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No. 2

DESCRIPTION OF THE PREPARATORY STAGES OF COLIAS CAESONIA, STOLL.

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

EGG.—Fusiform, thick in middle, tapering to a small rounded summit; marked by about 18 longitudinal ribs, these being low, narrow, the spaces between flat and crossed by many fine ridges. Color yellow-green. Duration of this stage about four days.

YOUNG LARVA.—Length .08 inch; cylindrical, thickest anteriorly; on the ridges of the segments many black points, each with a short black hair; among these are black tubercles, some with long hairs, but most with white clubbed appendages, which form three longitudinal rows on either side, one appendage in the row to the segment; these rows are sub-dorsal, upper and lower lateral; color greenish-white, with a tint of brown; head rounded, a little depressed at top; on the face many rounded tubercles, each with depressed black hair; color pale yellow-brown. Duration of this stage four to five days.

After first moult: Length .14 inch; the ridges thickly beset with black points, each with black hair; among these are small tubercles of same color, mostly on middle of each ridge, with longer hairs; along base a yellowish narrow stripe, and over it, on 3 and 4 each, a rounded black process; another larva showed this stripe only near the close of the stage, and had not the black process; color yellow-green; head rounded, nearly same green as the body, the tubercles and hairs more numerous than before. To next moult four to five days.

After second moult: Length .21 inch; color yellow-green, with yellowish basal band; the processes on 3 and 4 as before, shining, black; head yellow-green, more thickly covered with small tubercles, scattered among which are others, larger. To next moult three to four days.

After third moult: Length .32 to .38 inch; color yellow-green, the band greenish-white; the two processes on 3 and 4 present; on dorsum

of 2 and following segments are very small black rounded processes in cross line and equi-distant, placed on the second ring of each segment; these are very variable in number; one larva had four on 2, and two each on 3 and 4, no others; another had three on 2, one on one side, two on the other, six on 3, two on 4, and these last were larger than any others; six seems to be the full number on a segment, and they vary from that to one, present on some segments and lacking on others, with no apparent regularity; so also the number of lateral processes differs much; one had these on all segments except 2, 5, 9 and 13; as the stage progresses a yellow stain appears in the band on each segment, and at last is often orange-tinted; head yellow-green, a little lighter than body. To next moult about four days.

After fourth moult: Length .6 to .74 inch; to maturity about three days. There was much change in the markings at third moult, but still more at fourth. Some which had been wholly green at this moult discovered cross bands of black and yellow, one or both, and there was much variation in the extent of these bands.

MATURE LARVA.—Length 1.1 to 1.3 inch; cylindrical, of nearly even thickness from 3 to 11; thickly covered with small black tubercles, each of which gives a short black hair; color yellow-green, light or dark; along base a yellow-white band with a dash of orange on each segment, and sometimes the orange is nearly continuous; over the band on 3 and 4 each a large vitreous black rounded process, from the top of which comes a small hair, and around the base is a ring of black points; some larvæ have additional processes of same character on the succeeding segments, but there is much variation; occasionally all are large as on 3, usually they are much smaller; in one example they diminished regularly from 4 to 12; on dorsum of one or many segments are small black processes on the second ridge, varying from six to one, and often wanting; the same ridge is covered by a black band, sometimes present on every segment, sometimes only on the two or three anterior ones, with broken lines on dorsum or sides of the succeeding ones, frequently however wanting; in many examples the first ridge of every segment is bright yellow, and the complete series of black and yellow bands is often present; but others have the yellow bands broken up on middle and last segments, or lack them on these segments; others have a yellow line instead of band; and often there is no trace of yellow anywhere; some larvæ therefore are

wholly green, some green with yellow bands, some with black bands and no yellow, but more have both black and yellow, with variation as to extent of either; the black bands appeared at fourth moult in examples which showed no trace of them in previous stage, and some larvæ wholly green to end of fourth stage, at the moult took on all the bands; under side, feet and legs pale green; head round, slightly depressed at top, with many fine black points, each with short, black hair; color yellow-green. From fourth moult to pupation about six days.

CHRYsalis.—Length .8 inch; breadth across mesonotum .18, across abdomen .18 inch; greatest depth .24 inch; shape of *Eurydice*; compressed laterally, the thorax on ventral side prominent, rising to a narrow ridge; the abdomen tapering, conical; the mesonotum low, rounded, with a slight carina, followed by a shallow excavation; the head case produced to a point, a little curved up, with a regular slope on both dorsal and ventral sides, angular laterally; color bluish-green over whole dorsal side, below, the abdomen yellow-green; the wing and head cases dusky green, on the under side a brown crescent; on dorsum two rows of black dots from mesonotum to 12. one to each segment, and a small black spot on either side abdomen; the whole surface except wings dotted or finely streaked whitish.

Another example gave same dimensions; the dorsum yellow-green, ventral side of abdomen more yellow; a brown patch on under side of head case. Duration of this stage seven to ten days.

CAESONIA is a common butterfly in the Mississippi Valley and Gulf States; also in Southern California and to the Isthmus. I myself have never seen it on the wing, and the above descriptions are drawn from larvæ sent me during the season of 1887, by Mr. R. R. Rowley, of Curryville, western Missouri. The first lot of larvæ were received 2nd August, mostly young, and with them eggs which hatched a day or two after. On 11th Aug., there came about twenty larvæ of all stages to mature. Again, on 26th Aug., came eggs and young larvæ, and more on 8th October. The food plant was *Amorpha fruticosa*. In California it is *Amorpha Californica*, and I was able to feed the larvæ from plants of this last growing in my garden. The behavior of the larvæ is in all respects as in *Eurydice*, *Philodice* and other species of the genus.

A noticeable feature of these larvæ is the variation in markings,

described in some degree above, the greatest change occurring at the fourth moult.

Boisduval, in Lep. de l'Amer., gives a Plate of *Caesonia*, with larva and pupa, copied from one of Abbot's unpublished sheets. This larva is roughly done, but shows the phase which has a yellow and a black stripe on each segment. The text says the larva feeds on many kinds of *Trifolium* and *Glycine*, and also *Tagetes papposa*.

In the latter part of the summer and in the fall the females of this species are apt to be more or less suffused with rose-pink on under side of hind wing, and about apex of fore wing, and occasionally the male shows something of this at base of hind wing, and around the margins of both wings. Mr. Rowley writes: "The females with red under the wings do not occur at all in the early summer broods. I took scores of butterflies this season in late April, all through May, June and July, and discovered not a streak on one of them. The first examples with red were taken in August. In September they were more numerous, while nearly every female of late October and November were either heavily streaked or solidly red below. I have yet to see a red under-wing of earlier date than August. The feature is surely a seasonal one."

NOTES ON THE GENUS COLIAS.

BY H. H. LYMAN, M. A., MONTREAL.

The discovery by Mr. W. H. Edwards that *Colias Hagenii* is only a form of *C. Eurytheme*, as detailed in the CANADIAN ENTOMOLOGIST for September, while very interesting in itself, serves also to show that this genus is still in a very unsatisfactory state. That a form which so closely resembles *Philodice* that nine entomologists out of ten would take it for that species, should turn out to be a variety of *Eurytheme*, emphasizes Dr. Hagen's statement "that reliable differences between these two well known forms are still a want." Mr. Edwards has also come to the conclusion that *Hagenii* is the same as the form previously named *C. Eriphyle* by him, as detailed in the November number of the CANADIAN ENTOMOLOGIST. A glance at the history of this form will be found interesting.

In 1873, Mr. G. R. Crotch collected a number of butterflies at Lake Labache, in British Columbia, among which were a number of specimens which Mr. Edwards seems to have regarded as *Colias Philodice*, as mentioned in Trans. Amer. Ent. Soc., v., p. 15. Subsequently on page 202 of the same volume, he described these specimens as a new species under the name of *C. Eriphyle*.

In the same place he said that a *Colias* similar to this had been taken by Mr. Mead, in Colorado, and by Dr. E. Coues, in Montana, and had been referred to by Mr. Reakirt as *Philodice*, but was, he thought, nearer to *Eriphyle* than to *Philodice*. The question now arises as to how these discoveries affect the standing of other so-called species of *Colias*, for it would seem that some of these forms are like children's tin soldiers set near together, in which if you knock down one, a whole row is laid low.

In But. N. A., vol I., plate 15, *C. Eurytheme* var. *Keewaydin* is excellently illustrated as a distinct species, as it was then believed to be by a number of eminent entomologists, and one figure—No. 7—depicts a greenish-yellow form with rather pale margins, which is certainly strikingly unlike the ordinary type of *Keewaydin*, but which was believed by Mr. Edwards to be merely a variety of that form. In the text, page 50, it is described as follows :

“Variety A. ♂. Upper side pale yellow with a very slight tinge of orange on disk of primaries ; sometimes wholly without orange and then uniform lemon yellow ; the marginal borders also very pale (Fig. 7.)”

On page 51 the following extract from a letter of Mr. Henry Edwards is given : “I may notice that the flight of the new species is much more rapid and varied than that of *Eurytheme* ; * * * that the only variety which appears in the latter is in the case of the albino female, while the male of the new species is constantly subject to run into the lemon yellow variety, which, however, is rarely so well defined as in the specimen I send you.” [Figured in plate.]

Subsequently Mr. Edwards ascertained that *Keewaydin* was only a form of *Eurytheme*, as was also *Ariadne*, which had been described as a distinct species in 1870, and he accordingly published in Part vii. of second volume of But. N. A. (pl. 21, pp. 103-116) a very full account of *Eurytheme* and its forms *Keewaydin* and *Ariadne*.

In the course of this most interesting account he said : “If (*Eurytheme*) occupies with *Philodice* the whole of the United States and

much of British America, and like that species, which it resembles in every respect but in color, it is subject to great and extreme variation, there being no feature whether of size or ornamentation that is not unstable."

At the close of this notice he said (page 116): "The butterfly figured on Plate of *Keewaydin*, in vol. i., as No. 7, supposed to be a variety of that species, is regarded by Mr. Henry Edwards as distinct, and has recently been described by him as *C. Harfordii*."

C. Harfordii was described from seven males by Mr. Henry Edwards, in 1877, in Proc. Cal. Acad. Nat. Sci., and at the same time *C. Barbara* was described from two females, but subsequently he came to the conclusion that they belonged to the same species, in which opinion Mr. W. H. Edwards acquiesced. In "Papilio," iii., p. 160 (1883) Mr. W. H. Edwards described *Colias Hagenii*, and said of it that it was close to *Eriphyle* and lay between *Philodice* and *Eurythème*, "the four species making a sub-group."

In CAN. ENT., xix., p. 174, Mr. Edwards said: "*Hagenii* is known to fly throughout the Rocky Mountain region, from Colorado to British America. * * * and I think it probable the yellow form accompanies the orange over much of the territory occupied by the latter. On the plains to the east of the mountains these would have been regarded as *Philodice* by collectors. The yellow male figured in But. N. A., vol. i., on plate of *Colias Keewaydin*, fig. 7, is *Hagenii*, a very small example."

Now if this same much abused butterfly, known as fig. 7, is both *Harfordii*, of which, as I have mentioned, *Barbara* is a variety, and also *Hagenii*, and if taken east of the mountains would be regarded as *Philodice*, and that *Hagenii* is *Eurythème* and also *Eriphyle*, it must follow not only that *Eurythème*, *Eriphyle*, *Hagenii*, *Harfordii* and *Barbara* are one and the same species, but also that it becomes extremely difficult to separate *Philodice* from the same group. In connection with this it should be remembered that at least two well marked specimens of *Eurythème* have been taken in this Province, one, a female, at Quebec, by the late Mr. Bowles, and another, a male, at Montreal, by Mr. C. W. Pearson, and that specimens of *Philodice* slightly suffused with orange do occasionally occur.

I am, however, not prepared to follow Dr. C. V. Riley in his suggestion that these two forms should be united.

The December number of the CANADIAN ENTOMOLOGIST contains another paper by Mr. Edwards announcing a further reduction of species in this genus by the recognition of *C. Edwardsii* as a variety of *C. Alexandra*. This reduction will, I venture to think, be followed by others, which will considerably curtail our list of species in this genus, for in view of all these discoveries it becomes impossible to believe that *Occidentalis*, *Chrysomelas*, *Emilia*, *Interior*, *Scudderii*, *Pelidne*, *Palæno*, *Chippewa* and *Boothii* are all distinct species.

It would of course be rash to try and indicate in what way the reduction is likely to take place, but I am inclined to believe with Dr. Hagen that *Emilia* will prove to be a variety of *Alexandra*, and that *Chippewa* will be united with *Palæno*.

There are, of course, several well-marked forms other than those above mentioned which will probably maintain their positions as distinct species, as for instance *Meadii*, unless it should prove to be a variety of *Hecla*, as Strecker has suggested; *Christina*, which I believe to be thoroughly distinct, but I do not think that the name *Astræa* should be retained at all, as I have a ♀ supposed to be that form which I obtained from Mr. Gamble Geddes, whose specimens were determined by Mr. Edwards, and which agrees exactly with what I consider the typical orange female of *Christina*; *Nastes*, from which *Moina* seems to be distinct, but may probably prove to be a variety, and *Behrii*, which is certainly distinct from any other American species.

Unfortunately some of these species are only found in very remote localities, and it will, I fear, be many a long day before their life histories are worked out, if indeed, of the arctic ones, they ever can be. Let us, however, hope that the enterprising and hardy race which will result from the colonization of our mighty Northwest Territories may produce scientists who will yet push their way into the arctic regions of this continent in their search after knowledge, and succeed in wresting nature's secrets from her.

PREPARATORY STAGES OF CATOCALA DESPERATA, GUEN.

BY G. H. FRENCH, CARBONDALE, ILL.

EGGS.—Diameter, .04 of an inch ; low conoidal, the edges of the base rounded ; striated, fifteen of the striæ reaching the micropyle, sixteen more that do not reach the apex, though but few of these are only half length ; shallow transverse striæ. Color dull brownish olive. Duration of this period 201 days.

YOUNG LARVA.—Length, .15 inch ; cylindrical, slender, shape like others of the genus, a looper from the abortion of first two pairs of prolegs. Color of dorsum and head smoky, the head the darkest, pale between the joints ; sides a little paler than the back, with three fine dark red lines. Towards the last of this stage the color is more of a whitish olivaceous with a slight pinkish tinge, and the head and top of joint 2 brownish. Duration of this period 10 days.

After 1st moult.—Length, .35 inch ; shape much as before. Color, purplish black ; four white stripes tinged with the ground color, the two upper blending on joint 2, the lower situated below the stigmata ; venter pale with purple black spots in the middle of the joints ; head striped with broken whitish lines ; thoracic feet pale. Towards the last of this stage the black stripes are separable into a paler center and a darker border line ; the pale a little lilac tinted. Duration of this period 7 days.

After 2nd moult.—Length, .85 inch. Colors much as before, four dark and five light stripes, the pale of the dorsum making a pale stripe, each stripe double ; the pale stripes are lilac color, but the two dark stripes on the dorsum have prominent darker patches in the dark bordering lines on the posterior part of joints 4 and 5, and some on the joints back of these, being a spreading of these lines towards the centre of the body, so that between the two there is only a fine lilac line. Piliferous spots black, but so small as to be scarcely perceptible ; head about as during preceding stage ; venter with a prominent black patch on middle of each joint. Duration of this period 3 days.

After 3rd moult.—Length, 1.35 inches. Developing more into the usual *Catocala* larva shape, slightly flattening and fusiform. Striped as before, but paler ; ground color, pale lilac ; the bordering lines to the stripes black, broken into dots and short bars, the central part of the stripes mottled with black, the mottling in the dark stripes heavier than

in the light stripes, the one on each side near the subdorsal region with the black patches on the posterior part of joints as before, the patch on joint 5 filling the whole stripe, the next a little pale in the centre, those back of joint 6 a little darker than the anterior part of the joint in the same region; between the stripes a pale red line; piliferous spots small, orange; hairs gray. Head dull pale purplish red, marked longitudinally with yellowish white broken stripes, more yellowish towards the mouth. Lateral fringe white, well developed. Legs white, mottled with pale purplish red. Venter white, with large black patches on all the joints. Duration of this period 5 days.

After 4th moult.—Length, 1.60 inches; lateral fringe long, profuse, reaching the ends of the prolegs; head oblique and flattened slightly as in other species. Marked and colored much as before, but more of a pinkish shade. Ground color pale lilac, the stripes as before, even to the arrangement of the black spots on the dark subdorsal stripes; the dark stripes are made dark by mottlings that are mostly black dots, the light stripes are equally mottled, but the mottlings in the centre are dark reddish purple; in the paler edges—being the dividing lines of the preceding stage—is a line of purplish red dots; the dark part of the pale stripes is narrower than the dark stripes, though this dark part and the pale bordering line are altogether wider than the dark stripes. Joint 9 is not elevated, but is black shaded on posterior part, the shading extending down the sides and into the anterior part of joint 10. Piliferous spots orange, their bases the ground color; those on joints 5 to 13 larger than on joints 2 to 4, each tipped with a short black hair. Head purplish gray, marked with dull white stripes that are made up of dots, some orange spots on the vertex with a black hair in the centre of each, these orange spots in line with the dark subdorsal stripes, the spots contiguous so as to make a short line. Lateral fringe of the same color as the body ground color. Venter white, black patches on all the joints. Duration of this period 11 days.

After 5th moult.—Length, 1.90 inches. Color and markings about the same as before, a pale lilac ground color with stripes composed of black dots giving a grey appearance, the ground color of the dark stripes being a little darker than that of the light, the light and dark stripes being now nearly the same color; instead of a black patch in the dark stripe, each side of the dorsal stripe between joints 5 and 6, and 6 and 7,

there is a patch of clear pale olive, without black dots; the dark stripes on posterior part of joint 9 olive tinted, giving the joint a darker shade. Head striped longitudinally with dull lilac and white, the latter broken and irregular; the top has the lilac replaced by black, with the orange dots of the preceding stage present; a short black stripe on each side from the clypeus. Venter white, the joints bearing legs with black patches tinted with orange, the others with orange patches. Piliferous spots the ground color, but a little rose tinted.

MATURE LARVA.—Length 2.50 inches, width of middle of body .30 inch, of head .20 inch; depth of middle of body .25 inch, of head .15 inch. Color characters the same as at the beginning of period; the three anterior ocelli black, the three posterior brown. Duration of this period 15 days.

CHRYSLIS.—Length from .90 to .95 inch; lateral diameter, through joint 5, .33 to .35 inch; dorso-ventral diameter, through the same joint, .28 to .30 inch; the cause of the difference being a lateral expansion of the wing cases; only a slight dorsal depression on joint 1 (referring of course to the abdominal joints); length of tongue and wing cases .60 to .65 inch, both extending to posterior part of joint 5; from joint 5 tapering regularly to the posterior part of the terminal joint, this ending abruptly in the cremaster; anterior part rounded, this and the tongue and wing cases moderately corrugated or wrinkled; abdominal joints punctured; the whole covered with a white or glaucous secretion. Duration of this period 28 to 30 days.

In this species, as in most I have bred, the eggs continue to hatch for several days after the first ones emerge from the shell, these later specimens being so much later in their pupation and in their other changes, when the hatching is not too long delayed. In some cases these belated examples are weaker than the earlier ones, and either die before reaching maturity, or produce smaller or imperfect imagines. For these reasons I have given the changes and characters of the earlier individuals. I believe, however, that in the woods the delayed hatching produces the late specimens that are to be found in good condition in September and often later.

The eggs from which these observations were made were obtained October 29, 1886, by confining a dilapidated female with hickory bark and leaves, the supposed food plant. They began to hatch April 21, 1887.

when the hickory leaves began to expand. This would give the egg period 201 days. They began to spin June 11, giving a larval period of 51 days. With a pupal period of 28 days, we have a period of 79 days from the egg to the imago, or 280 days from the egg to the same. It is evident from my date of obtaining the eggs that they were obtained from one of the latest specimens, and that eggs from one of the earlier moths would add one or two months to the egg period, as there is evidently only one brood in a season of any of our species of *Catocala*.

The food plant, as given before, is hickory. When ready to spin they fastened leaves together in the breeding cage, preferring seemingly the dry leaves under the fresh food. Several spun under a leaf lying on the dirt in the bottom of the box, fastening bits of sand together for the bottom of the cocoon and this to the leaf. These points would seem to imply that they do not spin on the tree, but in the dry leaves under the tree on the ground. This is further corroborated by several years ago finding a chrysalis in leaves on the ground under a hickory tree, that produced *C. flebilis*. The cocoon, like the other species, is but slight, with the hooks of the cremaster fastened into the posterior end.

DESCRIPTION OF A NEW HEMILEUCA.

BY W. G. WRIGHT, SAN BERNARDINO, CAL.

HEMILEUCA CALIFORNICA, n. s.

Expanse, ♂, 2.40-2.50; ♀, 2.85-2.90. Head black. Antennæ, ♂, stem brown, pectinations black; ♀, wholly brown. Prothorax white. Patagia white in front, overlaying longer hairs of white and black. Thorax black, with tufts of rust-red hairs behind the patagia. Abdomen black, with a few scattered white hairs toward anal end, and with white or sometimes yellow hairs in segmental spots on sides beneath; ♂ with large anal tuft of rust-red, ♀ without tuft, but tip is hoary with short hairs of sordid white. Legs—femora with long red and black hairs, tibiæ with fewer hairs of white and black. Wings, above and beneath the same; costa dense black to apex, base dense black, at length becoming thinner, outer margin black and like the intermediate white portion, sub-diaphanous.

When quite fresh the wings are clear white and black, and rather opaque, but with exposure speedily become sordid, yellowish and less opaque. Veins all are honey color. Discal spots thin black, touching the costa, but separated from black base, and yet more widely from dark margin; at the cross vein in centre is the lunule, narrow, obtusely angled, the angle clean cut and pointing toward the head. Discal spots on secondaries small, black, never with any lunule or central mark whatever. Habitat, Southern California. Types in author's museum.

This species has heretofore been run in with *H. Nevadensis*, Stretch, but must be separated because of the red tufts on thorax, the white spots on abdomen beneath, the color of the nervules across the black margin, the angled lunules on primaries and absence of lunules on secondaries, in all of which the differences are persistent and without intergrades. Indeed, there appears to be as great difference between *H. Californica* and *Nevadensis*, as between *Nevadensis* and the Eastern *Maia*.

NOTES ON THE LIFE HISTORY OF HEMILEUCA CALIFORNICA.

This insect is quite local, being found in comparatively few places, but is fairly abundant in such localities as it frequents. Like many other species of Lepidoptera, it is often abundant one year, and nearly wanting the next. This present season it has been more scarce than I have ever before found it.

It is first seen on the wing in the latter part of October, males and females appearing at about the same time, and it continues about three weeks. The flight is labored and clumsy, so that they often fly against sticks or twigs, yet vigorous and sustained. It flies only in the heat of the day, and by three o'clock, or at the first whiff of cool afternoon air, it hangs up for the night. The line of flight is undulatory, with a wavy up and down motion, and slow, so that it is very easily taken in the net, or it may be often caught in the hands.

The insect does not feed at all, nor drink, but spends the whole time of its few days of life in the business of reproduction solely; its large body contains sufficient nutriment to sustain it a sufficient length of time to enable it to fulfil its destiny. They are rather handsome when fresh, but a clumsy flight among weeds and bushes speedily ruins all good looks. The male is gay with his showy red anal tuft, and his deeply pectinated antennæ show off beautifully as he flies slowly past with them gracefully arched in front of him. If caught when fresh, he flaps his

wings stiffly together over his back, and curling his anal end round under his thorax like a caterpillar, remains rigid and immovable; but if he be old and worn, he is likely to struggle continuously for liberty. The female has similar habits.

Copulation takes place as soon as the female emerges, often, and perhaps usually, before her wings are developed sufficiently to enable her to fly. The emergence is from the ground, and as she climbs up some grass stem or weed, shaking out and developing her wings, her presence becomes known to the males, who cluster around, on the wing and on foot, fluttering up blunderingly and with clumsy efforts to touch her with their antennæ. And here occurs a most singular thing, that in many instances, as soon as the male actually touches the female with his antennæ, he becomes alarmed and instantly flies off in precipitate flight, dismayed and demoralized, and does not return. But there are plenty of others left, and they crowd around, and it is not long before the right one arrives and speedily becomes attached, when in a little while all the other males fly away and leave the pair in peace.

The next business for the female is to lay her eggs. She flutters about the willow twigs a few feet above the ground, and selecting a suitable twig a line or two in diameter, catches hold with her claws, and hanging suspended, bends her ovipositor up to the twig and deftly places the eggs in a solid ring all round the twig. She commonly begins to oviposit in the afternoon, and continues hanging in the same place all night, placing eggs occasionally as they mature. When thus engaged in ovipositing, if she be annoyed or roughly interfered with, she flaps her wings violently back like those of a butterfly, and remains sullenly immovable. The males, becoming weary with their heavy flight, frequently stop to rest by hanging on a twig or leaf, looking very much like a female ovipositing. He, also, if picked off in the fingers, suddenly flaps his wings back forcibly, making no effort to escape, except that probably he will exude upon the captor a drop or a fine stream of vile fluid, which seems to be his chief weapon of offence and defence. When at rest, or ovipositing, the wings lie down over the body the same as do the wings of most moths, but when caught they throw the wings back and curl the abdomen around under the thorax, without further effort in self-defence.

The eggs hatch in the spring as soon as the leaves have grown sufficiently to afford them food; they are gregarious when young, but become

solitary toward maturity. They feed chiefly upon white willow, *Salix lasiolepis* and *S. lasiandra*, or the smooth-barked willow, like the Eastern golden willow, and also upon the cottonwood, *Populus Fremonti*. I have also found their eggs upon *Artemisia*, "Roman wormwood," but I do not think that plant can be a normal food-plant. The larvæ are yellowish, very much like those of *Vanessa Antiopa*, but are larger and lacking the red dorsal tufts of the latter; are spiny, and apt to be annoying if they fall upon a person's neck as he goes among the trees where they live, wherefore they are locally known as "the poisonous caterpillar." At maturity they come down the stem of the willow, and pupate in the ground or among the rubbish. Such as I have had to pupate in confinement, do so without making any sort of cocoon, but with chrysalis naked, like that of a butterfly.

STRAY NOTES ON MYRMELEONIDÆ, PART 4.

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

(Continued from vol. xix., page 217.)

Gen. nov., BRACHYNEMURUS.

Tibiæ calcarate; spurs as long as the two basal joints, or a little shorter; antennæ longer than head and thorax, stout, cylindrical, a little thicker to tip, which is bluntly pointed, but not clavate; palpi about equal, last joint of labials (except in *B. longipalpis*) with the basal two thirds inflated, fusiform; abdomen long, slender, about half longer than the wings (male); or as long as the wings (female); male appendages very short, less than half the length of last segment, stout, cylindrical, very hairy and spinous; a very small ventral triangular plate below and between them. Female superior parts split, with numerous very strong spines; a short flat appendage each side of the ventral part. Wings long, bluntly pointed, hind wings narrower; costal space with two series of arcoles, or with one series, and the apical transversals forked.

1. *Brachynemurus longicaudus* Br.

Burm. II., 994, 8; Ramb., 386, 2, pl. 12, f. 3; Walk., 329, 46; Hag. Syn. N. A., 227, 4.

Body luteo-fuscous, hairy, very slender; head very small; antennæ longer than head and thorax, strong, thicker to tip, brown, somewhat reddish before the apical part; vertex elevated, with a split in the middle anteriorly, luteous, with a transversal blackish band; another larger transversal blackish band, in which the antennæ are inserted, is notched below; face luteous, with a faint black longitudinal line. Palpi short, feeble, pale luteous; maxillary cylindrical, apical joint brown; labial not longer, paler, last joint fusiform, its basal half brown; prothorax slender fuscous, variegated with gray, two pale gray spots near the front border, and some laterally; mesothorax and metathorax fuscous, with yellowish marks; abdomen very slender, a little less long than twice the length of hind wing, hairy, fuscous, basal half above with a yellowish band, a little enlarged on the articulation, and divided by a median fine black line; segments 2 to 5 of equal length, 7 a little shorter; appendages blackish, fuscous, with long black spines and hairs; compressed, about one fourth the length of the last segment, straight, after the basal half narrowed; a short triangular yellow plate below; legs pale, densely sprinkled with black, with long bristles; tip of tibiæ, third joint of tarsi on tip, fourth joint entirely, and tip of last joint black; spurs light brown, of the fore legs nearly as long as the two basal joints; wings narrow, hyaline, venation close, two series of areoles in the costal space of front wings; transversals in the costal space of hind wings furcate in the apical half; veins brown, interrupted with white; pterostigma small, white; front wings rarely sprinkled with fuscous, with three obsolete dots along the submediana. Male.

Length of body, ♂ 38 to 45, ♀ 27 m.m.; expanse al., 44-48 m.m.

Hab. Georgia, Burmeister's type with label in his handwriting, from Savannah, collect. Winthem; two males from Millin, Scriven Co., Ga., July, 1876, coll. by Morrison; two males from Florida, Cedar Keys, June 4, and Crescent City, by Hubbard; one male Amer. merid., out of the late Dr. Schneider's coll. (perhaps this locality is erroneous).

Burmeister, l. c., quotes a female: "Abdomine alis æquali; fusco hirsutiusculo; length 25 m.m." When Winthem's collection came in my hands, this female was wanting. Formerly I had this species determined in my publications as *M. abdominalis* Say: I believe now this species to be different.

Mr. Taschenberg (Zeitschr. Giebel., vol. 52, p. 213) describes the types of Burmeister in the Halle Museum of *M. irroratus*, from S. Carolina, Zimmermann. The two females belong evidently to *M. longicaudus*. Though I have no female of this species before me, the identity is proved by Taschenberg's description and by the mention of the three obsolete dots along the submediana of the front wings. There can be no doubt that these females are the types of *M. irroratus*, as in the Halle coll., and in Burm. Hdl., No. 11; but I repeat that the male described by me has on the pin the label "*irroratus* Burm." in his handwriting. As the name *irroratus* is pre-occupied, no change is needed.

2. *Brachynemurus nebulosus* Ramb.

Myrmecleon nebulosus Ramb., 387, 4; Walk., 33c, 48.

Very slender, villous; head small, blackish; face dull yellowish, with a fine transversal line before labrum and a longitudinal line, black; below the antennæ an incurvate black line; vertex elevated, not cut sharply in front, more rounded, grayish-fuscous, as well as the occiput, with some blackish not well defined spots; antennæ as long as head and thorax, strong, cylindrical, rather enlarged to tips, rufo-fuscous, articulations faint yellowish; palpi dull yellowish, the labials about as long as the maxillary, last joint longer, cylindrical, its basal half a little thicker and darker. Prothorax narrow, blackish, with three ill defined yellowish bands, beginning on the front margin; the median very short, split, the two others running together before the wings; meso- and meta-thorax blackish, each above with a yellow geminate spot and some marks near the wings; on each side above the legs some yellow stripes. Abdomen of the male very slender, much longer than the wings, villous, blackish; basal half above with a pale longitudinal band, interrupted on tip of segments; apical half black with a pale basal dot, and sometimes another one in the middle; appendages about half the length of last segment, with long black hairs, compressed, the base enlarged to reach the dorsum; below and between them a very short and small triangular whitish plate. Abdomen of the female as long as the wings, compressed on the more enlarged apical third; colored as the male; genital parts in the last segment above yellow, split, surrounded with strong black bristles; below two short thick black appendages. Legs short, pale yellow, much sprinkled with black, with white and black hairs; tip of tibiæ and of all joints of tarsi (the fourth entirely) black; spurs brown, as long as the two basal joints;

claws brown, as long as the spurs. Wings narrow, with fringes on hind margin, which is very little emarginate before tip; hyaline; venation pale interrupted with brown; base of numerous forks and around many transversals brown; front wings with many large rusty-brown round spots along the mediana and submediana; apical half of costal space with two series of areoles; hind wings similarly spotted, but without the large rusty-brown spots.

Length of body, male, 38 to 45 m.m.; female, 28 to 31 m.m.; exp. al., 40 to 50 m.m.

Habit., Millin, Scriven Co., Georgia; July, Morrison. I have before me two males and three females; it is a very pretty species and doubtless Rambur's *M. nebulosus*.

I had accepted this species to be *M. contaminatus* Burm., which is, with a short diagnose, only mentioned by his *M. irroratus*. Mr. Taschenberg describes a female, which is not labeled, out of Burmeister's collection. This female belongs doubtless to *M. conspersa* Rbr.; he calls the spurs of the anterior legs shorter than the first joint of tarsi, but these are probably spines. If this is really the type of Burmeister, and I have no doubt of it, the name has to be dropped, as it belongs to *M. conspersa*.

3. *Brachynemurus versutus* Walk.

Myrmeleon versutus Walk., 331, 51; Hag. Syn. Neur. N. Amer., p. 238, No. 8.

Black, very slender, faintly villous; head narrow; front shining, yellow, above a broad black band, notched in middle below, narrowly yellow around the eyes and around the base of antennæ; a black longitudinal line from the middle of the notch to the epistom, where it is enlarged and united with a larger transversal black band (which is sometimes divided into four spots) on the epistom; labrum black shining with yellow side-margins; vertex elevated, rounded, black, with a transversal yellow band, interrupted in middle, and a posterior one, representing a larger yellow spot on each side, and a smaller middle one, a little before them; antennæ of male much longer than head and thorax, about 10 m.m.; of female shorter, about as long as head and thorax, 7 m.m.; long, filiform, a little thicker to the tip, bluntly pointed; those of female a little more enlarged on tip; blackish-brown, the two basal joints shining black; palpi yellow, apical joint of the maxillary black shining, and the two foregoing black.

externally ; labials scarcely longer, last joint shining black, except at extreme base, long, a little inflated, but the apical half thinner. Prothorax yellow, as broad as long, a little narrower in front, with two broad black stripes, each of which includes a yellow dot in front, and another behind them ; meso- and meta-thorax yellow with two interrupted black longitudinal bands and some spots ; sides below the wings black with yellow stripes and dots. Abdomen of male very slender, much longer than wings, 40 m.m., blackish-brown, shortly villous, three basal segments dull yellowish above, with a fine dorsal median black line, the other segments black, with a fine yellow dorsal line ; appendages testaceous, more yellowish at base and tip, with long black hairs and bristles, long, but shorter than the segment before last, straight ; between them below a very short triangular yellow plate ; abdomen of female as long as wings, stouter, enlarged and compressed to the tip ; same coloration ; genitals yellow ; upper part inflated, with many strong black spines ; below two very short cylindrical yellow appendages. Legs yellow, largely sprinkled with black, with numerous hairs ; tip of tibiæ and of all joints of tarsi black ; spurs brown, as long as the two basal joints ; claws brown. Wings hyaline, thickly and almost equally covered with small brown dots, which are all at the base of the small forks, and on base and tip of the transversals ; veins brown interrupted with white ; pterostigma larger, bright yellow ; apical half of costal space with forked veins ; wings around and on the veins hairy.

Length of body, male, 42 to 46 m.m. ; female, 28 m.m. ; exp. al., 55 to 60 m.m.

Hab., San Luis, Mexico ; September and October, Dr. Palmer ; three males and six females. I think there is no doubt that this is the species described by Walker after one male.

NOTE ON LATE PAPERS ON THE NOCTUIDÆ.

BY A. R. GROTE, A. M.

My last paper in the Proceedings of the Am. Philosophical Society, Philadelphia, contains a number of typographical errors, the most serious of which I corrected subsequently by an "errata" in a later volume, not

being able to see the proofs. This paper reviewed the main and first two groups, leaving the Fasciatæ (*Catocalinæ* Pack.) and the Deltoids unreviewed. I would recognise five very unequal groups both in structural value and extent. Adopting Packard's nomenclature so far as he went (this author excluded the Deltoids at the time), we may call these groups sub-families, but in Europe my *Thyatiridæ* and the *Brephidæ* are taken out of the *Noctuidæ* as distinct families. We have thus the following classification, which can only be changed by throwing all five together as sub-families, which does not alter the matter in reality. The larvæ of the *Thyatiridæ* are, however, almost Notodontiform.

- (1). Family THYATIRIDÆ.
- (2). Family NOCTUIDÆ.
 - (a) Sub-family *Noctuinae*.
 - (b) Sub-family *Catocalinae*.
 - (c) Sub-family *Deltoidinae*.
- (3). Family BREPHIDÆ.

The groups I have recognised and named may be regarded as tribal with the ending *ini*, as *Hadenini*, *Orthosiini*, *Heliolithini*, *Stiriini*, *Scolecocampini*, etc. The Deltoids contain two such tribes, viz., *Herminiini* and *Hypenini*. My object has been to bring the classificatory terms to correspond with those in Coleoptera as used by Leconte.

In my last descriptonal paper in CAN. ENT., the genus and species (8) *Phiprosopus callitrichoides*, is omitted accidentally on page 132, vol. xv. My work is now to bring our genera into closer agreement with European genera by comparison of types, as I say on page 131 of the same volume, to which I direct the attention of students.

CORRESPONDENCE.

CALLIMORPHA.

Dear Sir: I am sure that Mr. Lyman's article on Callimorpha, with its excellent plate, has given an impetus to the study of this genus. It will be no question with the Derivatists that these forms are all descended from a single species. The test by breeding from the egg must now decide whether these forms have each an independent cycle of its own or are interdependent still. The test for *species* remains to be applied to

them. As yet we can only compliment Mr. Lyman's tact in sorting the moths. I had the opportunity of examining a lot of *Clymene*, taken in the vicinity of Buffalo, and I came to the conclusion that it was possible that the yellow and white forms are yet interchangeable. All the white forms show traces of yellow on costa or body parts. I also possessed an example of var. *albanchora* m. (corresponding to Lyman's fig. 5), which very nearly resembled *interrupto-marginata* as to the brown markings, but on a white ground. I believe it is Dr. Packard who first drew attention to the interesting fact that our Callimorphas are buff and white, corresponding to the prevailing colors of our *Arctiinae*, whereas the European species is gaudily tinted, agreeing with the brighter European representation of the sub-family of which it is a member. Like *Datana* and *Hemileuca*, *Callimorpha* is an example of a generic group in which the species or forms are more nearly related than usual, and is thus one of those assemblages which I have called *Progeneric*.

A. R. GROTE.

NOTES.

MR. ALFRED WAILLY, Tudor Villa, Norbiton, Surrey, England, is anxious to obtain specimens of the wild Silk-worms of all parts of the world for exhibition in the Department of Sericulture at the Paris International Exhibition of 1889. In order to make the exhibition as complete as possible, he wishes to obtain specimens of live cocoons, in large quantities or small, with names of food-plants for each species, whenever possible, and also specimens of the moths; any specimens sent will be purchased or exchanged, as desired. Small samples (in strong tin or wooden boxes) of live cocoons and specimens of moths, can now be very rapidly and safely sent by Sample or Parcels Post; to avoid the risk of emergence during transit, cocoons should be sent before the end of March. The production of mulberry silk has been so deficient of late years, it is most important that efforts should be made to utilise as many as possible of the wild Silkworms, many of which produce silk of great strength and beauty.

PROFESSOR SAMUEL PIERPONT LANGLEY, LL. D., has been appointed Secretary of the Smithsonian Institution at Washington, to succeed the late Professor Spencer F. Baird.

CHANGE OF ADDRESS.—Mr. C. H. T. Townsend, from Constantine, Mich., to War Department, Adjutant General's Office, Washington, D. C.