish-yellow, the basal joint thick, short. The opening of the female genitals on the ventral side seems to be present. Legs ferruginous, femora partly darker; the femora and the basal joint of tarsi of fore legs dilated as usual; the only dried specimen before me shows these parts shrunk, but they seem less broad than in *E. Savignyi*; the middle legs are more dilated and stronger than usual.

Hab.—The specimen before me is labelled Spain. Probably it is the same mentioned by me (Stettin Ent. L. 1886, vol. xxvii., p. 285). I have studied the type of *E. Solieri* Rbr. and some other larva from Spain in the collection of DeSelys Longchamps, but I can not find my notes. At least Rambur's description agrees with the specimen from Spain, nevertheless, if my memory is not at fault, the specimen from Marseille is larger. It is very remarkable, that in the more than forty years since Rambur's publication no winged imago has been found, though the

wingless form is widely spread in southern France and in Spain, and seems to be frequently met with.

In Petit. Nouvelles Entoml. Paris, 1877, vol. ii., p. 182 (not compared), Mr. Bolivar, commenting upon Mr. Girard's opinion, that only one species of *Embia* exists in Europe, and that probably an importation, notes that a species is abundant in the larval form near Madrid, and is no doubt indigenous. Mr. Girard, l. c., p. 125, replies, and thinks the discovery not opposed to his hypothesis. McLachlan, l. c., p. 193, states that there can be no doubt as to perhaps more than one species living in Europe (of Record for 1877).

Mr. Lucas, Ann. Soc. Ent. Fr., 1880, Ball, p. xcvi., had found in February, 1850, near Toulon, not far from the Fort Lamalgue, larvæ of *E. Solieri* below the humid stones. The larvæ were rather agile, and live like those of *E. Mauritanica* in silk tunnels made in hollow places of the stones. During the whole larval time they have the power of producing white silk to make tubes or tunnels in which they probably undergo their transformation. Contrary to Rambur's opinion the larvæ, at least of *E. Mauritanica*, live isolated, and only the adults become gregarious.

Mr. M. Girard, *ibid.* 1881, Ball, p. cxxxvi., reported *E. Solieri* larvæ collected by Mr. Xamben, near Port Vendres (Pyrenees Orientales), in March, below stones in silken tunnels, which are traps for insects. The species is very different from *E. Mauritanica* and *E. Savignyi*, and was also found by Mr. Lucas near Perpignan and Collioures. He adds that these localities harbor other southern forms, as *Paussus Favieri*.

Mr. Lucas, *ibid.* 1882, Ball, p. clxxxv., found near Amélie-les-Bains, end of December and January, 1882, below stones, a few *E. Solieri* larvæ, long 9 to 12 mill, with 16, 18 or 20 jointed antennæ. It is very rare that both antennæ of the same specimen have the same number of joints.

Mr. Lucas, *ibid.* 1883, Ball, p. xxvi., compare at some length *E. Solieri*, the imago of which is still unknown, with *E. antiqua* Piot., in the Prussian amber. He states that this species closely resembles in form *E. Solieri*, but differs by its longer antennæ, which nearly exceed the meta-thorax, though in *E. Solieri* they do not exceed the mesothorax.

McLachlan, Journ. Linn. Soc., vol. xiii., p. 376, states that he possesses *E. Solieri* from Hyères, collected by Mr. Pascoe under stones.

13. *Embia (Olyntha) Brasiliensis*.

*Olyntha Brasiliensis* Gray, in Griffith Anim. Kingd., vol. xv., p. 374, pl. 72, f. 2.

*O. Brasiliensis* Westw., Trans. Linn. Soc., vol. xvi., p. 373, pl. 2, f. 3.

*O. Brasiliensis* Walk., Neur. Br. Mus., p. 532, n. 1.

Winged form (male?) Length of body 16 mill.; exp. of wings 25 mill. (from Westwood's plate).

"Antennæ corporis fere longitudine, articulis 32; alae nervo 4 interno trifido. Piceo niger, prothorace supra femoribusque 4 antiois ochreis, antennarum articulis 10 ultimis albis, alis piceis, vittis albis inter nervos longitudinales, nervisque transversis tenuiter albo-marginatis." (Westwood.)

Hab.—Brazil, coll. British Museum, formerly in Mr. Children's coll. I have seen only the type, first described by G. Gray in Griffith and figured *ibid.* by Westwood; on the plate it is named *Embius? Brasiliensis*. I have omitted "palpi maxillares 4 articulati" in Westwood's description, as it has been corrected by Burmeister in 5 articulati for *Olyntha*, and this statement is verified by examination of the type by McLachlan, l. c., p. 378. The few words in Griffith contain nothing more, except that prothorax and femora are called fulvous instead of ochreous. Though there is no asymmetry stated for this species the figure by Westwood has the tubercle between the appendages drawn more to the right, and the figure in Griffith has a spine on the left side and the right appendage (by error) three jointed. In 1857, on my way to London, I had compared *O. Brasiliensis* in the museum at Berlin, and the type in the Museum at Halle, both from the same lot, and when I saw the type in London, I had the impression that the type of *O. Brasiliensis* was different from Burmeister's species, with yellow appendages. In the figure by Griffith they are black. On my return I compared again the specimen in Berlin, and found my first impression confirmed. As I had seen only single specimens, and was then very little acquainted with this family, I thought it more prudent in my Synopsis Embid, p. 222, to draw attention to the supposed difference. I should remark that Mr. Walker has copied Burmeister's description instead of Westwood's, though he had the type at his disposal.

14. *Embia (Olyntha) Batesi*.

*Embia Batesi* McLachl., Jour. Linn. Soc., vol. xiii., p. 38c,



*Olyntha Brasiliensis?* Burm. Handb. vol. ii., p. 770.

Winged form: Length of body 7 mill.; exp. of wings 14 mill. (41 mill. is a misprint, McLachl.)

"Nigra vel nigro-picea; prothorax flavo-ferrugineus; antennæ nigrae, 20-articulatae, articulis quinis ultimis flavidis, pallide pilosis; alae breves, latae, nigro-fuscae, albido 5-striatae."—McLachlan.

For the detailed description the original should be compared.

Hab.—Amazon's coll. by Mr. Bates, one specimen in McLachlan's coll. I have no specimen before me. The identity of Burmeister's species with *E. Batesi* is at least probable; if it belongs to a different species, it would be new. The differences to be noted out of Burmeister's description are as follows: *O. Brasiliensis* Burm. has 30-jointed antennæ, "apice albis"; *E. Batesi* only 20-jointed antennæ, the apical fourth five joints pale yellowish. Now, accepting that the antennæ of *E. Batesi* were incomplete, Burmeister's species, if identical, would not have the tip, but the apical half pale. Burmeister has, "femoribus 4-anticis ochraceis"; McLachlan, "coxæ yellowish." Finally Burmeister says, "cercis albis"; McLachlan, "the 2nd joint obscure yellowish with black hairs." *E. Batesi* is stated by McLachlan to be the broadest-winged species known to him.

15. *Embia (Olyntha) ruficapilla*.

*Olyntha ruficapilla* Burm. Handb. vol. ii., p. 770, No. 2.

*O ruficapilla* Walk. Neur. Brit. Mus., p. 532, No. 2.

Winged male? Length of body 7 mill.; length with wings, 11 mill.; exp. of wings 17 mill.

Dark fuscous, nearly black, shining, villous; head and prothorax red; head longer than broad, ovoid, slightly convex above; a transversal furrow between the eyes, which are black and very prominent, and a sharp longitudinal impression in the middle of head behind the eyes; epistoma transversal, half as long as broad, rounded besides; labrum short, somewhat triangular; mandibles orange; max. palpi fuscous, thick, 5-jointed, the last joint oval, larger; labial palpi fuscous, the last joint longer, ovate; antennæ dark fuscous, densely covered with dark hairs; only 16 joints present, which are longer than head and thorax together; thin, after 6th joint somewhat thicker; 1st joint cylindrical, a little stouter, 2nd short; 3rd a little longer than 1st, 4th to 6th a little shorter than 3rd; all following more elongate, fusiform, the two last ones again a little shorter. Pro-

thorax narrower than the head, longer than broad, enlarged at the base, flat, a transversal sulcus after the apical third. Legs rather long, dark fuscous, shining; fore legs with the femur, tibia and basal joint of tarsi equally long, compressed, dilated, the tarsal joint thicker, with a longitudinal furrow; the two apical joints short, the last one longer than the preceding; middle legs not so dark, more brownish, very little dilated, the basal joint of tarsus short, scarcely longer than the two following together; the whole tarsus very little longer than the tibia; hind legs with very strong, long, dilated femur; tibiae shorter, less dilated, compressed; tarsus about as long as tibia, basal joint not dilated, about as long as the two others together; the second very short; all claws bent, sharp, much thicker at base, rufous. Abdomen black, villous, shining, one third shorter than the wings; last dorsal segment polished; appendages black, villous, very long; basal joint thick, straight, apical joint longer, thinner, a little narrowed in the middle. The abdomen is too much shrivelled to make out anything more; I can not see any asymmetry, at least not of the appendages. Wings about four times longer than broad, smoky black, rugulose, with four narrow white longitudinal lines, the anterior (fifth) wanting; venation dark fuscous; sector trifurcate; about five costals and five transversals in the cell; in the spaces below some transversals.

Hab.—Brazil. I have before me two dry specimens; one from the collection of the late Dr. Schneider in Breslau, Prussia, has only the label Brazil; it may have belonged to the same lot with Burmeister's types and those in the Berlin Museum, but it has not been compared with them. The other was collected by the late Mr. Appun in Venezuela; head and prothorax wanting.

In my Synops. Embid. p. 221, I had put *E. Klugi* Ramb., Neur. p. 313, No. 3, with a question mark, to *O. ruficapilla*. In my Syn. of N. Amer. Neur., p. 301, it was given as a separate species. I have never seen the type, which was collected by Delalande in Brazil, and belongs to the Museum in the Jardin des Plantes in Paris. Rambur has apparently omitted to describe the wings. If they had not been present, he would have named the specimen a larva, as in the two other cases. Otherwise his description, which is very detailed for the legs, contains nothing that would not apply to *O. ruficapilla*; perhaps his specimen was somewhat darker.

The specimen from Brazil before me presents in all the wings an inter-

esting anomaly of the venation, though the specimen from Venezuela has in all wings the usual venation. The apical end of the cell is usually formed by the radius and the upper branch of the sector meeting shortly before the tip of the wing, forming a curve from which a short vein emanates. Now in the Brazil specimen the upper branch of the sector runs straight to the tip of the wing; the radius ends a little before and is not connected with the sector by curving down, but by a straight transversal, parallel to the other transversals. The cell is therefore not closed, as usual, at the end by a curve. The radius is connected with the margin by a costal originating at the same point with the last transversal in the cell below. The same arrangement of the venation occurs only in *O. Westwoodi*. That it occurs in *O. ruficapilla* as an aberration is rather important, and it will help to a right understanding of the venation.

16. *Embia (Olyntha) Salvini*.

*Embia Salvini*, McLachl. Journ. Linn. Soc., vol. xiii., p. 380.

Winged male. Length of body 7 mill., exp. of wings 12 mill. (both approximative). Body black, sub-opaque, covered sparingly with dark hairs. Head very little longer than broad, about quadrangular, the sides very little sloping to the rounded hind angles; a large shallow depression on the middle of the disk above, in the centre of which is a very faint short elevated longitudinal line; eyes black, large, but less prominent than in *O. ruficapilla*, reniform; antennæ with only 19 joints present, which are nevertheless longer than head and thorax together, yellowish to 8th joint, the following successively darker, fuscous nearly blackish, polished; all with long fuscous hairs; basal joint cylindrical, stout, a little darker than the following, reddish yellow; 2nd small, as long as broad; 3rd as long as the two basals together; 4th half as long as 5th, pyriform; 5th to 10th successively longer, pyriform; all following shorter, a little thickened after the middle; labrum short, half as long as broad, rounded, yellowish at base and sides; the middle and margin blackish; max. palpi dark fuscous, thick, 1st to 4th joint short, about alike, 5th longer, sub-acute; labial palpi similar, last joint longer; all palpi clothed with paler hairs; mandibles black on tip; mentum large. Prothorax short, half as broad as the head, enlarged to the wings, with a faint median longitudinal impressed line and a deep anterior transverse sulcus, prolonged shortly along the oblique side-margin; mesothorax rather longer than broad; metathorax nearly quadrangular. Legs shining black, clothed

with pale hairs, tarsi somewhat castaneous ; fore legs strong ; femur, tibia and first joint of tarsus of about the same size, compressed, dilated ; the two last joints of tarsus small, short ; middle legs about alike, but the 1st joint of tarsus shorter, much less inflated ; hind legs wanting. Abdomen black, shining ; appendages long, blackish, clothed with yellowish hairs ; right appendage with the basal joint stout, apical joint longer, thinner, both straight ; left appendage broken. I can not make out any asymmetry, but I can not examine the dorsum of the last segment ; between the appendages, nearer to the left, a spiniform yellow sharp process, bent to above. Wings narrow elongate, smoky blackish, with five longitudinal narrow whitish lines (the 4th becomes confluent with the 5th before its apex on the anterior wings in McLachlan's specimen) ; venation fuscous ; sector trifold ; cell long with two transversals, and several more in the spaces below ; four faint costals. In the left anterior wing the cell is closed as usual, where the right anterior wing has the cell open and the venation similar to the specimen of *O. ruficapilla*. from Brazil. In both hind wings the venation is even more irregular.

Hab.—One specimen collected by Prof. Sumichrast on the Isthmus of Tehuantepec, Mexico, in the Cambridge Museum ; one specimen from Central America taken by Mr. Salvin at Chinautta, at 4,100 feet elevation, in McLachlan's coll.

I have no doubt that both specimens are identical, and have followed closely McLachlan's description ; the only difference would be that the basal joint of the antennae is black in McLachlan's specimen and reddish yellow in mine.

(To be Concluded in November Number.)

#### ENTOMOLOGICAL CLUB OF THE A. A. A. S.

The meetings of the Club at Ann Arbor were held daily from the 25th to the 28th of August, both dates inclusive, and were very successful. The following among others were present and in constant attendance :— J. A. Lintner, C. V. Riley, Herbert Osborn, John B. Smith, D. S. Kellcott, O. S. Westcott, L. M. Underwood, A. J. Cook, E. A. Schwarz, Henry G. Hubbard, S. H. Peabody, Clarence M. Weed, Miss M. E. Murtfeldt.

In the absence of Dr. Morris, Prof. J. A. Lintner presided. Officers for the ensuing year are : Pres., Prof. J. A. Lintner, of Albany ; Vice,

Pres., Mr. E. A. Schwarz, of Washington; Secretary, Mr. John B. Smith, of Brooklyn.

Aug. 25.—The following papers were read: A Biographical Sketch of William LeBaron, late State Entomologist of Illinois; Notes on some Structural Characters of the Lepidoptera, by John B. Smith. The Family Position of *Euphanessa mendica*, by Geo. D. Hulst.

Aug. 26.—Notes on *Harmonia pini*, by D. S. Kellicott; On the Preparatory Stages of an Undetermined Cossus, by D. S. Kellicott; On the Principal Injurious Insects of the Year, by C. V. Riley. Messrs. Kellicott, Underwood and Osborn spoke on the same subject.

Aug. 27.—Messrs. Cook, Osborn, Smith and Riley continued the discussion of injurious insects of the year. Messrs. Lintner, Riley and Westcott discussed the ease and difficulty of raising certain larvae. Mr. Osborn gave some notes on the habitat of a Chironomous; Mr. Cook gave some notes on the functions of the secretion of Bark Lice (*Leucanium tilia*); also some notes on the Choke Cherry Tortricid, *Cacæcia cerasivorana*. Mr. Westcott gave some notes on the abundance of certain Coleoptera.

Aug. 28.—Random Notes on Mallophaga, by Herbert Osborn; Larval Longevity of a Species of Colophora; Extract from a letter of W. H. Edwards, on some food plants of *P. ajax*; On a Peculiar Structure of the ♂ *Cosmosoma omphale*, by E. A. Schwarz. How shall we Create and Foster an Interest in the Study of Entomology? by John B. Smith. All the gentlemen present participated in this discussion, which was of great interest.

The following committee of arrangements for the next meeting was appointed: Chairman, J. A. Lintner, and Messrs. John B. Smith and C. V. Riley. Adjournment to meet at call of the President at the next meeting of the Association.

#### LE NATURALISTE CANADIEN.

We heartily congratulate our esteemed confrere, M. L'Abbé Provancher, upon the re-appearance of his magazine after the lapse of many months, and we trust that henceforth all difficulties may be removed, and that the Government of the Province of Quebec will continue the assistance which we understand was formerly given to the Editor.

ERRATA.—Page 170, line 14 from bottom, read small *l* for *lithophilus*; specific name, not name of a genus. Same page, line 13 from bottom, for *Hestonotus* read *Xestonotus*.—C. H. T. TOWNSEND, Constantine, Mich.