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PAPILIO.
III

DEVOTED EXCLUSIVELY TO LEPIDOPTERA.

VOL. IV.

EDITED BY

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EUGENE M. AARON.



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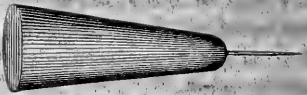
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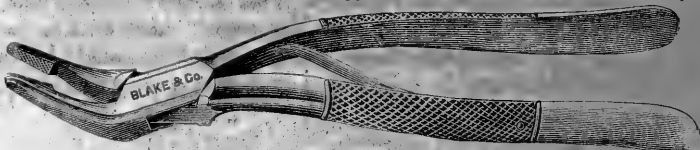


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VOL. 4.
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TO THE SUBSCRIBERS OF PAPILIO.

The pressure of a number of business engagements upon me, renders it impossible for me to continue the pleasant task of editing "PAPILIO," and though the journal appears to be on the high road to success, I am compelled to sever the connection with it, which for three years I have endeavored to make of value to the Entomological world. My regret, however, is lessened by the knowledge that I am enabled to transfer my stewardship into even better hands, and that the work which has been to me such a "labor of love," will henceforth be accomplished by one eminently fitted for the task, whose enthusiasm and ability are well and widely known, and who brings to his newly imposed position a very large experience in the Entomological field in addition to the valuable qualification of a practical business capacity. In introducing my good friend, MR. EUGENE M. AARON to the subscribers to "PAPILIO," I ask for him the kindly assistance and support which have in the past been given without stint to myself, and I bespeak for the journal a long career of uninterrupted prosperity.

New York, January 18, 1884.

HENRY EDWARDS.

In assuming Editorial control of PAPILIO, I have only to say that it will be my constant aim to conduct it in such a manner that the change in its management will not be too conspicuous. It has shown, not only its right to exist, but that its discontinuance would be a serious loss to our Science, and it was this fact alone that induced me, in compliance with the requests of some of its most earnest supporters, to take up the mantle laid down by my accomplished predecessor.

If I am furnished with the necessary amount of MSS., PAPILIO shall appear promptly each month, but in a magazine of this kind the Editor is entirely dependent on his contributors, and cannot furnish "copy" from his own brain whenever his printer may stand in need thereof. Therefore all LEPIDOPTERISTS who wish to bring their researches before their fellows, and who appreciate neat and accurate typography with prompt publication, are requested to make PAPILIO their medium.

EUGENE M. AARON.

DESCRIPTION OF THE PREPARATORY STAGES OF
COLIAS HARFORDII, H. EDWARDS.
 ♀ BARBARA. H. EDW.

BY W. H. EDWARDS.

EGG.—Shape of *Eurydice*, *Eurytheme*, *Philodice*: slender, fusiform, the base broad, top sloping to a round point; the sides ribbed vertically, the space between the ribs crossed by numerous horizontal striæ; color yellow-green, in a short time changing to crimson. Duration of this stage about four days.

YOUNG LARVA.—Length .12 inch; cylindrical, a little thickest on anterior segments; color brown-green; each segment four or five times creased transversely, and on the ridges thus caused are fine black points, with each a short black hair; scattered among these are club-shaped white hairs; head rounded, scarcely at all depressed at top, thinly covered by black tubercles, and hairs which are longer than those on body. Duration of this stage about three days.

After first Moulting: length .16 inch; same shape, and marked with points as before; color dark green; along base a faint yellowish stripe; head rounded, green, the points and hairs black. Duration of this stage about four days.

After second Moulting: length .28 inch; dark green; the basal stripe more distinct, whitish; before end of the stage some larvæ show traces of orange in this band. To next moulting about three days.

After third Moulting: length .4 inch; same shape; color dark green; the band pure white from 2 to 13 inclusive; in the first part of the stage it is stained yellow in middle, later the yellow has changed to red; head a shade lighter than body. To fourth and last moulting about three days.

After fourth Moulting: length .55 inch; in three days reaches maturity.

MATURE LARVA.—Length 1.1 inch; greatest breadth .17 inch; slender, cylindrical, thickest from 4 to 8; each segment except the extremes creased transversely six times, the intervening ridges flattened; on these are many fine conical black points, each giving a short hair; on dorsum the hairs are gray, on sides and beneath white; along base, from 2 to 13 inclusive, a continuous white band, through middle of which runs a stripe of vermillion, and the white below this is stained yellow; under side dark blue-green; feet and legs green; head sub-globular, a little depressed at top, thickly covered with black tubercles the size and shape of those on body, each with a black hair; color of head lighter green than body; ocelli emerald.

From fourth moulting to pupation about five days.

CHRYsalis.—Length .75 inch, greatest breadth .18 inch, depth .2 inch; compressed laterally, the thorax prominent; the head-case

beak-like, pointed, rounded on the under side, less so on the dorsal side; mesonotum rounded and rising to a low carina; abdomen conical; color yellow-green, the abdomen more yellow than elsewhere and granulated with pale yellow; along the side of abdomen a bright yellow band, through which runs a red or an ochrey line; on ventral side a line of small ferruginous spots; on middle of wing-case a blackish dot, and a series of marginal dots, one in each interspace. One chrysalis, instead of the ventral lines of spots, had a continuous reddish band which crossed three segments. Duration of this stage nine to eleven days. Duration of the larval stages about eighteen days; of the entire period from laying of egg to imago about thirty-one days.

Colias Harfordii was described in Proc. Cal. Acad. N. Sci., Feb'y. 1877, from seven males taken in southern California, the female not mentioned; and omitting here and there an unimportant word or line, thus: Bright lemon-yellow. Primaries with the border moderate in width, equal throughout its entire length, and more or less serrate on its inner edge. The band is divided by the nervures, but never to its extreme edge. Discal spot oblong, yellow, surrounded by black. Secondaries with the border narrower. Beneath, uniform pale orange, a little palest on internal margin of primaries, *and devoid of the black and grayish scales so apparent in Occidentalis and Chrysomelas*. Discal spot of primaries as on upper side; that of secondaries clear white in a brown-pink ring; and there is a faint indication of a row of sub-marginal spots of brown-pink on both wings.

C. Barbara is described in same paper from two females, "the male unknown:" Whole surface light canary-yellow, with a black cloud at base, and a few scattered black scales along the costa. The marginal band of primaries is composed of black atoms, through which the yellow of the ground color is distinctly seen. *It is broadest at the apex, thence narrows slightly, and continues of equal width to the inner angle.* In this respect it *differs greatly from Laurentina, (=Interior), in which the band is apical only, and obsolete before reaching the inner margin.* The discal spot is small, ovate, deep yellow, in a black ring. Secondaries are destitute of any border. The discal spot is circular, pale orange, surmounted by a small spot of same color. Under side of primaries pale lemon-yellow, powdered along the margin with black atoms, more broadly so at the apical and costal edges. Discal spot with the yellow centre very plainly marked. Secondaries more closely and thickly powdered with black atoms, giving a greenish appearance to the surface, and with a dark rose-pink streak at base. Discal spot large, circular, clear white, surmounted by a smaller one, each in brown ring.

In the Proc. Cal. Acad., for June, 1878, Mr. Edwards says that he is inclined to think *Barbara* is the female of *Harfordii*.

The differences between these two supposed species were given in the above description as follows:

Harfordii.

Color: bright lemon-yellow.
 No black at base mentioned.
 No discal spot of hind wing mentioned.
 Under side pale orange, devoid of dark scales.

No pink at base mentioned.
 A faint indication of submarginal spots on both wings.

The chief points of resemblance between the two, according to the descriptions, are found in the discal spots of both surfaces, and the fringes, rose-pink.

Evidently there are two types of this species, the *Harfordii* type, lemon-yellow, no black at base; under side free from dark scales; the *Barbara* type, canary-yellow, black at base, under side of both wings dusted black, the secondaries thickly. Neither of these forms has the fringes of upper side wholly pink; they are rosy, mixed with yellow on upper half of fore wing, and posterior half of hind wing, but the rest, amounting to nearly or quite one-half, is yellow only. On the under side the fringe is always yellow at and near inner angles of primaries, and usually next outer angles of secondaries, the rest pale pink, with more or less yellow mixed through it, but sometimes clear pink.

I have upwards of fifty examples of the species before me as I write, nearly all from San Bernardino, (two bred from eggs sent from that place); of these 7 are females, two of which came from Mr. H. Edwards, marked "type." Also a ♂ from him marked "type." And this series shows that the two types run through both sexes. That is, there are the two sexes of the *Harfordii* type, and the two of the *Barbara* type. It is a very curious thing, and for this reason I go into details at some length. Some of each sex are of a lovely bright and deep yellow, called in the description canary. Some of each are lemon-yellow. The typical male has no black at base; a bred female shows the same peculiarity. On the other hand, many males have the black at base as dense as in the type *Barbara*. On the under side the type males are devoid of black scales, but some (*Barbara* type) are just as much dusted over both wings as the type female, the hind wings also having a greenish hue, as stated for the female. The type female has no submarginal spots, but other females have the spots as distinctly as any of the males; on the other hand, occasionally a male has not a trace of these spots, others have a trace, as in the type; but some have

Barbara.

Color: bright canary-yellow.
 A black cloud at base.
 Discal spot of hind wing pale orange, with smaller spot.
 Under side pale lemon-yellow; primaries powdered along the margin with black scales; hind wings more closely and thickly powdered, giving a greenish appearance to the surface.

A pink streak at base.
 No submarginal spots mentioned.

the spots as conspicuous on both wings as in many *Philodice*. There is always a little pink at base of hind wing in both sexes. The discal spot of under hind wing is usually white, but occasionally is diluted rose. Now it is the fact that the males bear a certain resemblance to the males of *C. Interior*. Dr. Hagen, in his *Colias* paper, Proc. Bost. Soc. N. H. xxii, p. 165, claims that in Wash. Terr., he took 4 ♂♂ 5 ♀♀ of *Harfordii* and *Barbara*, and that Mr. H. Edwards "recognized instantly" that they were of that species. It is true, eight of these nine examples had wings of a peculiar shape, "only one has the wings of the common shape," and no males have submarginal spots below. Nevertheless, "they cannot be separated from *Edwardsii*, except as a somewhat extravagant variety connected to the type by intermediate forms." On p. 167, we read, *Harfordii* and "*Laurentina* seem by the shape and color of the upper side to be nearly related to *Philodice*, but otherwise to belong to *Edwardsii* = *C. Interior*. Till the contrary is proved they should be so placed." The probabilities are that not one of the 83 ♂♂ 46 ♀♀ captured by Dr. Hagen in Wash. Terr. and treated of in the paper quoted, was *Edwardsii*. Such wild comparisons as the above are so frequently made in this paper that I must infer that true *Edwardsii* is yet unknown to Dr. Hagen. "Till the contrary is proved they should be placed with *Edwardsii* = *Interior*!" I do not undertake to pronounce on these nine ♂♀ supposed *Harfordii*, except to say that they could not possibly be *Harfordii* if they were *Edwardsii*, and they could not possibly be *Edwardsii* if they were *Interior*. Nothing is more certain than that, but what they were I have no idea. They had "a peculiar shape," unlike that of *Harfordii*, and while they are not described, it is let out that there was no trace of submarginal spots, which is a feature of *Harfordii*. *Edwardsii* is a large species, has a black discal spot without yellow centre, yellow fringes, and the under side is dusted over the margins of primaries and all of secondaries with gray scales like *Alexandra*; the discal spot of hind wings is small, white, with a delicate edging of rosy scales. There is no trace in either sex of submarginal spots. That is a very different thing from *Harfordii*, of either type, and no lepidopterist would have thought of comparing the two.

As to *Interior*, the differences are decisive, and indicate a different sub-group. The description of *Barbara* (♀) given by Mr. Edwards settles the matter in a few words: "border broadest at the apex, thence narrows slightly, and continues of equal width to the inner angles." There never was seen an *Edwardsii* or an *Interior* with a border like that. Mr. Edwards, as if he had a prevision of the memorable raid into Wash. Terr. to be made one summer day by our great Neuropterist, adds: "in this respect it differs greatly from *Laurentina*, in which the band is apical only, and obsolete before reaching the inner margin." *Laurentina* is *Interior*, neither more nor less, and that is

the style of border found in it, and in its next ally, *Pelidne*. There is no other American species with a border like that of the female *Harfordii*. Further, *Interior* of both sexes has a large deep roseate discal spot in a heavy brown ring, and often a diluted reddish ring outside that, and it has no trace of submarginal spots. Its under side is yellow; the males thinly dusted gray, the females rather densely. *Harfordii* in both sexes has a white discal spot in slight brown pink ring, submarginal spots from a nearly obsolete trace to a bold series over both wings; and either little or no dusting on either wing, or if of the *Barbara* type, heavily dusted, and of a greenish hue. The submarginal spots connect the species with *Philodice*, but the *Harfordii* type of male is not *Philodice*, and the border of the female is in an altogether different style from that species. *Harfordii* may stand between *Philodice* and *Interior*, but not as linking the two species. It should be as a sub-group, with a rank equal to either of the sub-groups which contain these two species.

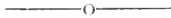
Mr. W. G. Wright had several times taken the two forms *Harfordii* and *Barbara* in copulation, in 1882 and 1883, and was fully satisfied that the two made but one species, though he had not learned that Mr. H. Edwards had come to that conclusion. Two pairs so taken were sent to me, and now stand in my collection. One of these males is canary-yellow, not black at base, the under side much dusted, the submarginal series of spots complete and conspicuous. The other male is pale yellow, with but a trace of the spots on hind wings; the under side moderately dusted; base above black. These are between the two forms. Both females are typical *Barbara*.

Mr. Wright was greatly interested in the peculiarities of this species, and kindly undertook to supply me with eggs. These he obtained by tying females in bags over *Astragalus crotalaria*, which he had observed to be the food plant. Mr. Wright had before this obtained one egg laid on Bur Clover, *Medicago denticulata*, but this egg was not laid till the ♀ had been confined with the plant six days, and she laid no more. That plant could not be a favorite. The females which laid the eggs on *Astragalus* were sent me, and they were type *Barbara*. On 13th of July, 1883, came the first lot. Eight larvæ hatched on the road, and two eggs. Next day came thirty-one larvæ. These had been six days out. The young larvæ looked like those of all other Coliads with which I am acquainted. It is not easy to find distinctions between larvæ of this genus at any stage, but such as there are consist mostly in variations of the longitudinal bands, and of the black spots under the band, or in some cases, on the body above. Comparing the mature larvæ with that of *Philodice*, *Harfordii* is more slender, lighter green, the red stripe more continuous, and below it the band is yellow. There is an absence of black spots, which are almost constantly found in *Philodice* under the band. Nevertheless, of the *Harfordii* larvæ,

one did have small black spots under the band. Comparing with *Eurydice*, the two are very much alike in form, color, surface, but the larva of *Eurydice* has the red stripe macular, and there are peculiar rounded black knobs about the body which are not found in the other *Coliads* named. The eggs and chrysalids of all these species are after one pattern.

I offered these larvæ red clover, that being the usual food plant of *Philodice*, but they at all stages refused this. White clover they eat readily. The same thing occurred with larvæ of *C. Hagenii* from Colorado. Its food plant was an *Astragalus* also, and red clover it utterly refused to touch. I lost many of the *Harfordii* larvæ all through the stages to pupation, either from change of food or change of climate, so that I got but two butterflies at last, 1 ♂ 1 ♀. The former came out 8th August, the other on 6th August. Both were bright canary-yellow. The female has an even border quite to inner angles; no black at base; a slight trace only of submarginal spots, and very little dusting on under side. That is, it is of same type with H. Edwards' male *Harfordii* except as to color, which is that ascribed to *Barbara*. The male is of the *Harfordii* type, only with color of *Barbara*.

In a letter received from Mr. Wright, dated 26th Dec., 1883, he speaks of finding larvæ of *Harfordii* of all sizes up to mature, and, as he says, "this proves that they breed here all winter."



A NEW SPECIES OF NYSTALEA.

BY A. R. GROTE.

Nystalea Indiana, n. sp.—♂. Antennæ shortly pectinate on basal half, simple to tips. Wings long; abdomen exceeding hind wings. Head and collar discolourous ochrey. Fore wings dirty gray, with upright faint brown lines. Two brown costal spots at middle and two beneath them on median vein. Reniform, two brown points connected by a pale shade. Fringe dotted. Hind wings with whitish pellucid base and black borders. Expanse 42 mil. Indian River, Florida.

This has no apical pale patch, like *Conchifera*.

This tropical genus has not been previously found in the United States. There are hardly any but West Indian forms found in Southern Florida, and to work them up properly it needs a full West Indian collection. It is evident that for sometime the synonymy of the species must be uncertain and there is no other way than to describe our species in cases of doubt. Ultimately the collections described by Mr. Walker from the West Indies will have to be overhauled and compared with Floridian collections.

PREPARATORY STAGES OF CATOCALA AMATRIX, Hubn.

By G. H. FRENCH, Carbondale, Ill.

EGG.—Somewhat spheroidal in shape, the longitudinal diameter being .02 inch and the transverse .035 inch. They are ridged longitudinally, 14 of these reaching the punctured area at the apex, these alternating with shorter ones that do not reach so far. The base is scarcely more flattened than the apex. Color very pale dull olive. Duration of this period from 200 to 249 days.

YOUNG LARVA.—Length .12 inch. Color brown, one dorsal and three lateral stripes a little darker than the rest of the body, hairs and head concolorous, the number of feet 12. Toward the close of this period the sides are more of a brownish yellow with four reddish brown stripes, the lower or substigmatal not clearly discernible at first, and on the venter dark brown spots in the centre of joints 4 to 8. Duration of this period six days.

After first Moulting.—Length .35 inch. Color of the dorsum brownish buff, the sides dark purplish brown; by transmitted light it may be seen divided into four more or less distinct lines, the pale alternate lines narrow and faint. Head brown not very dark, with faint traces of lines. Scarcely a trace of the centre of the dorsum being lighter than the rest of the dorsum. Venter pale, joints four to eight with each a central black spot. First and second abdominal legs about one-fourth the size of the others. Duration of this period four days.

After second Moulting.—Length .65 inch. More striped than before, a dorsal stripe somewhat moniliform, the centre purplish brown on a yellow field or the outer part of the stripe yellow. Subdorsal line yellow, between this and the dorsal stripe a stripe the color of the centre of the dorsal stripe. Joint 8 a little raised and all but the centre blackish. Subdorsal region two stripes, the upper like the second dorsal, the lower almost black; the substigmatal line and the one separating the two stripes gray. Head striped with a number of blackish longitudinal lines. Thoracic feet yellow, the others yellow with a black base. The black is a smoky purplish black and not clear. Venter pale yellow with the usual black spots. Duration of this period three days.

After third Moulting.—Length .75 inch. As before, the dorsal space is composed of three stripes, and each side to the lower part of stigmata two. The central of the three dorsal stripes somewhat elliptical on each joint, the central part pale dull reddish yellow, outside of this clear pale yellow. The division between this and the next stripe a more or less distinct black line composed of a series of dots, a similar series of dots, marking the division between the reddish yellow and

the yellow portions of the dorsal stripe. The second stripe dull pale yellowish red. Subdorsal line another series of black dots, but more nearly a continuous line. Below this line of dots a pale yellow line bordered below with another line of dots, a similar pale yellow line and bordering lines of dots separating the two lateral stripes, the series of dots next the lower stripe more prominent. The centre or body of the lateral stripes the same as the dorsal in color. Substigmatal line pale yellow bordered with black. These black lines are so fine that they make but little of the color of the surface except the lower lateral one. Joint 8 elevated in the region of the posterior dorsal piliferous spots, back part of the elevation on back and sides mostly black, except the pale yellow lines; more black also on posterior part of joint eleven. Piliferous spots rather prominent, orange, the hairs black. Head paler than the body, a black stripe on each side, and two on each side of the front. Quite a prominent fleshy fringe along the side. Toward the last of this period the general color changes to a grayish red with a yellow tinge between the joints. Duration of this period three days.

After fourth Moulting.—Length 1.05 inches. Pale reddish gray, the stripes as before but faint, indicated principally by the rows of dots. Sides of posterior and anterior parts tinged with black. Duration of this period eight days.

After fifth Moulting.—Length 1.40 inches. Ground color very pale lilac-white, the body still having some of the appearance of stripes between the joints, but the general appearance is of a uniform color with rows of black dots. Joint 8 still elevated, and the posterior pair of piliferous spots on joint 11 more prominent than the others, pointing back and with an oblique black mark from behind them forward. Middle of joint 8 yellowish with black mottlings on the sides running back to abdominal legs on joint 9. Head nearly a clear color, a black line down the sides of the cheeks and another fine one back, a little brown in front. Stigmata pale brown, finely ringed with black. A little faint yellowish along the back, head and legs with faint brownish tinge.

MATURE LARVA.—Length 3 inches; width of head .17 inch; of joint 8, .35. Height of joint 1, .15 inch; of joint 8, .35, tapering gradually each way from joint 8, the place where the measurements taken being a little elevated. More distinctly striped than at the beginning of the period, there being three dorsal and three lateral to each side; the central dorsal pale, the parts on each joint somewhat elliptical, the broad part between the joints the narrow in the centre. The whole body dotted with fine black dots that seem to be as during other periods. The second stripe on dorsum darker, more intensified on joint 8. The darker stripes are made darker by the slightly darker ground color. First lateral stripe pale, the dots gathered in its centre in slightly elliptical

masses, much as in the dorsal, wider than the next. Stigmatal stripe dark, including the dark brown stigmata. Below this a pale stripe that reaches to the fringe. Color of all the stripes gray, slightly flesh colored in the paler ones. Elevation of joint 8 more distinctly black in the dark stripes, the central fulvous on the elevation without the black dots. Piliferous spots orange, rather inconspicuous except the posterior dorsal pair of joint 11, which are prominent and project backward. Head mottled with pale brownish, otherwise as at beginning of period. Three of the ocelli black. Legs pale. Venter pale without the black dots, the centres of joints 4 to 8 with purplish black spots, traces of same on other joints. Duration of this period twenty-five days.

CHRYsalis.—Length 1.25 inches, length of wing and tongue cases .65 inch, these reaching to the posterior part of joint 5. Shape to joint 5 cylindrical, the rest of the way conical. Depth of thorax .40 inch, of joints 2 to 4 .38. Head, thorax and wing cases chagreened, rather coarsely, the head end rounded, eye cases not very prominent. Abdominal joints punctured, tip ending in six hooks in three sets of two each as to length, the two longer turning outward, the two short at the base turning inward. Color dark chestnut-brown, covered with a glaucous powder. Duration of this period from twenty-eight to thirty-four days.

October 14, 1882, a female *Amatrix* was brought to me, from which I obtained the next day 261 eggs. These began hatching May 3rd, 1883, and continued hatching to June 21st, making the egg period from 200 to 249 days. Only the few that hatched first were fed, and the greater part of those failed to reach maturity, owing mainly to a form of bacterian disease that has prevailed in the most of the species of caterpillars I have attempted to raise this year, and it has not been confined to the breeding cages, but has been as destructive in the fields. Two imagines were raised, one pupating June 21, and producing the imago July 25, the other pupating July 8, and hatching August 3. This gives us a minimum period of 277 days from the egg to the imago. Supposing that the difference in hatching of the eggs noticed here is their usual way, this accounts for fresh specimens being found in the woods from August to October, and I think very likely with a sufficient number of eggs other species would show a similar trait. I am of the opinion that all our species are single brooded, this being based on observations of different species in the woods, and rearing three different species.

This species was fed most of the time on Cottonwood, though they were fed for a few days on Lombardy Poplar. In pupating they spun leaves together, lining the leaves with a very thin cocoon of silk. Both specimens obtained were males, one with the fore wings the uniform gray, the other with the dark longitudinal shade through the middle of the wings.

NOTES ON MEXICAN LEPIDOPTERA WITH DESCRIPTIONS OF NEW SPECIES.

BY HENRY EDWARDS.

It has recently been my privilege to examine a magnificent collection of Lepidoptera, captured chiefly in the State of Vera Cruz, Mexico, by Mr. William Schaus, Jr., many species in which appear to me to be new to science. It is, however, ~~im~~possible that some of those now characterized may have been described in the "Biologia Centrali-Americana," but as that magnificent work is inaccessible to me, I venture to put upon record my own descriptions, even at the risk of creating a few synonyms. For the following species I have searched in vain through the recent publications of Walker, Butler, and others, and unless they are known to the authors of the "Biologia," I think I am justified in my present course. It is a matter of great personal regret, and a great loss to science, that Mr. Schaus has, for the present at least, been compelled to leave Mexico, and abandon his observations upon the insect fauna of the interesting region explored by him. He had already done much toward a knowledge of the transformations of many rare species, and had exhibited so much zeal and intelligence in his work, that his cessation from labor in this enchanting field is greatly to be deplored. In a few years Mr. Schaus would undoubtedly have become one of our foremost entomologists, and it is earnestly to be hoped that he may yet be enabled to follow the study of the science he has done so much to illustrate. The types of the species now noticed are either in my own collection or in that of Mr. B. Neumoegen. I hope to continue the description of other forms in future numbers of "PAPILIO."

SPHINGIDÆ.

Amphonyx cluentius, Clem.—Palpi dull buff, blackish above. Antennæ sordid white, shading into brownish at their base. About the base of the legs are some dull buff hairs—the tibiæ are reddish brown, the tarsi a little darker. Thorax and head blackish brown, the former without distinct stripes, but with buff hairs intermingled, a roundish blotch on the sides, and a streak of the same color at the base of the wings. Abdomen blackish, a gray shade on disc, and a narrow black discal line on four posterior segments. The lateral spots are five in number, bright orange, margined in front with black, and reduced in size posteriorly as in all the genus. Primaries blackish brown, with a fawn-colored shade along the internal margin, widest at base, and enclosing some rather broad velvety-black waved lines.

There is also a black shade touching the buff patch at the base of wings. In the middle of the wing is another fawn-colored shade, reaching from near the centre to posterior margin. A black deeply-indented line runs sub-marginally from interior margin nearly to apex, where it branches into two forks, one slightly indistinct, going direct to apex, the other becoming creamy-white, and touching costa about its posterior third. Behind this last, and nearer to apex, is a small oblong black patch, bordered in front with cream-color. There is also an obsolete cream-colored dentated line near the base, running toward the disc, and a very indistinct cream-white discal spot. The discal field is also clouded with velvety-black. Secondaries rich black, with rather narrow yellow semi-transparent band, reaching from the costal margin to the centre of the wing, and cut by the black nervules. Nearer the base is a large, nearly ovate orange spot, below this, and nearer to anal angle, another smaller spot of the same color, while the abdominal and anal margins are wholly orange, the former more broadly so. The exterior margin is more deeply toothed than in other species of the genus, the dentations being distinctly edged with yellowish. Beneath, the abdomen is wholly buff, with five black triangular patches, the primaries are brownish with a bright orange patch from centre of wing to near the base of the internal margin, and another orange streak at extreme base. The secondaries are also brownish, showing the orange semi-transparent streak, and three basal dashes of same color.

Exp. wings 133 mm. Length of body 73 mm.

Nearly allied to *A. Anteus*, Cr., and its variety *A. Medor*, Cr., but differing in its much darker color, and in the presence of five, instead of three orange spots on sides of the abdomen.

Diludia collaris, Walk.—This name, which has hitherto gone as a synonym of *D. Brontes*, Dru. must be restored. Specimens taken by Mr. Schaus prove its distinct character. It differs from *D. Brontes*, by the dark medio-costal triangular space which encloses the white discal spot, and by the fewer distinct undulating black lines, and from *D. Jasminearum* LeC., by the absence of the black streak, which in the latter species passes obliquely from costa across median space, to the middle of the posterior margin. There is also in *D. collaris* a more distinct waved black apical streak than in either of the other two species. The lower wings very much resemble those of *D. Jasminearum*, but in the two examples I have seen the "hoary bands" spoken of by Mr. Walker are nearly obsolete. This I do not regard as a character of great importance as in many specimens of *D. Jasminearum* they are strongly marked, in others entirely absent. The present species is very well figured as *Macrosila collaris* in "Figures of N. American Lepidoptera," by J. W. Weidemeyer, L. Calverley, and W. H. Edwards, Plate 18, Fig. 1. Exp. wings 105 mm.

ZYGÆNIDÆ.

Alypia disparata, n. sp.—Allied to both *A. octomaculata* and *A. Wittfeldii*, but differing from both by its more slender form, longer antennæ and abdomen, and narrower primaries with more produced apices. There is a strong character in the presence of a very large and distinct vitreous space between costal and sub-costal nervure, causing an enlargement of the costa as in *A. Lorquinii*, and others. The primaries are more than twice as long as broad, greatly produced at apex; the anterior spot is oval, larger than the posterior, which is sub-ovate. The lower wings are like those of *A. 8-maculata*, the outer spot being quite small, but they are more transparent than in the common species. Otherwise as in *A. 8-maculata*. 1 ♂.

Exp. wings 38 mm. Length of body 18 mm.

Alypia (Agarista) Grotei, Bdv.—Three examples of this rare species are in the collection, one of which has two spots on secondaries instead of one, as stated by Dr. Boisduval. The thorax also has four pale yellowish spots, two in front on the edge of the collar, and two on the sides. These may have been obliterated in Dr. Boisduval's examples. I think this is the insect recently described by Grote as *Alypioides flavilinguis*. The tongue in *A. Grotei* is bright yellow.

Lycomorpha contermina, n. sp.—Nearly allied to *L. pholus*, but differing in the larger field of orange on the primaries, and the absence of that color on secondaries, except along that portion of the costa hidden by the fore wings when expanded. The orange space of the primaries covers two-thirds of the wing, its posterior edge being somewhat waved. Fore femora and hind tarsi dull buff in front. The remainder of the insect is blue-black. 1 ♂.

Exp. wings 33 mm. Length of body 10 mm.

Lycomorpha marginata, n. sp.—Wings above and below dull orange, with very narrow black margin to primaries from middle of costa to near internal angle, the margin being a little widest at the apex. The secondaries have a broader black margin which narrows out as it reaches the anal angle. Thorax and collar orange, rest of body glossy black. 1 ♂.

Exp. wings 19 mm. Length of body 8 mm.

Triprocris aversus, n. sp.—Primaries, lower side of all the wings, and upper side of abdomen bright glossy greenish black. Secondaries above, and all the rest of the body dull black. The wings are narrower and longer than in any of the allied species. It is nearest to *T. atrata*, French, from Arizona. 1 ♂.

Exp. wings 28 mm. Length of body 9 mm.

Ctenucha votiva, n. sp.—Head, front of thorax, base of patagiæ, fore femora, and abdominal tuft bright crimson. Primaries greenish

black. Secondaries of a bluer shade than the fore wings. Abdomen concolorous with secondaries. Wings same color beneath, whole surface with metallic lustre, especially the abdomen. 1 ♀.

Exp. wings 45 mm. Length of body 15 mm.

This species is nearly related to *C. Robinsonii*, Bdv., but differs in having only the last segment of the abdomen red, whereas in *C. Robinsonii*, that color obtains in the five terminal segments.

Ctenucha proxima, n. sp.—Closely allied to the preceding. In this species, however, the abdomen is wholly bronze-black, the only red coloring being on the head, collar, pectus and disc of thorax. The fore wings are greenish black, the secondaries of a bluer shade as in the previous species. Under side wholly blue-black. 1 ♀.

Exp. wings 50 mm. Length of body 18 mm.

Ctenucha modulata, n. sp.—Wholly brassy-black above and beneath, except the head, collar, palpi, pectus, femora and lower side of abdomen, which are bright orange. 1 ♀.

Exp. wings 38 mm. Length of body 14 mm.

The three species now described may belong to Grote's genus *Pygoctenucha*, but I have not Mr. Grote's diagnosis of that genus at hand, and therefore cannot decide this definitely.

LITHOSIDÆ and BOMBYCIDÆ.

Josiodes distincta, n. sp.—Primaries dull brown without any orange band or spots on the upper side. Secondaries with broad orange median band reaching quite to the external margin. Abdominal and hind margins also orange, the latter slightly toothed in centre. Beneath, the primaries have the base and costa for two-thirds its length, and the whole of the median space orange, leaving the internal, apical, and posterior margins black. Secondaries as on the upper side. Thorax and legs dull brown. Abdomen brown-black beneath, orange at sides, and black dorsally. 1 ♂.

Exp. wings 43 mm. Length of body 18 mm.

Josiodes inversa, n. sp.—Closely allied to the preceding, and possibly only the other sex. It differs in having to the secondaries a wide black border, leaving only the abdominal margin and a broad median band orange, the latter not touching the posterior margin. The orange mark on primaries beneath is of the same shape as in *J. distincta*, but smaller, thus leaving a much larger black margin. 1 ♀.

Exp. wings 42 mm. Length of body 17 mm.

Ameria (Eudule, Hbn.) nigricosta, n. sp.—Bright orange; costal border narrowly black, widening at apex; fringes of both wings black; tibiæ and tarsi orange. 1 ♂.

Exp. wings 24 mm. Length of body 10 mm. Closely allied to *E. invaria* and *E. conformis*.

I have followed Mr. A. G. Butler in referring this species to Hubner's genus *Eudule*.

Melanchroia spuria, n. sp.—Bluish black; primaries with the apex and fringes broadly white. Beneath both wings have the base broadly orange. Thorax with sordid white stripe at sides; collar reddish, rest of body blue-back.

Exp. wings 26 mm. Length of body 9 mm. 1 ♂.

Diopsis nervosus, n. sp.—Smoky-brown; thorax with orange tegulæ; antennæ black. Primaries with a broad white median patch reaching to costa, but not touching internal angle. This mark is narrowest at costa, swollen behind its centre. There is a very distinct, pale orange, circular apical spot, and the nerves at base are streaked with whitish. Secondaries have the abdominal margin broadly, the posterior margin narrowly smoky brown, the rest clear white. On the underside the markings are repeated. 1 ♂.

Exp. wings 28 mm. Length of body 12 mm.

Ecpantheria tenella, n. sp.—Head black below the eyes, cream-white on the crown. Thorax above cream-white, with seven rather large black ovate spots, two on collar, one on each tegula, two on disc, and one on base. Pectus and base of legs dusky black; tibiæ cream-white; tarsi dusky black. Abdomen dull orange at the sides, blackish at base, with a blue-black dorsal stripe on four posterior segments; anal extremity black, beneath cream-white. Primaries cream-white, with six irregular bands of black spots, basal consisting of two spots not reaching internal margin; second of four spots; third of six spots, crossing the middle of the wing; fourth of five spots; fifth of six spots, those at the internal angle being connected with the marginal band, which consists of six spots, the apical being very minute. With the exception of the marginal band the costal spots are always the largest. The nervules are dull-yellow. Secondaries cream-white, dull yellow at base. On anal margin, which is produced, as in all the genus, is a dull-black cloud, bordered with dull yellow. On the underside of the wings the markings are repeated. 1 ♂.

Exp. wings 45 mm. Length of body 18 mm.

Opharus euchætiformis, n. sp.—Fore wings fawn color speckled with brown, with three small dark brown dots in the disc, and two rather larger behind the cell. Secondaries slightly vitreous at the base, dull fawn color at the margins. Under side same as the upper, with a yellowish shade at the base of the wings. Head and thorax concolorous with the wings, as are also the legs. Abdomen bright orange at the sides, with a lateral row of black spots; fawn color at base, with five black dorsal spots. The whole of the under side of body, including the base of the tibiæ, is dull buff. 1 ♀.

Exp. wings 48 mm. Length of body 19 mm.

This species exactly agrees structurally with Walker's genus, *Lep. Heter. B. M.* page 728, the form of the palpi, and the length of the legs serving to distinguish it.

Anisota suprema, n. sp.—Primaries above reddish brown, with faint indication of a basal black band; an oblique black band from near apex to near internal angle, being indeed the sub-marginal band. The nervures are all prominently marked out with black; a clear white discal spot, and the extreme margin narrowly black. Secondaries wholly jet black. Beneath the primaries are dull crimson at the base of costa, this color widening out as it approaches the black sub-marginal band, which is here distinctly seen. Sub-costal nervure pale yellow at its base for one-half its length; rest of the wing smoky, with the nervures black. The same pattern of coloration is repeated on the secondaries. Antennae, head, thorax, tip of abdomen, and fore femora, orange; the rest of abdomen and legs jet black. 1 ♂.

Exp. wings 53 mm. Length of body 22 mm.

A magnificent insect, by far the handsomest of its genus.

Hyperchiria Schausii, n. sp.—♂. Primaries much produced apically, rich olive-brown, darkest at the posterior margin, a straight basal streak of dull ochreous across the wing. At the junction of this with the internal margin arises another streak of the same color, running from the basal third to the apex. The discal mark is irregularly ovate, dull ochreous. Secondaries bright orange, dusty at base. Discal areolet red, with black ring and a black pupil, around which are a few white scales. At the termination of the orange space is a black sinuate line; behind this, following the same course, a rather wider reddish line, while the margin is fawn color. Beneath the wings are pale olivaceous. Primaries with the oblique band very distinct, black, a large black discal spot, in the centre of which are a few white scales; apices and margin dusky. Secondaries reddish along abdominal margin, a small, white discal spot, a waved, reddish brown sub-marginal line, with a faint shading of the same color behind it. Antennae orange. Thorax and abdomen dusky above, reddish fawn color beneath.

Exp. wings 80 mm. Length of body 23 mm.

♀. Similar to ♂, but with the discal areolet of secondaries more distinctly marked on the lower side.

Exp. wings 100 mm. Length of body 40 mm.

It is with sincere pleasure that I dedicate this grand insect to my valued friend, Mr. W. Schaus, whose entomological labors entitle him to the widest recognition, and whose personal kindness to myself merits my warmest regard.

NOCTUIDÆ.

Thyatira Batis, var. **Mexicana**, n. var.—Differs from the European form by its larger size, much darker ground color of the wings,

both primaries and secondaries, and by the pinkish spots, having a larger and darker internal shade. The number and shape of the spots are the same as in *T. batis*. The ground color of the primaries is rich dark olive-brown; the secondaries the same color, with fainter median band, and a little lighter shade at the base.

Exp. wings 44 mm.

Average exp. of *T. Batis*. 34 mm.

Charadra nigracreta, n. sp.—Primaries chalk-white; median band blackish, moderately toothed anteriorly, nearly oblique posteriorly, slightly waved in the middle. Reniform clear white; apex blackish, from whence runs an imperfect black dentate line, interrupted before reaching the internal angle. Behind this some blackish shades, margin black, fringe white. Secondaries smoky-black, fringe white. Head, thorax, and abdomen whitish, with black speckles. Wings beneath smoky; fringes and costa whitish; antennæ testaceous. 1 ♂.

Exp. wings 32 mm. Length of body 14 mm.

Hadena viridis, n. sp.—Primaries bright dark emerald-green, with black blotched markings, and with the nervures marked with bluish. The usual lines are obliterated, but the black marks are arranged in a series of three broken bands. Reniform green, sub-reniform black, both indistinct. Secondaries smoky black. Thorax and abdomen concolorous with wings. Palpi and legs dotted with brownish. Beneath the wings are smoky, the discal mark, and a marginal band on secondaries, distinct. 1 ♂.

Exp. wings 29 mm. Length of body 14 mm.

Hadena metallica, n. sp.—General color rich purplish brown, with metallic lustre. Fore-wings richly shaded with blackish. The t. a. and t. p. lines are distinct, dull red, and in contrast to ground color. The former oblique forward from internal margin to near base of costa, which also has some reddish shades. This line is interrupted near the median nervule. The t. p. line bends outwardly near median nervule, and is joined there by a pale ochreous faint line, which reaches to the nearly obsolete reniform. At base of internal margin a small spot of bluish white scales, and an ochreous spot at internal angle. Sub-marginal points angular, black. Secondaries smoky brown, dusky white at base, fringes whitish. Beneath the wings are dusky, white at base, with rather wide smoky margins, the t. p. line distinct, formed of black dots, and passing through secondaries, enclosing distinct discal spots. Palpi, thorax, legs and abdomen, mottled with brown and reddish above and below. The abdomen has some white tufts at its extremity. Antennæ testaceous. 1 ♂.

Exp. wings 40 mm. Length of body 19 mm.

A very handsome species, somewhat recalling the coloration of *Amphipyra sanguinipuncta*, Gne. from N. S. Wales.

Drasteria magnifica, n. sp.—Primaries rich brownish fawn color, a slight basal line enclosing on internal margin a distinct black velvety spot. On costa some large triangular brown blotches, not extending beyond the median nervule, some faint brown waved median lines, and an oblique sub-marginal line. Behind this a double row of black points, and a regularly toothed marginal line, the dentations rather deep; margins brownish. Secondaries smoky, with ochreous waved median shade. Abdominal and external margins also ochreous, the latter with toothed marginal black line. Thorax brownish. Abdomen ochreous smoky, tip ochreous. Beneath wholly ochreous, with smoky shades on primaries. 1 ♂.

Exp. wings 58 mm. Length of body 25 mm.

The largest species of the genus known to me.

GEOMETRIDÆ.

Calledapteryx opinaterata, n. sp.—Body and wings ochreous brown. On the primaries is a broad median space, widest on costa, constricted in the middle, and widening again to internal margin. This space is edged in front with a brown distinct line. Posterior edge brown on costa, whitish in the middle, the median nervules also whitish. The posterior margin has a brown dash at the base of the sinus, the other spaces being freckled and clouded with darker brown. Secondaries a little more ochreous than primaries, with similar median space, edged with brown and whitish, and very deeply toothed externally in the centre. Some whitish shades near anal angle, and a dark brown shade at base of costal prominent tooth. Beneath wholly ochreous, with brown freckles, most distinct on the margin of the wings. 1 ♀.

Exp. wings 40 mm. Length of body 15 mm.

As far as I know this is the second species of the genus yet discovered. It is very like *C. dryopterata*, Pack. (Monog. Phalænidæ, p. 313) but is much larger, differing also in the form of the band on primaries, and by the absence of the dark shades on the internal margin.

Mecoceras Schausaria, n. sp.—Bright apple green, with a slight bluish tint. The costa is pale, and on the wings are numerous bright red dots and dashes, almost invisible without a lens. There is an oblique submarginal band common to both wings, yellowish, with some red spots, a more distinct red spot as the band reaches the internal margin, and again at the anal angle. Beneath wholly pale green. Legs and abdomen whitish beneath, both with long hairs, especially on hind tarsi. Antennæ testaceous. 1 ♂.

Exp. wings 45 mm. Length of body 22 mm.

Somewhat resembling *M. peninsularia*, Gr. but the color is much brighter, and the bands and spots less distinct.

Drepanodes vehemensaria, n. sp.—Ochreous. Fore wings very much falcated, with a broad brown irregular band from apex to middle of internal margin, and carried along the secondaries to middle of abdominal margin. On primaries, within this band, are several brown blotches, the basal being the largest. Behind it are some smaller specks, the same coloration and markings also obtaining on the secondaries. The whole surface of both wings covered with brown dots and wavy lines. Beneath paler, with the markings repeated. Thorax and abdomen concolorous, with brown shades. 1 ♀.

Exp. wings 40 mm. Length of body 18 mm.

Geometra iridaria, var. **consequaria**, n. var.—In this form the costal border is very distinctly freckled with black, the oblique sub-marginal line very broadly bordered with white, and the whole of the nervules behind this line are very prominently shaded with white to the posterior margin of both wings. Antennæ white, with black spots on basal five joints. Abdomen green above for basal five joints, the rest white. Beneath the fore wings are green, the hind pair white, lines less distinct than above. Near base of hind wings some distinct small black blotches. 1 ♂.

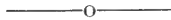
Exp. wings 31 mm. Length of body 15 mm.

I have also received this form from Georgia and from Florida.

PYRALIDÆ.

Metræa argentalis, n. sp.—♂ size of *M. osternalis*, Gr. Pure silvery white, with black basal dentate line not extending from internal margin beyond the median nervule. In front of this is a single black dot and behind it a double black dot. A sinuous and very distinct sub-marginal black line, broken into spots at the apex. Lower wings wholly silvery white. Under side with the lines of primaries very faintly displayed. Head, thorax, and abdomen pure white.

Exp. wings 32 mm. Length of body 14 mm.



DESCRIPTION OF A NEW HEMILEUCA.

By W. G. WRIGHT.

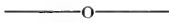
Hemileuca Electra, n. sp.—♂ expanse 2.25 to 2.50 inches. Head bright rust-red; antennæ dark red or reddish black. Prothorax white, with tinge of yellow; patagia black, bordered and tipped with white; thorax black above, red below. Abdomen bright red above, below black with white bands at each segment. Legs black; body slender, comparatively, with red anal tuft; length .85 inch.

Fore wings narrow, two-fifths as wide as long; white and black, sub-diaphanous, basal third apparently reddish from the showing

through of the red under side. Costa strongly concave, edged with black; outer margin with narrow black border, through which some of the nervures cut as white lines. In hind angle is a large ovoid space extending over half way to apex, darker, yet more transparent than any other part from absence of the opaque white scales, sparingly dusted with minute black scales, and across it the nervures are deeply covered with black. An oval spot of dense black overlaid with white scales in the middle occupies the basal half of interior margin, in its widest part extending half way to costa and connected therewith by a black band. Discal lunule very large, irregularly oval, white overlaid with reddish yellow, and bordered with dense black. Hind wings rust-red, with scattered black scales on costa, and a narrow border of black sharply defined, broadening toward anal angle and ending thereat; near inner margin an indefinite, smoky, longitudinal cloud; discal spot very large, quadrangular, black. Beneath, costa of fore-wings narrowly edged with black, a thin dark border on outer margin, the basal part of wings rust-red, the color becoming obsolete, but following the nervures throughout. Discal spot as above. Hind wings wholly red, with a sharply defined border on outer margin narrower than on upper side. Discal spot as above, but cut by a faint white transverse line.

Habitat:—Southern California. Described from 2 ♂ taken on the wing, flying high, near San Bernardino, Cal., in Oct. 1883, by the author, and now in his possession.

Following Drury, this name is given for that daughter of Atlas—the “missing Pleiad.”

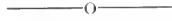


A NEW SPECIES OF GNOPHÆLA.

BY G. H. FRENCH, Carbondale, Ill.

Gnophæla Arizona, n. sp.—Expanse 1.90 inches. In color and marking this resembles *G. Hopfferi*, but in shape of wings is more like *G. Vermiculata*. Thorax black, on the prosternum a patch of orange hairs that extends up to the humerus and over the front of the anterior femora. Abdomen steel-blue, five more or less distinct whitish spots on each side. Ground color of wings black, the hind wings with a steel-blue reflection in a certain light. The pattern of markings similar to *Hopfferi*, but is of a paler whitish yellow color, with the following differences: of the three central spots to the primaries, the discal and submedian are pointed next the body, and the anterior and posterior of the four terminal ones are very small. The secondaries have three medio-basal spots arranged similar to those on the primaries, a little less pointed basally, and the second or middle one a little smaller. Beyond these a row of three situated in the costal, first and second cells, the first lapping a little in front of the discal, but not as much as in

Vermiculata, the second is quadrate or nearly so, the third ovate. Fringe at apex of both wings anal angle white. In the fringes this form resembles *Vermiculata*, but in the space between the central and terminal group of spots it is like *Hopfferi*. Described from 5 ♂s from Arizona, received from H. K. Morrison.



NOTES ON LEPIDOPTERA.

PAPILIO ANTIMACHUS, Drury.—Several specimens of this rare and remarkable butterfly are now known to exist in collections, though until within the past few years nothing was known of it beyond the type specimen now in the collection of the Hon. Wm. Macleay, of Sydney, N. S. Wales. This was purchased at the sale of Francillon's collection for the enormous sum of £30 sterling. In the Hewitson collection are now two others, taken by Mr. Rogers and Miss Diboli. The former of these cost Mr. Hewitson £20. Other examples are in the cabinets of F. J. Horniman; C. Ward, of Halifax; H. Grose Smith; Thomas Chapman, of Glasgow; B. Neumoegen, N. York; Herman Strecker, of Reading; Honrath, of Berlin; and C. Aurivillius, of Sweden. A battered example was sold at Stevens' rooms, London, for £5. Probably about fourteen examples are now known. The home of the species is the West coast of Africa, from Sierra Leone to the Gaboon River, where it flies in the hottest sunshine.

HENRY EDWARDS.

PACHYLIA FICUS, L. is very destructive in its larval stage to the Eucalyptus trees planted in various parts of the State of Vera Cruz, Mexico. In some districts the whole trees are stripped of their foliage. It is somewhat singular that the larva should leave its general food, which is the leaves of *Ficus* and kindred genera, for those of an imported plant, of a very different natural order.

W. SCHAUS, JR.

DENUDATION FOR STUDY.—Will some of the readers of *PAPILIO* who have succeeded in denuding the wings of Butterflies without injuring them for the study of their neuration, favor me with their methods?

I desire to prepare a series of wings in this condition, but have so far failed to discover a good process.

E. M. AARON.

NOTES ON AGROTIS VORAX, n. sp.—The body light brown or gray, the lower side of a beautiful pale greenish metallic hue, with two parallel rows of black points lengthwise. About middle of August I observed the caterpillar forming an "army worm," thousands marching, or rather wriggling across roads and stones and fences to attack a new tree, after having left a former one leafless; they choose young ash trees, making their way up the green stem, of about four to six inches thickness. While feeding they are continually shaking one end of their body, either holding on by fore or by hind legs.

The larva is chocolate color, scarcely over an inch long; emaciated, thin, in spite of all feeding. The next thing observed about them was that, coming to the ground in thousands, skinny and meagre, they bored themselves into the hard soil, leaving a small sandy tumulus outside. Forming afterwards such a bulky chrysalis and heavy moth, one might conclude they continue their feeding under ground. On September 4th the moth made its appearance from my chrysalids in captivity. In October only they were observed generally abroad, and came for shelter to the houses about the time of a snow-storm on the 4th of October.

JAMES BEHRENS, San Francisco.

ERYCIDES OKEECHOBEE, Worthington. Careful comparison of this large Hesperid, a typical specimen of which has been kindly loaned me by Mr. W. H. Edwards, with specimens of *Erycides Batabano*, Lucas, in my own and the American Entomological Society collections, shows them to be the same species. Lucas' description in La Sagra's History of Cuba, is brief, but as full as most of his descriptions, and answers to the type of *Okeechobee* in every particular. Two specimens of *Batabano* from Señor Gundlach, in the collection of the Society, with one from Hayti, and another with no locality label, show considerable difference in the amount of shining blue atoms on the secondaries. The specimens from Marco Island, which Mr. Worthington used in describing his *Okeechobee*, are evidently less sprinkled with these scales than the more southern specimens of the species usually are. I have, however, a specimen from Samana Bay, Hayti, which in every way agrees with the description of *Okeechobee*. Mr. Strecker gives *Batabano* a place in our fauna in his Catalogue, page 163.

E. M. AARON.

PAMPHILA PANOQUIN, SCUD. IN NEW JERSEY.—Various collecting trips to the sand hills below Atlantic City, N. J., have convinced me that this is one of the most interesting collecting fields in the Middle States. The locality consists of a series of sand ridges thrown up by the action of the wind, none of which are over twenty-five or thirty feet high. These are generally bare on top, with the sides thickly clothed to leeward with Everlasting, Mouse-ear, and various small shrubs. In the narrow valleys, between these ridges, trees (mostly Cedar and Holly) grow but little above the highest ridges, above which point they are stunted by the constant winds from the ocean. A few rivulets spread out occasionally, making stagnant pools and marshes, which are surrounded by flags, rushes, etc.; most excellent localities for *Hesperidæ* and *Odonata*. This locality extends for about one mile in length, and varies from one-quarter mile to one hundred yards in width. Though so small in extent, this is the only locality on the island that is attractive to butterflies, and therefore many species may be found in a very small compass. Here, on blackberry flowers, I took, on the 25th of June and 1st of July, 257 specimens of *Pamphila Panoquin*, Scud., a species heretofore catalogued from the Gulf States only. In his description of *Panoquin* (Proc. Essex Inst., Vol. III, p. 178), Mr. Scudder gives Connecticut as a locality, but in his "Systematic Revision" he states that this reference "was erroneous." In the light of the fact that *Panoquin* is one of the commonest butterflies at Atlantic City, it seems probable that Mr. Scudder was right in giving Connecticut as a locality.

Here I also had the pleasure of seeing a fine specimen of *Thecla M-Album* on the 11th of June, and, stranger yet on the 1st of July, a fair specimen of *T. Læta* was taken. This adds another locality to this rare but wide-spread species, which, though never taken in any considerable quantity, has been captured in Canada, Maine, New Jersey, West Virginia, and Arizona.

Among other captures in this locality may be mentioned the following: *C. Eubule*, *M. Phæton*, *P. Batesii*, *J. Cœnia*, *N. Areolatus*, *T. Smilacis*, *P. Massasoit*, *P. Phylæus*, *P. Accius*, *P. Ocola*, *P. Viator*, *P. Delaware*, *T. Persius*, *E. Lycidas*, all of which, with the exception of *P. Batesii*, *N. Areolatus*, and *P. Viator*, have been taken in sufficient numbers to indicate that they are not merely occasional visitors.

E. M. AARON.

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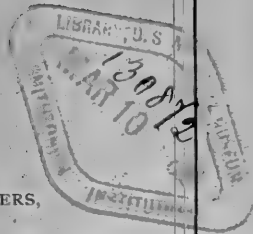
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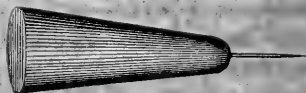
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VOL. 4.
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THE LEPIDOPTEROUS GENUS DATANA.

BY HENRY EDWARDS.

(Read before the Linnean Society of New York, December, 1883.)

It is my purpose this evening briefly to call the attention of the society to a genus of moths well known to entomologists and collectors, the habits of which, however, as far as a close study of the various species is concerned, appear to be but little understood. All persons accustomed to notice the objects of nature are familiar with the caterpillars of these moths, which are found in spring and summer in large numbers upon the terminal branches of our oak, hickory and walnut trees. They are generally bunched together in a somewhat compact mass, and on being disturbed throw themselves around in a singular and somewhat ludicrous manner, jerking their extremities from side to side, and bending the body so that the head and anal extremities meet over the back. They are mostly blackish or brown in color, with stripes of yellow or white, variously disposed in the different species. The destruction they cause is terrible, it being by no means an uncommon occurrence to see whole trees denuded of their foliage by the attacks of these pernicious caterpillars. I have found as many as 130 individuals in one of their bunch-like masses, while others were scattered over various portions of the tree. The depredations they commit are therefore readily understood. It may be said that on the young larvæ being hatched from a bundle of smooth, shining, whitish eggs, which are laid by the parent generally on the under side of a twig or stem, they commence their work of destruction by devouring only the softer parts and the lower side of the leaf, gradually, however, consuming all except the stem. When fully fed they descend the tree independently of each other, enter the ground, and transform to a smooth pitchy brown chrysalis, not enclosed, as a rule, in a cocoon, though it would appear that the insect if not quite deep enough in the soil has the power to protect itself from the inclemencies and changes of tem-

perature by spinning a thin web. There is only one brood, the insect passing the winter in the chrysalis state, and emerging as a perfect moth in July and August. The imagines have the wings of various shades of chestnut or chocolate brown, with a general resemblance as regards their pattern and system of markings, viz. : four or five transverse lines of a darker shade than the ground color, one or two discal dots and a square, oblong, or triangular mark of the same shade upon the disc of the thorax. Common though the caterpillars are, the perfect insect is very rarely met with, and it is only by raising them in confinement in large numbers that the species can be obtained for the cabinet, or for purposes of closer study. My friend Mr. S. L. Elliot, of this city, has been for the past three years devoting a large portion of his time to the breeding of these insects, and it is to his labor and observation that I am largely indebted for the substance of this paper. The genus *Datana* is of rather wide distribution, occurring as far north as Canada, southward to Texas, and west as far as the borders of Nebraska. It appears, however, to thin out as we get towards our northern boundary, and is by no means abundant in Texas, two species only as yet having been reported from that State, while it certainly does not occur west of the Rocky Mountains. At the time of the distinguished entomologist, Thaddeus Harris, whose work on the "Injurious Insects of Massachusetts" was published in 1852, only one species was described, but Harris says, "I have seen on the oak, the birch, the black walnut and the hickory trees, swarms of caterpillars slightly differing from those described, but their postures and habits appeared to be the same. Whether they were all different species, or only varieties of the well-known species arising from difference of food, I have not been able to ascertain." The doubt which naturally arose in Harris' mind is now, through the careful investigations of Mr. Elliot and others, set at rest, and no less than eleven species totally distinct from each other, and bearing unmistakable characters peculiar to themselves, are now known to us. Four of these were described by Grote and Robinson about thirteen years since; one by Walker, one by Drury, and one by Graef. The remainder are new species, and are at present undescribed. One of these new species I desire to bring before you this evening. I am quite aware that there are many entomologists who will maintain that these varied forms are what, for the want of a better term, they are pleased to call "varieties," and the statement that these slight differences are due to the food-plant, or to some climatic or other circumstances, will by no means surprise me. But such objections fall to the ground in the light of Mr. Elliot's experiments, the caterpillars being changed from one food-plant to another, losing none of their characters, but producing from generation to generation the same identical form. And I maintain that however closely allied two or more species may be, if they possess characters peculiar to themselves, which

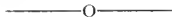
characters are produced and reproduced through successive broods without change, the same thing always producing its progeny exactly similar to itself, it is entitled to rank as a species, and not as a variety having a tendency to return to its parent stock. I say here nothing as to the origin of these forms. It is possible, nay more, it is almost certain that they all sprang from one form, but by the law of development they have now become, to all purposes necessary for us, as permanent and fixed as any other species can be, and as such they must in future be investigated. It would be tedious for me to enter upon a minute description of the species of this genus, but I have brought together for your examination the larvæ and perfect insects of many of them, so that you may for yourselves remark their peculiarities, and observe their differences. At the same time I wish to append to this paper a description of the larval and imago stages of one of the new species of which I have spoken, which I have called *Datana Drexelii*, in honor of Mr. Joseph Drexel, of this city, who has done, and is doing much to foster a love for the study of Entomology amongst us. I may here also state that a complete monograph of the group, with colored figures of the species in all their stages, is now in the course of production by Mr. Elliot and myself, which will, I trust, clear up a good many of the difficulties now surrounding these insects. Such a work naturally must occupy a considerable time, but I trust it will not be delayed longer than the close of the next summer.

Datana Drexelii, n. sp.—LARVA, full grown. Head almost globose, jet black, shining, with deep frontal sinus, slightly roughened about the posterior edges. Second segment *wholly* golden yellow. Body black, with four distinct, equidistant stripes of citron yellow, the space between the two dorsal lines being a little the widest. *These lines all become conjoined, and form a yellow blotch of irregular form at the posterior extremity.* A citron yellow line runs along the base of the feet and legs, which is broken at the place of their junction. The anal segment is jet black, with two protracted points. It is very shining, like the head, the rest of the body being dull. The spiracles are dull orange, as are also the swollen bases of the abdominal legs and thoracic feet. Beneath there is a rather broad and distinct yellow median stripe. The hairs are long, few to each segment, dull white, most numerous on the lateral region. Food-plant, high-bush huckleberry (*Vaccinium corymbosum*). Length 1.80 inch.

IMAGO.—Very like that of *D. Ministra*, but differing in the following particulars: the primaries of *Drexelii* have *invariably* five transverse lines, and two darker spots on the disc, while in *Ministra* only four lines and a single spot are to be distinguished. The color is slightly yellower brown, and the thoracic patch always paler than in *Ministra*, while its edges are more oblique, and not constricted, as in the older

species. This latter character is very conspicuous in the females. The posterior spot on the disc of *Drexelii* always rests on the second transverse line, while the corresponding mark in *Ministra* is placed between the first and second line, or in the field of paler color enclosed by these two lines. The tip of the abdomen, too, is usually darker in *Drexelii* than in *Ministra*. It must, however, be admitted that it is difficult to define their separate characters in words, but when a large number of specimens are placed side by side, they are apparent to every observer.

In the pupa stage there is little difference, but the pupa of *Drexelii* is always a little larger than that of *Ministra*, and the spines of the cremaster are decidedly longer.



EUDAMUS TITYRUS, Fabr., AND ITS VARIETIES.

BY EUGENE M. AARON.

PAPILIO TITYRUS, Fabr., Syst. Ent., p. 532, No. 382 (1775).

Thymele Tityrus, Kirby, Cat. Diur. Lep., p. 571, No. 39 (1871).

Papilio Clarus, Cram., Pap. Exot. I, pl. 41, E. F. (1776)

VAR.—*Eudamus Tmolis*, Burm., Rev. Zoöl., p. 33 (1875).

Thymele Tmolis, Kirby, Cat. Diur. Lep. p. 816, No. 54 (1877).

VAR.—*Proteides Zestos*, Hübn.,* Zuträge, 4th 100, p. 9, figs. 615, 616 (1832).

Telegonus Zestos, Kirby, Cat. Diur. Lep., p. 574, No. 29 (1871).

Eudamus Oberon, Worthington, PAPILIO, Vol. I, p. 132 (1881).

The large and interesting Hesperid, *Proteides Zestos*, Hübn.,* seems to have been entirely overlooked by students of the North America fauna until redescribed by Mr. Worthington under the name of *Oberon*. It has, however, been in the possession of collectors, as from Florida, for many years. I have in my collection a specimen from the collection of the late Dr. Asa Fitch, which is labelled "Florida, Sept. '53," and the American Entomological Society possesses three specimens, one of which was presented by the late James Ridings prior to 1870. I have also received this form from Yucatan; Samana Bay, San Domingo; Nassau, Bahama Islands; Matanzas, Cuba; and Sanford, Florida. Mr. Worthington describes it from Marco Island, Florida; and Hübner, and Kirby following him, from Surinam. Strangely enough Dr. Gundlach fails to mention this in his Catalogue of the Diurnal Lepidoptera of the Island of Cuba (PAPILIO, Vol. I, p. 111, 1881); nor does he mention any species that he could have confused with it.

Hübner's description is sufficiently full to identify this species, and his figures of it, as is usually the case with his figures, all that could be

* I feel some doubt as to the propriety of accrediting this form to Hübner, as it is figured in the 4th hundred of the Zuträge, which was published by Carl Geyer in 1832, six years after Hübner's death. The reference in Kirby's Catalogue is erroneous.

desired. Worthington's description agrees in every particular with Hübner's, and a specimen of *Oberon*, kindly given me by Mr. H. Edwards, is an exact counterpart of Hübner's figure, both above and below, so that there can be no doubt that they are identical.

Having settled the fact that *Zestos* is entitled to be catalogued among our North American Rhopalocera, and that it is undoubtedly the same as *Oberon*, the question of its specific worth at once presents itself. Mr. Worthington has pointed out its striking resemblance to *Eudamus Tityrus*, Fabr., but has mentioned the following differences as entitling it to recognition as a good species: "the yellow spots are less confluent and more opaque, the general color deeper and fringes not divided by brown on the veins; beneath, it differs conspicuously in the more uniform color, the purplish cast and entire absence of the large silver spot so prominent in its ally." Before attempting to show that these characters are not of specific value, but on the contrary belong to a rather inconstant varietal form, I would state that my conclusions have been reached with over 160 specimens of *Tityrus* and *Zestos* before me. When compared with specimens of *Tityrus* from the northern portion of the United States and from Canada the yellow spots of *Zestos* are "less confluent and more opaque;" but when compared with specimens from Arizona, Yucatan, Florida, or even North Carolina and Tennessee, it at once becomes evident that these differences no longer exist. I have before me eight specimens of *Tityrus* collected in Arizona by Mr. H. K. Morrison in 1882 and 1883. All of these without a single exception have the yellow spots considerably less confluent than in *Zestos*, and three of them, together with specimens from Tennessee, Florida and Yucatan, have the spots somewhat more opaque, the two larger ones being a deep orange in place of honey-yellow, as is usually the case in *Tityrus*.

Compared with bred and fresh specimens of *Tityrus* the "general color" of *Zestos* is undoubtedly "deeper," but as starving the larvæ will frequently produce this condition, and sudden changes in the temperature always do so, it cannot be used even as a character for varietal differences, much less for specific. Unfortunately many of my specimens of *Zestos* are far from being bright and perfect ones, and therefore I cannot so readily compare the fringes, which certainly seem to be, with one or two exceptions, unicolorous, and not alternately brown and ashy as is usual in *Tityrus*. However, I find among my Arizona and Tennessee specimens of *Tityrus* three that closely approach *Zestos* in this respect; and among my specimens of *Zestos* one that is nearly as bicolorous as typical *Tityrus*, and fully as much so as those from Arizona.

From these comparisons it will be seen that the upper side affords no constant differences, and that consequently it is beneath, that we must look for those characters which should be considered specific. In

Tityrus, as usually found in the Northern and Eastern parts of North America, there is along the outer margins of both wings, beneath, a broad shade of pruinose atoms extending on the primaries from the apex nearly to the inner angle, and on the secondaries from the costal edge two-thirds of the way to anal lobe. This character is almost wanting in *Zestos*, but is in all specimens under my notice, faintly indicated by a reflection which is undoubtedly caused by a slight sprinkling of the same atoms observed in *Tityrus*; so that "the more uniform color" in *Zestos* is only caused by a partial absence of these atoms and not by the entire absence of any positive character constant to *Tityrus*. The uselessness of this character is all the more manifest when *Zestos* is compared with certain specimens of *Tityrus* from Arizona, Tennessee and Philadelphia, in my possession. Two of these, from Arizona and already alluded to, have all the characters of *Zestos* mentioned by Mr. Worthington, except the absence of the silvery spot on under side of secondaries. Those from Tennessee (two) and from Philadelphia (five) were all bred on Locust (*Robinia*), and the Philadelphia specimens were starved so severely that they were the only survivors of thirteen larvæ. These nine aberrant specimens of *Tityrus* approach much nearer to *Zestos* in their uniform coloring beneath than to typical *Tityrus*, from which, as already observed, they also differ in the lack of confluence, and the opaqueness of the yellow spots on the primaries. Together with these characteristics of *Zestos*, these and other specimens of *Tityrus* have also "the purplish cast" mentioned as another peculiarity of the former. This, moreover, is frequently observed in freshly-bred specimens of *Tityrus*, especially those from the Southern States, and in one specimen before me is also quite decided on the apex of the primaries above.

The "entire absence of the large silver spot so prominent in its ally" (*Tityrus*) is now the only character left us whereby we may with certainty distinguish *Zestos* from *Tityrus*, and it remains to be seen whether even this seemingly marked peculiarity is sufficient to warrant their separation specifically.

In the summer of 1882 I had, among other species of Hesperid larvæ, about fifty larvæ of *Tityrus* feeding on *Robinia*. Through carelessness thirteen of these, which were in a compartment of my breeding-cage alone, were overlooked, and no food was furnished them for three days. When discovered two of them had succumbed, several others bid fair to follow their example, and all were much shriveled and reduced in size. This seemed to afford such an excellent opportunity for the observance of the effects of starvation on larvæ, that I continued this neglectful treatment as rigorously as possible until all but seven were dead. Of these seven, one had not sufficient strength to spin its pupa-case, and another died when almost entirely transformed to the pupa state. Of the five remaining ones three emerged on August 4th, another on the 6th, and

the last during my absence from home on the 9th or 10th; this latter specimen was unable to fully expand, and was aborted on one secondary wing. In all five of these specimens the silver spot is much restricted, and in two examples is divided by the ground color of the wings about two-thirds of the way from the lower end, leaving much the largest portion towards the anal angle. In another specimen the silver is confined to a narrow streak slightly broken in two places. This latter specimen is closely allied to one in my collection received from Mr. Herman Strecker, and labeled "*Eudamus Tmolis, Buenos Ayres*" (see Kirby's Catalogue, p. 816, No. 54). These specimens make an excellent "missing link" between *Tityrus* and *Zestos*. Above they have the confluent and less opaque yellow spots of *Tityrus*, and the almost unicolorous fringes of *Zestos*; beneath they have pruinose atoms as in *Tityrus*, and the purplish reflections of *Zestos*; the specimen from Buenos Ayres (*Tmolis*) has the silver spot a mere streak, much less than half the area of that of typical *Tityrus*, and the one from Philadelphia has it but slightly more than half that of *Tityrus*. In both of these specimens, and in another of the starved ones, the restricted silver patch is bordered, largely on the outer side, by a dense sprinkling of scales slightly lighter than the ground color. This has its counterpart in *Zestos*, where there is, to quote Mr. Worthington, "a faintly indicated paler median band extending two-thirds across the wings."

In several specimens of *Zestos* this median band has exactly the general outline of the silver spot of typical *Tityrus*, broad centrally, obtuse below, produced more narrowly above, dentate towards outer margin, deeply emarginate within. Another specimen of *Tityrus* before me, labeled "Upper Amazons," is differentiated from typical *Tityrus* in an exactly reverse manner from *Zestos*. This specimen has the silver area extended, by a dense clouding of silver atoms, to the margin, so that the whole outer half of the wing, except that portion immediately over the anal projection, is overcast with a silvery shade. Nevertheless the outline of the typical patch is indicated, and conforms most nearly to specimens of *Tityrus* from Yucatan.

From the above facts, and bearing in mind the strong tendency to vary found among their congeners, I am convinced that *Zestos* should be catalogued hereafter as a variety of *Tityrus*.

Having seen how starvation for but a few days towards the close of their larval period will change *Tityrus*, and cause them to approach *Zestos* in every particular, it is easy for us to imagine *Tityrus* larvæ constantly under just such conditions as will account for *Zestos* as one of the broods of the former. My correspondent in Yucatan has on several occasions complained to me of the excessive drouth which dried up the grasses, etc., on which the Hesperid larvæ fed, and which consequently made it very difficult for him to obtain them during that

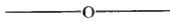
period, and rendered them exceedingly scarce thereafter. *Tityrus* in its more southern limits feeds largely on one or more species of wild bean, which is commonly found in marshes and along small streams, and which is very sensitive to dry weather. It is very evident that if constantly compelled to subsist on an insufficient diet both in quantity and quality (lacking moisture), *Tityrus* would soon develop, in the brood so subjected, a strong tendency toward the *Zestos* form; and as this is exactly what any brood of larvæ attempting to feed during the dry season in the tropics must be subjected to, it seems entirely natural to find that form not uncommon there.

Therefore, until further light is thrown upon the subject, I shall catalogue the species as at the beginning of this paper.

I have dwelt upon this subject much more fully than I should have done had I not considered it a typical case of the unfortunate work that has been done on the *Hesperidæ*. In this case, as in scores of others, characters that are found, on examination of a large series of specimens, to be inconstant, and which, however constant they might have been, were unworthy of specific distinction, have been employed in a manner that can only prove unfortunate for the authors using them, and for the science so abused.

Mr. Worthington's mistake in supposing his *Oberon* to be a new species was quite natural, and a mistake that any one who described with limited material from only one locality would be likely to make, especially as he probably had not access to Hübner's Sammlung. But what reason Mr. W. F. Kirby can give for placing these forms, so nearly devoid of constant colorational characters, in different genera of his catalogue, using *Thymele* for *Tityrus*, and *Telegonus* for *Zestos*, when their structural, or generic characteristics are identical throughout, is beyond our powers of conjecture.

Their being so placed, however, accomplishes good, inasmuch as it calls attention to the utter worthlessness of these genera as at present separated by cataloguers.



NOTES UPON COLIAS CHRISTINA Edw., and C. ASTRÆA Edw.

BY W. H. EDWARDS.

C. Christina was described, Proc. Ent. Soc. Phil., 1863, from 4 ♂ 1 ♀ received from Mrs. Christina Ross, and taken at the Portage of Slave River, about Lat. 60°. So far as I know, these examples were the only representatives of the species in collections until 1883. The male was yellow, with a large deep orange patch on the disk of each wing; the borders broad, black, and like those of *Eurythyme*; the under surface of fore wings yellow, of hind wings covered uniformly with

fine black scales; the discal spot of same wing small, white, in a red-brown circlet, about which were scales of same color; no patch at outer angle; no sub-marginal spots in three of the examples, but traces of such spots in the fourth. On the Plate, in But. N. A. Vol I., this fourth male is represented with three points in the three lower interspaces on fore wing, and three in the middle of hind wing.

The female was wholly pale yellow, without any border; under side thickly dusted, the discal spot as in the male; no patch at outer angle; no sub-marginal spots.

C. Astræa was described Trans. A. E. Soc., 1872, from a single male taken in Yellowstone region by the Hayden Expedition. Upper side pale ochraceous, a little orange-tinted on disk of hind wing; border pale black, of medium width. Under side of fore wing yellow, of hind wing so thickly covered with blackish scales as to conceal the whole surface; the discal spot of hind wing small, white, without a ring, and like that of *Alexandra*; no patch at outer angle, no sub-marginal spots. Subsequently I received another male, from Yellowstone, agreeing in all these points with the type. So far as I remember, this comprises all that was known of *Astræa* up to 1883.

In the summer of 1883, Mr. Wm. M. Courtis, M. E., then at Judith Mts., Montana, sent me four males, *Astræa*. The specimens before received had been much rubbed, and were old and faded before capture. The Mt. Judith males were in fair condition, and the peculiar ochraceous shade was deeper than in the type. This color occupies the same parts of both wings as does the deep orange in *Christina*. But one of these four showed the entire wing covered with ochraceous, except just at base, where yellow prevailed. The type *Astræa* had the discal spot of under hind wing small, white, with no edging. These Judith males all differed from the type here, having a few roseate scales around the white spot, or else a mere thread of roseate. All were immaculate and thickly dusted. With these males came one other which approached *Christina*, but the orange was rather a decided tint than a solid color. There came also two males, E, of deep lemon yellow, with orange-ochraceous on the disks of fore wings only, restricted to the median interspaces, which it filled to the marginal borders. Both had the discal spots as in the first mentioned, were thickly dusted and immaculate.

No yellow females came from Mt. Judith, but there were two white females, and these at the time much puzzled me, as it did not occur to me that they must be albino *Astræa*. These are greenish white; one with a faint broad border reaching quite to inner angle of fore wing, with interior light patches; the other with a slight border on upper half of wing only. Beneath, both are thickly dusted; are without patches at outer angle, and without sub-marginal spots; the discal spot of one is

white in narrow edge of roseate, the other white in ring of red-brown. Captain Gamble Geddes sent me for inspection a large number of examples of *Colias* taken by him in 1883, in the N. W. Territories of British America. Among them were many male *Christina*, typical form. Others shading from deep orange to pale, and into ochraceous. There were also several forms of yellow female, including the immaculate one originally described and figured; also many white females, some of which were precisely like the albinos from Mt. Judith. After a brief and hurried inspection these insects were returned, and I am not able to speak of them now except in a general way. But I have lately received from Captain Geddes for my own collection four typical males, *Christina*; one male (E^2) like E of Mt. Judith lot, that is, with pale orange on disk of fore wings only, the rest being yellow; and one ochraceous male, close to the typical *Astræa*. Of the four orange examples, two have the under side greenish yellow, as originally described for this species; both have a slight red-brown ring about the white discal spot; one has a small red-brown patch at outer angle (the only instance known to me where that mark has appeared in this species), otherwise immaculate. The other two examples have the under side deep yellow; in one of these the discal spot is in roseate edging, with red-brown scales interior to that; otherwise immaculate; the other has roseate edging only, and is immaculate, except that a few black scales in the sub-median interspace of fore wing gives a suggestion of an obsolete row of sub-marginal spots.

The pale male, E^2 , is yellow beneath, immaculate, dusted; the discal spot duplex, each part white with rosy edge, and slight outer ring of red-brown. The sixth male, like *Astræa*, has also a duplex spot, and traces of the three lower spots of sub-marginal row on fore wing, otherwise immaculate, dusted.

The three yellow females differ from each other; No. 1 is like type *Christina* ♀, figured in the Plate; no marginal borders; immaculate beneath, densely dusted; discal spot duplex, the larger part white with some rosy scales amongst the white, a thin rosy edge, and red-brown outer ring. No. 2 is color of No. 1, but with the faintest shade of orange in median interspaces of fore wing; a few black scales about apex and down hind margin suggest a border; under side densely dusted, immaculate; discal spot white in thin rosy edging. No. 3 has decided but pale orange on both wings; and a decided pale black border, with a whitish space in middle instead of a series of spots. Under side immaculate, dusted thickly; discal spot duplex, each part in slight rosy edging.

Of the three white females, No. 1 is like yellow No. 2 except in color, and the white has a faint yellow tint; under side immaculate, dusted; discal spot white in slight red-brown edging. Nos. 2 and 3 are greenish white, with pale broad border entirely across wing; one

has light patches inside this border, the other has none; beneath immaculate, densely dusted; the discal spots small, one in rosy edging, the other in red-brown.

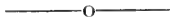
At this present writing I have also before me four yellow females, and six white ones, of Captain Geddes' collecting, but belonging to Mr. Neumoegen. Of these yellow ones, none are uniform in color, like the type; No. 1 has a flush of orange; 2 and 3, more orange; 4 decided orange on both disks. One has traces of sub-marginal series of spots, to wit, a few scales in three lower interspaces on fore wings; otherwise all are immaculate; all are thickly dusted; and the borders of upper side vary from a few scales at apex and along margin to a well defined broad border, with interior light patches; discal spots just as before described.

Of the six white females, two have slight borders, mere traces of the inner and outer edges of a border; one has the half of border on margin distinct; the other three have full width borders, with interior whitish spots; one of these has also a border to hind wings, made up of separated patches lying at the ends of the nervules. No other female, white or yellow, has shown a border to hind wing. Beneath, all are heavily dusted; one has two little clusters of scales on fore wings on lower two interspaces, otherwise all are immaculate; the discal spots of all small, white, in either roseate or red-brown edging.

After seeing this material from localities widely separated, from Montana, and British America as far north as Lat. 60° , I am of the opinion that all the examples are members of one species, to wit, *Christina*. The type male has deep orange disks. *Astræa* is a well marked form or variety; the disks orange-ochraceous, and one style of color grades into the other. One of the Montana examples approached *Christina* in coloring, but the usual Montana type appears to be not orange, but ochraceous. All the males from the far North were deep orange. So also were most of the males taken by Captain Geddes (about Lat. 50° , along Can. Pac. R. R.), but a few showed a change towards the *Astræa* type. It is probable that in Lat. 60° there is but a single brood of the butterfly, and if that is the case, *Christina* is the winter form. If in Montana there are two broods, *Astræa* may be the second brood, the species being seasonally dimorphic. But it seems to me more probable that the case is like that of *Satyrus Nephela*, there being a Northern form and a Southern form, and between the areas occupied by the two, a belt of dimorphism. *Nephela* passes into this belt, and on the other side of it emerges *Alope* (or the reverse takes place), as I have clearly shown in But. N. A., Vol. II. So *Christina* may represent its species in the far North, *Astræa* in the Southern area, while between the two is a belt in which both are found. The species passing through this belt loses one form and emerges under the other. The case of *Occidentalis* and *Chrysomelas* is perhaps one of the same nature.

Of the females, there are several distinct types; the pure yellow, immaculate; the yellow with more or less of a marginal border; the pale orange with medium border; the decided orange with heavy border; and there are intergrades between these. In addition to these are the white females, which seem to constitute a very high percentage of the whole, perhaps fifty per cent., a remarkable number as compared with *Eurytheme* or *Philodice*, for instance, where the albinos probably do not constitute one per cent. I have seen no white female absolutely without traces of a border, but the traces are sometimes very slight, and there are grades just as among the yellow females up to a heavy border, and even a border on hind wing, which is unusual.

As a rule, the discal spot of fore wing is black, but if there is a clear space within the black spot, in the orange examples, this is orange; the spot of upper hind wing is usually orange, but sometimes ochraceous, the latter color perhaps always in albinos. The under side is always densely dusted, often so as to conceal the color of the hind wing. The discal spot of this wing is white, but occasionally a few rosy scales are mingled with the white ones; and either there is no edging at all, or there is a slight edge of roseate or of red-brown. One instance only has been noted of a patch at outer angle; and one only of distinct sub-marginal spots on hind wing. This is the male figured on the Plate, and the spots are seen to be very small, and limited to middle of the wing. On the fore wing never more than three small spots have been noticed, and these are in the lower three interspaces. Some examples have traces of one or two spots, always in the lower interspaces. Both these spots and the patch are exceptional, and are caused by reversion. That is, the original of this and many of our species had a patch at outer angle, and a series of sub-marginal spots on both wings, such as is seen in all the members of the *Eurytheme* sub-group to-day. *Christina* lies between that sub-group and the one which contains *Alexandra*, the type *Astræa* ♂ approaching *Alexandra*.



CAPITALIZING SPECIFIC NAMES.

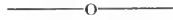
BY W. H. EDWARDS.

Lepidopterists have followed quite strictly the rules of Zoölogical Nomenclature adopted by the British Association, 1842, and amended by Section D, 1865, even where to many of them a further modification in certain points has seemed desirable. At the meeting of the Association, 1865, a report of a new Committee appointed 1863 was submitted and adopted by Section D. Moved by Mr. Gwyn Jeffreys, seconded by Dr. Sclater, "That the report now read be approved and adopted by the Section, and that the rules or propositions, as thereby

altered and amended be printed in the Report of the British Association and recommended for the general use of zoölogists."

The proposition, VI, reads thus: "The recommendation '*Specific names to be written with a small initial.*' The committee propose that this recommendation should be omitted. It is not of great importance, and may be safely left to naturalists to deal with as they think fit."

This sufficiently disposes of the whole matter. The "tendencies" which Professor Riley speaks of, PAPILO III, 165, have nothing to do with the proprieties in the case. I see there is a little bit of a "tendency" already to print the genus names with small initials. Ten years hence this fashion may find followers.



NOTES ON SOME SPECIES OF CATOCALA.

BY JAMES ANGUS.

In the Check List of Macro-Lepidoptera, published by the Brooklyn Entomological Society, some changes have been made in the specific character and relations of the *Catocalæ* which, in my humble judgment, I think had better not have been made without the clearest and most undoubted proof that such changes are called for. In the mysterious life history of the *Catocalæ* in their pre-imago stages, too little is yet known to warrant us in determining as facts what we know only from mere inference. The future may develop facts to necessitate many, even radical changes, but till then we ought to proceed with caution, or the last error may be worse than the first.

In the list referred to, *Angusi* and *Residua* are classed as varieties of *Insolabilis*. I hope I shall be pardoned for briefly giving my reasons for dissenting from this conclusion. It may be considered rather indelicate in me to volunteer to be the advocate of the merits of a species named after myself, but the name is of little moment, and would not, in a scientific point of view, weigh a feather in my judgment.

In some respects *Insolabilis* and *Angusi* are somewhat similar, but in others of material importance there is little or no affinity. *Insolabilis* is one of the most invariable and easily recognized of our black under-winged species. The beautiful silvery irroration covering the bluish gray ground-work of primaries, a constant and peculiar feature, is lacking in *Angusi*. The dark shading on the inner margin of the primaries of the former we never find in the latter, but as *Insolabilis* is so well known I need not speak of it further.

There are three distinct forms of *Angusi*, all of which are more or less incorporated in Mr. Grote's description. All three forms were before him at the time, and the differences noticed; but for convenience

I will take the liberty of giving each a designation by which they may be recognized. The three forms may be distinguished as *Angusi*, *Angusi* (a), *Angusi* (b), Grote.

The first is the normal form, the fore wings of which have none of the black shading of the others. *Angusi* (a) has a narrow, dense basal shade in the direction of, and just reaching the sub-reniform. *Angusi* (b) is the most remarkable; the black shade, which occupies but a small space on the wing of the preceding, is in this enlarged to nearly one-third the surface of the wing; it commences with a sharp point at the base, and gradually enlarges, until it reaches the reniform and sub-reniform, both of which it incloses in its track. The reniform, however, is never obliterated, but with its lighter color shows conspicuously through the dark cloud. There is here, however, sometimes a partial or complete interruption, but not in the strongest marked examples.

These three forms of *Angusi* I have raised in considerable numbers, and in about equal proportions. I have also captured many of the imago. They are generally to be found under the loose scales of the hickory bark, and, like some other allied forms, they are not easily started. Repeated raps with a rod are sometimes necessary to move them from their lair.

While I can see no reason whatever for confounding *Angusi* with *Insolabilis*, I am even still more surprised that *Residua* should have been brought into the same relation. In *Angusi* there is some resemblance to *Insolabilis*, but in no particular can this be said of *Residua*, unless it is in the blackish fringe of secondaries, in which there is a partial, but not an exact, resemblance. Had the reference been made to *Obscura* I would not have been surprised, and would have hesitated to offer a protest, but the fringe I suppose acted as an obstacle in the way. In *Insolabilis* the fringe is always black, and in *Angusi* generally so, but I have in my collection an *Angusi* (b), the fringe of which is as white as any *Obscura* I have ever seen. *Residua* and *Obscura* are quite variable in the color of the fringe; some of the latter are as dusky as the general run of the former. Were it not for the dusky suffusion of primaries and generally darker fringe of secondaries, *Residua* could not be distinguished from *Obscura*. They are, with these slight exceptions, so much alike I would not be surprised if they should yet prove to be the same species, but I would not like to jump to this conclusion without good and sufficient proof established by breeding or otherwise.

Hundreds of *Obscura* have passed through my hands; I am also familiar with their habits, and from my own personal knowledge I have no hesitation in saying that it and *Simulatilis* are identically the same; the latter was described from the largest, and the former from the smallest examples; there is really no other difference.

I might here say that I have a very singular *Obscura* in my collection raised from the larva. It is of a brownish or smoky color; head

and collar very deep brown; but the greatest peculiarity is in the anterior and posterior lines which are not separate, but united on the edge of the costa, and again before reaching the inner margin, or on the sub-median nerve. The generally prominent teeth are entirely wanting, and the indentations are scarcely noticeable. The united lines are heavy and irregular, and remind one of the outline of an island on a map. By a sudden sweep of the transverse posterior portion of the line—for they are but one—between the reniform and sub-reniform and around the lower edge of the latter, that part is left entirely out of the inclosure. The insect is fully developed and perfect in every particular.

I think it was also a mistake to degrade two such beautiful species as *Whitneyi*, Dodge, and *Abbreviatella*, Grote, by classing them as varieties of *Nuptialis*, Walk. The two former may yet prove to be identical with each other. Of this, however, I am doubtful, but they certainly have no specific affinity with *Nuptialis*; the size, form and color are in no way alike. *Abbreviatella* and *Whitneyi* are certainly very closely allied to each other, and yet in some particulars they are quite different. Take, for instance, the marginal band of secondaries. In the eleven examples of *Abbreviatella* in my collection, in ten of them the band is interrupted before reaching the anal angle, forming here a round or oval spot; the eleventh one is almost interrupted. In the thirteen examples of *Whitneyi* I have, not one of them is interrupted; but instead of going into further detail on the relative merits of these two beautiful species I will take the liberty of quoting Mr. G. M. Dodge's opinion from a letter lately received. He says, "I see there is a disposition on the part of some to regard *Abbreviatella* and *Whitneyi* as varieties of *Nuptialis*. I have collected large numbers of the two former, and judge, from my observations, that they are distinct. In Bureau County, Ill., I found only *Whitneyi*. Here all are found, but *Whitneyi* is far the most abundant, and *Nuptialis* rare. *Abbreviatella* appears a little earlier than *Whitneyi*, and the latter can be found in good condition long after the others have disappeared. If the three were identical there ought to be some intergrades, but I have never met with any that were not distinctly one form or the other." In Texas *Nuptialis* is common, and *Whitneyi* unknown. I think the late Mr. J. Boll informed me that he had never taken either *Whitneyi* or *Abbreviatella*.

MONOGRAPHS OF N. AMERICAN LEPIDOPTERA.

The growing interest in Entomology, and especially in the study and collection of the Lepidoptera, seems to indicate that a ready means of reference to certain groups which may be chosen for examination, is among the greatest needs of the science to-day. To endeavor to supply this want in the most practical manner, the undersigned have for three years past gathered material, and solicited aid from some of the most eminent entomologists of this and other countries, and with the promise of pecuniary assistance from influential gentlemen in New York, are enabled to announce that they will shortly prepare for publication the monographs hereafter mentioned. These will be issued as rapidly as possible, the editors only pledging themselves to lose little time in placing the various numbers before the entomological public. The price charged for each will be a very small amount above the actual cost, the object being to bring the series within the reach of all who are interested in this branch of Natural History. Though occasionally dealing with insects of other countries, in the case of homogeneous genera, it will be the object of the projectors to pay the greatest attention to the species of the United States, and it is confidently asserted that with a fair amount of patronage, they will present to the entomologists of America one of the most valuable works ever offered to the scientific world. The species of every group treated of will be figured in detail, and as far as known, the earlier stages will be given. The illustrations in colors will be ample and complete, and peculiarities of the structure will always be given in the most careful manner. Though until the present, only privately announced, the scheme now made public has long occupied the attention and thought of the editors, and they have received promises of support and assistance from many distinguished entomologists. Among the monographs already promised are the following:

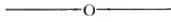
1. The genus *DATANA*, by S. Lowell Elliot and Henry Edwards.
2. *GEOMETRIDÆ*, described since 1875, by Dr. A. S. Packard, Jr.
3. The genus *ICHTHYURA*, by Roland Thaxter.
4. The family *ÆGERIADÆ*, by Henry Edwards.
5. The *COCHLIOPODÆ* (Limacodes, etc.) of the United States, by Henry Edwards.
6. The recently described species of the *HESPERIDÆ*, by Eugene M. Aaron.
7. The genus *ARCTIA*, by R. H. Stretch.

8. The LYCÆNIDÆ of the United States, by W. H. Edwards.
 9. HALISIDOTA and allies, by B. Neumoegen.
 10. The genus EUCHÆTES, by Henry Edwards.

* * * * *

As some groups are so much smaller than others, and as all species will be illustrated (as before stated) in colors, with their transformations as far as known, it will of course be impossible to fix a general price for the numbers, but the assurance is herewith given that no profit will be charged upon the work beyond that sufficient to cover the actual outlay. Further particulars will shortly be issued.

Editors: { Henry Edwards, Wallack's Theatre, New York.
 { S. Lowell Elliot, 538 East 86th Street, New York.



TOUCHING THE SO-CALLED "CONTROVERSY" CONCERNING SPECIES.

BY A. G. BUTLER, F. L. S., F. Z. S., etc.

In a paper published in PAPILO, pp. 151-155, Mr. Elwes comes to the front as a supporter of Dr. Hagen; he says, "Mr. Edwards seems to think just as Mr. Butler did when I ventured some notes on the genus *Colias* three years ago in the Transactions of the Entomological Society, that because a man has not been a lepidopterist, and nothing else all his life, he has no right to speak or to have an opinion on the subject."

I should be glad to know how Mr. Elwes became gifted with such erratic second-sight as to perceive so distorted, not to say suicidal, a picture of my mind; as probably one of the last general entomologists obliged, by "circumstances over which I have had no control," to dip more or less deeply into every order of insects, I should surely be the last to hold a view so narrow. When briefly criticizing an aggregation of names of species within arbitrary limits, by a man who certainly had not reared many (probably not one) from the egg, I commented upon a remark of the author thus: "That it does 'require special training to appreciate' specific differences is a truism which no entomologist who has specially studied any branch of his science will be inclined to dispute; for that very reason it is unwise for any naturalist, when taking up the study of a branch of science comparatively new to him, to plunge at once into the most difficult genus in that branch, and criticize the work of all previous laborers in the same field." Now, in this para-

graph I say nothing about being a lepidopterist, nothing about studying butterflies in the cradle, nothing against another man having an opinion on the subject. What a mountain my snow-ball has become! Does Mr. Elwes seriously think that the study of vegetable life would enable me, for instance, to form an accurate opinion as to the limits of variability in butterflies? I am sure it would not help me one whit more than the study of painting would help a man to play the flute; if the same laws in all their details were applicable to plants and butterflies, the student of botany might be fitted to become, in a short time, an authority on Lepidoptera; so far as I have been informed, however, this appears not to be the case; indeed, Mr. Elwes virtually admits the fact when he says "Perhaps nothing does so much to shake one's faith in the fixity of species as horticulture."

On p. 154, Mr. Elwes is again troubled with his deceptive second-sight; he concludes, from the fact that I have shown up Mr. Pryer's inability to prove his claim to the species of Africa, Borneo, Java, China, and the N. E. Himalayas (none of which he probably ever saw), as mere sports reared by himself from eggs laid by *Terias mandarina* of Japan, that therefore I, "no doubt," feel hurt; I can assure Mr. Elwes that it would take a very great amount of such literature to hurt me, unless, indeed, it is injurious to a man to be amused; I believe it to be morally injurious to a man to disguise a species by either altering its natural coloration, or passing it off as an inhabitant of a country where it did not naturally occur; and I am only too glad when such tricks are exposed; as tests of scientific knowledge they are usually failures, owing to the want of ocular education on the part of those who send them out into the world.

In conclusion I may mention that I published no "Revision of the Genera of *Pierinae*" in the Proc. Zoöl. Soc., London, either in 1881 or any other year, and that the observation which he quotes is in a "Revision of the genus *Terias*," published ten years before that date; moreover, Mr. Elwes has misrepresented me by quoting only part of the paragraph, as, indeed, the "therefore" would lead any quick reader to surmise; one would almost think that Mr. Elwes had the keenness of a publisher in refusing that which would damage his wares; the paragraph runs thus, "My principal object in the present paper is to refer the species of this very difficult group to the genera into which I separated it in my 'Revision of the Genera of the Sub-family *Pierinae*' (Cist. Ent. III. pp. 33-58). I shall not, therefore," etc. Mr. Elwes would have it supposed that in those days of my innocence I shuddered to think that by describing all the species at my disposal I should add a heavy burden to that which, alas, must needs be borne; whereas I simply proposed to clear up before starting afresh.

NOTES AND QUERIES.

MEXICAN LEPIDOPTERA.—I am anxious to state at once, that in my paper on Mexican Lepidoptera (PAPILIO, Vol. IV, page 11), I have redescribed a species of Messrs. Grote and Robinson.

Ecpantheria tenella, mihi, is = *E. leucarctioides*, G. and R.

A typographical error also occurs, page 11, line 7, in which *impossible* is printed for *possible*, thus entirely altering my meaning. HY. EDWARDS.

A NEW ENTOMOLOGICAL SOCIETY.—At a meeting to which the entomologists of Washington and Baltimore were invited, held at the house of Dr. C. V. Riley, in Washington, D. C., on the evening of 29th February, 1884, and presided over by Rev. Dr. John G. Morris, of Baltimore, a resolution was unanimously adopted to establish an entomological society in Washington and vicinity, and a committee was appointed to draw up the necessary regulations and to call a future meeting for organization.

Washington, D. C., March 1, 1884.

B. PICKMAN MANN, Sec'y.

KILLING LARGE LEPIDOPTERA.—I have for many years killed large LEPIDOPTERA (*Bombycidae*, *Sphingidae*, etc.) by hypodermic injection after the fashion indicated by Mr. Blake, but long since discarded cyanide of potassium for carbolic acid and creosote, the preservative action of these and the protection they afford from parasites being manifest advantages. Either causes instant or nearly instant death, or its equivalent, by producing complete paralysis of the thoracic muscles without the troublesome rigor induced by cyanide. Even injections of chloroform, however, are not always sufficient to prevent muscular action in the abdomens of females of the larger species for considerable time, but as the operation undoubtedly induces complete insensibility, and such specimens are usually eviscerated at once, this is not an objection.

Those who do not possess hypodermic syringes can make an efficient apparatus for this purpose by drawing one of the slender glass tubes (known as "glass straws") to a point over a gas jet. If this is done in the middle of the tube a moment's labor with file and forceps will make two slender-pointed "blow-pipes" by means of which the poison can be introduced, this being effected by simply placing the pointed end in the liquid and placing the finger over the other orifice, lifting two or three drops *in* the pipe, inserting the point in the thorax of the victim and blowing into the open end.

C. E. WORTHINGTON.

MR. STRECKER'S COLLECTION.—During a recent visit to Reading I had an opportunity to inspect this remarkably rich collection for the third time. In it I had the pleasure of seeing three fine specimens of *Papilio Antimachus*, Drury, among them the "giant" once in the cabinet of Mr. Chapman; this is believed to be the largest specimen in collections, and was the third specimen captured; it measures within a fraction of 10 inches in expanse. The other specimens measure $8\frac{1}{2}$ and $8\frac{3}{4}$ inches respectively. Mr. Strecker informed me that "the first *Antimachus* cost Mr. Hewitson not £20, but over £200, as I had from himself at the time."

Among other rarities I noticed a finely preserved type-specimen of *Colias Boothii*, taken by the Ross Expedition in 1829. It is a ♂ of the var. *Chione*,

and was purchased by Mr. Strecker for £5. *Erycides Batabano* (= *Okeechobee*) and *Thecla Hugon* were both represented by specimens taken in Florida by Mr. Charles Dury, five or six years since.

Careful comparison of the types of *Limenitis Disippus*, var. *Floridensis*, Streck., convinces me that this is the same insect since described as *Eros*, by Mr. W. H. Edwards. These types do not in any way differ from specimens of *Eros* bred by Dr. Wittfeld, in Florida, with which they were compared. Specimens of *Argymnis*, var. *Erinna*, Edw., from Lieut. Ricksecker's collecting (from whence Mr. Edwards' types came) compared with Mr. Strecker's types of *A. Arge*, showed them to be alike in every particular save the slightly lighter general color of *Arge*. Mr. Strecker's types of this species were received from Dr. Behr, from California; Mr. Edwards' types were from Spokane Falls, Washington Territory.

Fine specimens of the recently described *Hemileuca Electra*, Wright, were also shown me, obtained some years ago from Mr. A. Bolter, who captured them in San Diego, California. This species connects the *Maia* and *Pseudohagia* groups.

Mr. Strecker has recently moved into a house which he has had built with a view to the special requirements of his large collection, and here the student of the LEPIDOPTERA can always feel sure of a hearty reception. It is a fact, however, much to be deplored that the collection is not in some more accessible locality than Reading. But he who allows its inaccessibility to deter him from a visit thereto loses a rare treat, and fails to see the most complete collection in North America of the LEPIDOPTERA of the World. EUGENE M. AARON.

SEXUAL ATTRACTION IN THE GENUS SAMIA.—I notice in the December number of PAPHIO, that Prof. A. G. Cook states that a ♀ *cecropia* attracted ♂ *columbias*, and he asks if any one can doubt that *columbia* is an off-shoot of *cecropia*. By a queer coincidence, the same number contains notes from Mr. Bruce about *ceanothi* attracting *cecropia*, and Mr. Pilate speaks of *cyntia* attracting *cecropia*; and we know that *cecropia* and *gloveri* mate freely. Now, would Prof. Cook say that *ceanothi*, *cyntia* and *gloveri* are also off-shoots of *cecropia*? And will he be so kind as to tell us what he means by an "off-shoot," whether a variety or a distinct species? for we would like to know what relation these moths bear to each other. I think that if others should breed as many *columbias* and *cecropias*, side by side, as several different persons have in this vicinity, and notice the entire absence of variation towards each other in all their stages, they would be more willing to consider them distinct species.

MRS. C. H. FERNALD.

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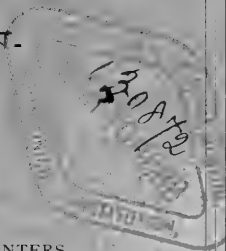
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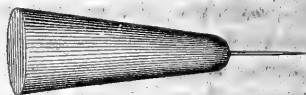
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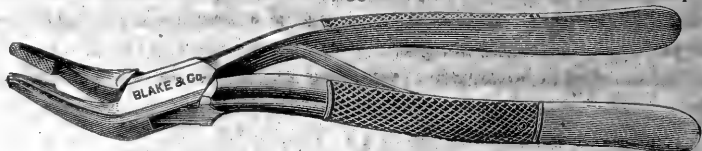


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{ VOL. 4.
No. 3.

SOME NEW FORMS OF N. AMERICAN MOTHS.

BY HENRY EDWARDS.

ZYGÆNIDÆ.

Alypia Hudsonia, n. var.—♀. Greatly resembling *A. Langtonii*, Coup., of which it may probably be a variety. It has, however, *two spots* on secondaries instead of one, the outer one much the largest, and both white. The spots on primaries are larger than those of either *A. Langtonii* or *A. Octomaculata*, the basal being sub-triangular, not ovate. There is no trace, either, of the usual blue scales.

Hudson's Bay district (Captain G. Geddes). Type, Coll. B. Neumoegen.

Pyrrhomorpha fusca, n. sp.—Wings slightly hyaline, dark smoky, as are also the antennæ, lower side of abdomen, and the legs. Head, thorax and upper side of abdomen bright orange.

Exp. wings 25 mm. Length of body 8 mm.

Arizona (H. K. Morrison). Several examples. Coll. B. Neumoegen.

LITHOSIDÆ.

Eulithosia, n. gen.—Head rather small, deeply imbedded in the thorax, which is twice as broad as the base of the head. Palpi very short, almost hidden by the rounded clypeus, with the terminal article acute, conical. Abdomen very little longer than the hind wings, somewhat swollen; ovipositor broad at base, tapering suddenly to a point. Fore tibiæ with long sharp claw. Hinder tibiæ with two long and two short spurs. Wings ample, rather broad, and shorter than in *Lithosia*, with a very glossy sheen. Fringes long; vein 2 widely separated from 3, which latter, with 4 and 5, start from the extreme point of discal cell, and are thence equidistant to margin. Sub-costal vein of secondaries bifurcate towards the margin, where its lower fork almost joins vein 5. Antennæ simple.

A curious genus, somewhat recalling the forms of some small *Noctuidæ*.

Eulithosia composita, n. sp.—Above, entirely orange, of rather a dull shade, but very glossy; the disc of secondaries very slightly clouded with dusky. Beneath, the dusky shade is most apparent on primaries, the costal and posterior margins being brightly orange. Eyes, fore tibiæ and tarsi dusky. Fringes very glossy, paler than wings.

Exp. of wings 22 mm. Length of body 9 mm.

Arizona. 1 ♀. Coll. B. Neumoegen.

Eulithosia thoracica, n. sp.—Cream color, secondaries with a less yellow shade than primaries; the costa of primaries brownish at base. Both wings beneath clouded with dusky, the primaries especially so. Head and thorax bright orange; legs and antennæ dusky; tip of abdomen luteous.

Exp. wings 26 mm. Length of body 10 mm.

Arizona. 1 ♀. Type, Coll. B. Neumoegen.

BOMBYCIDÆ.

Heterocampa lunata, n. sp.—Allied to *Obliqua* and *Subrotata*. The color of primaries is olivaceous drab; the lines all faint, paler than the ground color. Basal line deeply dentate in the middle, the basal space being a little darker than the rest of the wing. Some pale marks on costa, an oblique, slightly dentate sub-marginal line, and a very distinct, black, linear, lunate, discal mark. Secondaries smoky drab on costa and abdominal margins, sordid white in the middle. Beneath, the wings are sordid white, sub-marginal band distinct, clouded on costa with dusky. Thorax and abdomen concolorous.

Exp. wings 44 mm. Length of body 21 mm.

Arizona (H. K. Morrison). 1 ♂. Coll. B. Neumoegen.

NOCTUIDÆ.

Plusia Snowii, n. sp.—Primaries rich brown, with a reddish tint. The t. a. and t. p. lines are bordered with yellow, and terminate on the median nervule, enclosing a very bright brown space. The sub-marginal line is dentate outwardly, and joins the t. p. line at the internal angle, where there is a small orange blotch; margins and fringes paler brown, with a few indistinct orange patches. At base of costa is another obscure orange streak, bordered with brown. The reniform and sub-reniform are fused together, and surrounded by a whitish line, bordered with black. The metallic mark is oblique from median nervule, with a bent streak from about its middle, which again touches the median nervule, the enclosed space being chestnut brown, with a few black scales. Secondaries bright orange, with broad black border, narrowest at the anal angle. Beneath, the wings are all orange, clouded with dusky brown, and with a small discal spot on primaries. The

border of the secondaries is indicated by a dusky shade. Head, thorax and abdomen bright brown, with reddish hairs intermingled. Tibiæ and tarsi pale testaceous.

Exp. wings 30 mm. Length of body 14 mm.

Near Hot Springs, Las Vegas, New Mexico (Prof. F. H. Snow), to whom I have great pleasure in dedicating the species. 1 ♂.

It is a lovely insect, abundantly distinct from any other of our orange winged forms.

Basilodes territans, n. sp.—Very closely allied to *Plusia Howardi*, Hy. Edw., but differing from it in that the bright gold band, common to both species, reaches in the present one to the base of the wing, while in *P. Howardi* it is cut in two before reaching the base, leaving an ovate spot only. The brown patch below this is, therefore, very much smaller in the present species, while on the costa are two distinct brown spaces. The lower wings are also clear white, and not clouded with dusky as in *Howardi*. In all other respects they are similar.

Arizona (Morrison). 3 ♂ 1 ♀. Coll. B. Neumoegen.

I originally described *P. Howardi* from a single specimen found at Prescott, Ariz. Other examples were afterwards taken in the same locality by Mr. J. Doll. Mr. J. B. Smith, who has great knowledge of the *Noctuidæ*, assures me that they both belong to the genus *Basilodes*.

Heliothis suavis, n. sp.—Primaries very pale, but bright, lemon-yellow, with the costa, a basal line, and a sub-marginal line pink. In the cell are also two pink spots of irregular shape, and another smaller one behind the sub-marginal line, near the apex. Secondaries pale testaceous, with the apical margin dusky. Beneath, the wings are all pale testaceous; primaries with a dusky sub-marginal band and two costal spots of the same hue. Secondaries have a pink streak near apex. Head, thorax in front, and some small basal tufts on abdomen pink. Feet and legs also pale pink; rest of body testaceous.

Exp. wings 36 mm. Length of body 16 mm.

Prof. F. H. Snow, near Hot Springs, Las Vegas, New Mexico, 7000 feet; August, 1882. Several examples.

Though differing widely in color, I can find no good ground for separating this exquisite species from the genus to which I have assigned it.

Melicleptria septentrionalis, n. sp.—Closely allied to *M. Oregonica*, Hy. Edwards, but differing in important characters. The basal space of primaries is greenish gray, flecked with black, a blackish median band, equal in width, slightly oblique to near the middle of internal margin. Behind this a white space, clouded on internal margin; then a narrow band, following the course of the median; behind this a pale sub-marginal line, with the margins and fringes darker. The median line is straight on its outer edge, and not outwardly toothed

as in *M. Oregonica*. Secondaries with ground color sordid white; a blackish basal shade, continued along abdominal margin; a large and very strongly contrasted discal spot; and a sub-marginal band, narrower than that of *M. Oregonica*, and more deeply sinuate a little way from the apex. This band encloses a small sordid white blotch. Beneath, sordid white, with black, sub-marginal, slightly waved bands; a very large black discal spot in primaries; a smaller one near the base; and a large one also in secondaries. Thorax and abdomen concolorous.

Exp. wings 25 mm. Length of body 13 mm.

Hudson Bay Territory (Captain G. Geddes). Several examples. Coll. B. Neumoegen.

Acopa pacifica, n. sp.—Primaries dark gray. The t. p. line only slightly oblique, strongly black, with a slight tooth in the middle. Basal half of line apparent; t. p. line oblique from near middle of internal margin to a little below apex, where it is lost in a white cloud, which passes directly along the wing from internal base to apex. Median space shaded costally with white, darker on the internal margin. Reniform, sub-reniform and orbicular, very apparent, white, surrounded by a black ring, and enclosing brownish scales. Sub-marginal space clouded with brownish; a black streak at apex; and the marginal line also black, equal. Fringes grayish brown. Secondaries dusky; fringe white. Beneath, all the wings dusky, secondaries palest, with a trace of a median band. There are also some white streaks about the costa. Thorax concolorous with the primaries, with a large tuft at the base. Abdomen and legs dusky.

Exp. wings 25 mm. Length of body 11 mm.

Arizona (H. K. Morrison). 1 ♂. Coll. B. Neumoegen.

Syneda perfecta, n. sp.—The primaries have the base fawn color, the t. a. line being broadly brown. Behind this is a whitish band, broadest on costa, and limited by the t. p. line, which is fawn color. The space between it and sub-marginal line is shaded with brown, and almost touching the costa is a white sub-oblong patch, with the edges dentate. Sub-marginal band sinuo-dentate, pale. Behind this is a grayish band; margin and fringe brown and white. Secondaries white at base, with a linear discal mark, and a rose-colored stain from middle of wing to external margin. The border is broad, black, but interrupted in the middle by a curved space, through which passes the rose-colored stain. The black border is widest at apex. Beneath, both wings clear white, with the black borders interrupted by sordid white blotches. Discal mark on primaries prominent, joining the border. The rosy stain less distinct than above. Head and thorax pinkish drab above. Abdomen ochraceous; all the body parts, beneath, clear white.

Exp. wings 36 mm. Length of body 16 mm.

Arizona (Morrison). 1 ♂. Coll. B. Neumoegen.

Bears a superficial resemblance to *Cirrhobolina Mexicana*, Behr. Indeed, I see no structural difference in these two genera.

Syneda perplexa, n. sp.—Closely allied to *S. Howlandii*, Gr., and may be mistaken for that species. It differs, however, in the following characters: the t. a. line enclosing the basal space is more distinctly arcuate than in *S. Howlandii*, and more regular in its outline; the median space is broader, and the sub-marginal and t. p. lines are connected on the internal margin, which is not the case with the allied species. The dark space behind the middle is thus of a long triangular form, and the grayish marginal space is much wider than in *Howlandii*. Secondaries orange-red, with the marks exactly as in Grote's species, as is also the under side.

Arizona. 1 ♂. Coll. B. Neumoegen.

If a variety, it is very strongly marked.

Synedoida ægrota, n. sp.—Primaries fawn-color, with dark brown lines and marks. The basal and t. a. lines are obsolete, but the space enclosed by them is covered with small black blotches. In the middle of costa is another rather large triangular blackish blotch. The median space is fawn-color, with a reddish tinge towards costa; t. p. line only apparent near costa, where it is slightly dentate. The space behind this is dusky, encroached upon in dentate form by the sub-marginal line, which is reddish fawn-color; marginal space paler; marginal line equally toothed, the teeth following the course of the nervures. Fringes fawn-drab. Secondaries white at the base, borders very broad, black, occupying nearly half the wing, and enclosing near the middle two oblong white marks. The fringe and extreme margin clear white. Thorax and abdomen fawn-drab. Under side clear white, with a dusky black, sub-marginal, oblique band, common to both wings, behind which are some whitish clouds, and in the middle of the margin of secondaries a black ovate spot, touching the band. Discal mark of primaries large.

Exp. wings—♂ 30 mm., ♀ 38 mm. Length of body—♂ 14 mm., ♀ 16 mm.

Arizona (Morrison). 1 ♂ 1 ♀. Coll. B. Neumoegen.

GEOMETRIDÆ.

Phasiane aberrata, n. sp.—Fore wings pale ochraceous drab, speckled with brown, and with a pale brownish, oblique, sub-marginal line from apex to about 3 mm. from internal angle. The secondaries are sordid white, with very slightly waved, dusky, median line. Markings more prominently repeated on the lower side, with a dusky shade along costa for its basal half, and on secondaries a large, distinct discal spot. Antennæ sordid white, the pectinations blackish.

Exp. wings 30 mm. Length of body 14 mm.

Hudson Bay district (Captain G. Geddes). Several examples. Coll. B. Neumoegen.

I hesitated to place this moth in the genus *Phasianæ*, but I can find nothing with which it agrees so well, the differences being chiefly those of markings. The neuration appears to be the same, and the tibiæ are slightly swollen. *P. aberrata* bears a superficial resemblance to *Scidosema*, but it is a smaller insect.

Antepione imitata, n. sp.—Closely allied to *A. sulphurata*, Pack., and possibly only an extreme variety. It differs, however, in having the bands on primaries quite distinct, and in the costal apical spot being more perfectly triangular in outline than is usual in *A. sulphurata*. In the present form this mark is narrower, and more produced at the apex. The discal dot is very apparent on both wings. The double spot near internal angle is large, and joined to the apical mark by a distinct brown band, while the anterior band is also distinct, and curved a little forward near the costa. On the secondaries there is also a less distinct median band, slightly bent in the middle. Beneath, the bands are very pronounced on the primaries, less so on the secondaries; otherwise as in *A. sulphurata*.

Exp. wings 38 mm.

Las Vegas, New Mexico (Prof. F. H. Snow). 1 ♀.

Tetracis indiscretata, n. sp.—Ochraceous drab; basal line obsolete; sub-marginal line pale ochraceous, distinct, oblique, running from two brown spots near internal angle, and connecting there with a well-marked brown costo-apical, triangular spot; a black discal dot, costal edge brown, and some brown dots about basal half of wing. Secondaries with black discal dot, and a faintly indicated median band. Beneath, yellow ochraceous with brown dots, particularly on costa; rest of the body ochraceous.

Exp. wings 35 mm.

Las Vegas, New Mexico (Prof. F. H. Snow). 1 ♀.



CERTAIN METHODS OF JUDGING AND DESCRIBING NEW SPECIES.

BY S. FRANK AARON.

A few papers have appeared in recent numbers of *PAPILIO* and elsewhere, on the subject of true species of Diurnal *LEPIDOPTERA*. As a citizen of the "Republic of Science" I may venture to add my voice in submission of evidence, which has, it seems to me, been overlooked in this discussion.

Certain entomologists hold the opinion that by observing the characters of lepidopterous larvæ they may, with certainty, establish distinct species; that if two forms, appearing as varieties by the characters of the imagines alone, differ in the larval characters, they are specifically distinct. Mr. W. H. Edwards, the chief exponent of this doctrine, has expressed himself to this effect: that by breeding he has established distinct species, which by the imaginal characters alone appeared to be mere varieties.

A work has recently been written by Dr. August Weismann,* containing some very interesting experiments on raising *LEPIDOPTERA*, and it will be found of value to the scientific entomologist.

Regarding the subject of larval classification, Weismann has shown that the larva and the imago vary in structure independently of each other (vol. ii, p. 401); that the larvæ of two very distinct forms may have much resemblance (due to adaptation of similar conditions of life), and, *vice versa*, that very different larvæ may produce the same species (chapter on Phyletic Parallelism of Metamorphic Species). In the summary and conclusion of this chapter he says, "Thus the caterpillar-shaped and maggot-formed larvæ of the *Hymenoptera* differ from one another to a much greater extent than their imagines, since the latter have experienced a complete transformation of typical parts, while in the caterpillar-formed larvæ these parts vary only within moderate limits. Similarly in the case of the *Diptera*, of which the gnat-like larvæ diverge more widely from the grub type than do the gnats from the true flies. On the other hand, the divergence between the imagines of the fleas and gnats is considerably greater than that between their larvæ; indeed, the larvæ of the fleas would have to be ranked as a family of the sub-order of the gnat-like larvæ, if we wished to carry out a larval classification." (p. 505) Again (p. 506) he says: "The larvæ of the fleas, on account of their small divergence from those of the gnats, could only lay claim to the rank of a family, while their imagines are sepa-

* Studies in the Theory of Descent, by Dr. August Weismann, with notes and additions by the author. Translated and edited, with notes, by Raphael Meldola. With a prefatory notice by Charles Darwin, two vols., eight colored plates, London, 1882.

rated from the gnats by such a wide divergence, that they are correctly ranked as a distinct tribe or sub-order. The inequalities in the lowest groups, varieties, can be regarded in a precisely similar manner. If the larva of a species has become split up into two local forms, but not the imago, each of the two larval forms possesses only the rank of a variety, while the imaginal form has the value of a species."

Therefore, the mere fact of finding the larvæ of two varietal forms different does not proclaim these two forms distinct, for it is the characters of the imago that are of specific importance, and we have seen that the larvæ of the same species may vary.

Thus, "*Colias Hagenii*," Mr. Edwards' latest synonymical achievement, is no more entitled to a specific name than is *C. Ariadne*, for *Hagenii* does not differ in any specific characters in the imago, and the larval characters indicate only a variety, if they even indicate that. The red within the band, not over it, is valueless specifically. The discovery of *Hagenii*, however, may do one thing, it may unite *Philodice* with *Eurytheme*.

In Mr. Edwards' "Comments on a paper entitled 'The Genus *Colias*,'" his arguments regarding the species *Chrysotheme* and *Eurytheme* are perhaps well taken, but not at all conclusive. If after "the diffusion of the same species over two continents," and their permanent establishment in certain southern localities in those two continents, both forms remain true to their original type or ancient progenitor, they could not correctly be separated as different species by the separation in their habitats alone. Our American Wolf, which some eminent naturalists now consider identical with the European species, offers a somewhat parallel case. It is subject to variation in this country, and has been divided into several species, but these are now known to be one, and as long as no constant characters separate it from the Old World Wolf, they are all classed as one and the same species.

Modification has not taken place in these Coliads, except in the varieties of *Eurytheme*, and I have no doubt that if specimens of *Chrysotheme* were sent to Mr. Edwards labeled "Western States," he would call them all *Keewaydin*. It is preposterous in Mr. Edwards to assume that mere climatic varieties in one form only would proclaim them distinct, for there must be some difference in climate to allow for that, and it is like the case of the Wolf, in which the European species is subject to less variation than the American.

Regarding the subject of community of origin, let us look on the same side of the shield with Mr. Edwards, viz., the Darwinian side. "We can understand why a species or group of species may depart in several of its most important characteristics from its allies, and yet safely be classed with them. This may be safely done, and is often done, as long as a sufficient number of characters, let them be ever so

unimportant, betrays the hidden bond of community of descent. Let two forms have not a single character in common, yet if these extreme forms are connected together by a chain of intermediate groups, we may at once infer their community of descent, and we put them all into the same class." (Origin of Species, p. 426) Therefore, if we have two forms of the same genus, but without a single specific character in common, and these two forms are connected by intermediate forms, we at once infer their community of specific (not generic) descent and varietal modification, and we class them as the same species.

There are many instances in nature. Among the snakes, for example, in the genus *Ophibolus*, Prof. Cope has shown that two forms,—one Northern, the other Southern, for a time considered distinct,—have been found to grade directly into each other, and therefore are but varieties of the same species. He has not insisted that they were distinct species, as Mr. Edwards would have done, and then justified himself on the ground of reversion of character. Nor would Prof. Cope have called every intermediate form a distinct species merely because their young might differ from other young forms.

Referring to the closely related but geographically separated species of plants, quoted by Dr. Gray, Mr. Edwards says: "I do not find, by the way, that Dr. Gray gives these related forms any less rank than species." Of course not, for there are absolute constant specific characters to separate them, otherwise Dr. Gray would have called them all varieties of one species, for wide geographical separation is not alone a specific character. Why does not Mr. Edwards call every marked variety a species, and the ancestral specific type from which it springs a genus, for by his reasoning it must be so. Look at the so-called different species allied to *Papilio Asterias*, viz.: *Indra*, *Brevicauda*, *Bairdii*, etc. If these forms are all distinct—and it is plain to see that they all sprung from one immediate progenitor very different, for instance, from the ancestral type of the *Turnus* group—then they should be classed as a distinct genus by themselves, for it is evident that they possess an aggregate of characters that will proclaim their community of origin. May we not better call all these forms but the varieties of some one form, say *Asterias*, and infer that the characters descending from the immediate ancestral type are only specific? I think this illustration may serve to show the absurdity of calling every slight variation a new species.

The above considerations may prepare us for a brief criticism of the methods by which certain naturalists rush into the publication of new species. Mr. Edwards has said: "If, in my opinion, a form of butterfly of which nothing is known except by the dried specimens, is distinct enough to deserve a specific name, I give the name without hesitation." In another place he adds: "I spot the new form, make it conspicuous, place it where it can not be overlooked, and leave it to time

and fuller materials to determine its position." This is as much as to say that without hesitation he calls every form that he may consider distinct a new species, and leaves it to time and fuller materials, with eight out of ten chances to prove it a useless synonym to bother the heads of students and to increase the more than worthless literature of synonymy. Is this working for the good of the science? It may be working for the honor of Mr. Edwards, for if the described form prove distinct, his name is certain to have priority. It is, of course, not to be supposed that a describer must never make a synonym, for it is impossible always to draw the line between specific and varietal characters, but he may keep on the safe side. He would not err in describing a new species from but one example if its characters differed from those of its nearest allied form in as marked a manner as in the case of *Vanessa Antiopa* and *V. Milberti*, or *Argynnis Diana*, *Idalia* and *Cybele*, or *Melitæa Phaeton* and *Chalcedon*.

On the other hand, if a new form is closely allied to a known species, I maintain that it should not be described with a new name, without large material to determine the constancy of its separating characters. To show what I mean by closely allied forms I will mention here some so-called species which I think should not have been described as species, and which will eventually prove to be mere varieties of one another:—Some of the allied species of *Papilio Asterias*, *Callidryas Eubule* and *Sennæ*; *Danais Berenice* and *Strigosa*; some forms of *Argynnis*, such as *Cybele*, *Carpenterii* and *Aphrodite*, *Zerene* and *Monticola*; *Melitæa Anicia* and its allies; most of the recently described species of *Apatura*; *Satyrus Alope* and *Pegala*; *Lycæna Melissa*, *Scudderii* and *Acmon*; and numerous other examples.

If Mr. Edwards wants certainty as regards distinct species and varietal connection, which is what we all want, he may attain it by breeding from the egg if he always goes far enough to establish it upon the characters of the imago; his larval characters will not do. And though he may with certainty establish a variety, he can never with *absolute* certainty prove two forms to be specifically distinct. Sufficient certainty will be admitted by all, however, if but one form be raised from many sets of eggs, and by comparison of large series from varied localities no intermediate grades be found.



DESCRIPTIONS OF NEW SPECIES OF BUTTERFLIES, MOSTLY FROM ARIZONA.

BY W. H. EDWARDS.

TERIAS LINDA.	PAMPHILA BELLUS.
MELITÆA NYMPHA.	“ CESTUS.
PAMPHILA LASUS.	PHYCIODES NYCTEIS, var. DRUSIUS.
“ LUNUS.	MELITÆA HARRISII.

✓**Terias Linda**, n. sp. ♂.—Exp. 1.45 inch.

Upper side citron-yellow; primaries have a triangular, black, apical border, descending on hind margin not quite to inner angle; the inside edge of this from costa to discoidal nervule is even, slightly incurved; below the nervule somewhat serrated; no black at bases of wings; secondaries have a black dot on margin at the end of each nervule. Under side paler yellow, uniform; primaries have a black dot at end of each sub-costal nervule; secondaries have two dots on disk at end of cell, a dot at end of each nervule, and a few black scales on disk in the discoidal and median interspaces.

♀.—Exp. 1.5 inch.

Paler yellow than the male; the black triangle somewhat broader, the marginal dots as in male; on inner side secondaries have a large, ferruginous, rounded spot at outer angle; other markings as in the male.

From 1 ♂, 1 ♀, taken in Mexico, a short distance from the boundary line of Arizona, by Mr. Morrison.

This species is allied to *T. Lisa*, same shape and size; paler yellow, the borders of fore wings confined to apex and hind margin above the end of lower median nervule, and less excavated than in *Lisa*; no discal mark on fore wings, and no border to hind wings, both of which are characteristics of *Lisa*. Under side immaculate, except for the two dots on arc of hind wings and a few scales on costa, and on disk of same in ♂, and a ferruginous patch in ♀. *Lisa* is much specked and spotted.

Melitæa Nympha, n. sp.—Allied to *Minuta* and *Arachne*.

♂.—Exp. 1.33 inch.

Upper side black, spotted and banded with fulvous and white; both wings have a sub-marginal series of small fulvous lunules, followed by an extra-discal row of large fulvous spots, the anterior ones, on primaries, showing obscurely white centres; the next, or third row, is pure white on secondaries, yellowish on primaries; on secondaries, outside arc, a demi-row of three yellow fulvous spots; a fulvous spot in cell next arc, two yellowish spots, opposite each other, resting on the ner-

vures, and in mid-cell a fulvous patch; secondaries have a large fulvous patch in cell, with a deep black sinus on posterior side; fringes white, fuscous at ends of the nervules.

Under side of primaries bright fulvous; along hind margin a row of irregular-sized buff spots, rounded, or partly lanceolate, on anterior side, those next inner angle with a black stripe; through all runs a sub-marginal black line; on the clear extra-discal area is a row of minute white spots from costa to second branch of median; then a row of obscure white spots corresponding to the discal row of upper side, a black mark inside each spot; four curved black lines cross the cell, and between the outer pair is a yellowish space; secondaries have a marginal row like that on primaries, but more regular, cut by a line in same way, and all edged black on anterior side; next above is a clear fulvous band, not macular, and with no black dots in the interspaces (as in the allied species); the disk is crossed by a broad buff band, on both edges of which is a macular black line, and another runs through near the basal side; this buff space is continued up inner margin to base; a band of fulvous next crosses from costa to sub-median, edged black, greatly widened in the middle, and inclosing in cell a buff spot with heavy black edging; then a band made of irregular square spots; a band of fulvous, and finally, the base is buff.

Body above, black, the abdomen ringed with fulvous; beneath, buff-white, with some fulvous on side of thorax, and the sides of abdomen fulvous, the ventral stripe white; legs fulvous; palpi fulvous above, at base yellow-buff; antennæ black above, finely ringed with white, the under side yellowish; club black, fulvous on under side about base, the tip ferruginous.

♀.—Exp. 1.5 inch.

Upper side largely pale fulvous, the basal area only black, and spotted fulvous; the light band is yellowish on both wings; the sub-marginal spots are largely lost in the fulvous ground, especially on secondaries. Under side as in the male; the second band on secondaries without black dots.

On the under side this species closely resembles *Minuta*, the markings being of same pattern, but there is an absence of black dots on the penultimate fulvous band of secondaries. On upper side the difference is wider, *Nympha* being black, with a white discal band; *Minuta* fulvous, with no such band.

Taken by Mr. Morrison in southern Arizona.

Pamphila Lasus, n. sp. ♂.—Exp. 1.4 inch.

Allied to *P. Ottoe*, Edw., which on the upper side it closely resembles; color bright fulvous, greenish over apical area of primaries; costal margins of same wings fuscous; the white spots of under side represented on upper by obscure pale fulvous; stigma as in *Ottoe*, long,

narrow, bent just above the second branch of median; behind it a large roughened patch, a shade darker than the ground elsewhere; both hind margins very narrowly edged by fuscous; secondaries clear fulvous, except along costal margin; immaculate; fringes long, white, with a yellow tint towards apex of primaries and at anal angle.

Under side of secondaries and apex and costa of primaries light yellow, with a green tint; part of cell of primaries fulvous, about base and along inner margin black; a large buff patch nearly covers the lower median and sub-median interspaces, and in the former is a brown-fulvous patch next the margin; on costa three white spots, and an oblique row of similar ones in discoidal and lower interspaces. Secondaries have the costal margin mottled brown; the sub-costal and median nervures and branches clear white; across these branches, beyond disk, is a band made up of confluent white spots, bent in the discoidal interspace at a right angle; most of these spots are slightly edged black on outer side; in cell a small white spot with black scales on the basal side; at the ends of the nervures a brown point.

Body above covered with yellow-green hairs; beneath, thorax and abdomen green-yellow; legs pale brown, yellow on under side; palpi yellow, greenish above; antennæ brown above, yellow below and along base of club; upper side of club brown, tip ferruginous.

Taken in southern Arizona, by Mr. Doll, and in Mr. Neumoegen's collection. Differs from all the allied species by the ornamenting of under side.

Pamphila Deva, Edw.—There are two species confounded under name of *P. Deva*, Edw. The original description of *Deva*, Trans. Am. Ent. Soc. V. 292, was as follows:

♀.—Exp. 2 inches.

Upper side uniform glossy brown, rather light in tint; primaries have three translucent spots, sub-apical, small, round, equal, in a straight line depending from costa; a fourth slightly larger than those near the top of the upper median interspace, and a fifth, an elongated narrow bar, in the next below, a little nearer base than the fourth; both these completely cross the interspaces; secondaries immaculate; fringes colored. Under side slightly paler in tint, darker on the disk of primaries and up to base, lighter next inner angle; the spots repeated, secondaries immaculate.

Body above dark brown; below, the thorax gray buff, the abdomen brown; palpi white; antennæ annulated, brown and dull white; club black, reddish at tip. From a single example received from Prescott.

The description of *Deva* in PAPILIO II, 138, is of a different, but closely allied species, to which I give the name of *Lunus*. *Deva* is redescribed as follows:

♂.—Exp. 1.6 to 1.8 inch.

Upper side light glossy brown; primaries have three minute (often mere dots and more or less wanting) semi-transparent sub-apical spots on costa, two narrow bars in median interspaces, the upper one sometimes a dot only, and both sometimes wanting; fringes of primaries fuscous, of secondaries whitish. Under side brown, thickly dusted with gray scales over apex and hind margin of primaries and all of secondaries; the spots repeated; secondaries have a black-brown dash, transverse on middle of wing, beyond disk, sometimes wanting.

Body above, color of wings; below, the thorax gray-buff, the sides gray, abdomen gray-brown ventrally; palpi white, not pure; antennæ brown above, either yellow-white or annulated with that color below; club black above, yellow-white below, tip reddish.

♀.—Exp. 1.7 to 2 inches.

Color of male; spots slightly larger, and in addition is sometimes seen a minute spot next sub-median nervure, in line with the other two. Under side as in male.

Mr. Morrison has taken many examples of this species.

The other species is described thus:

Pamphila Lunus, n. sp. ♂.—Exp. 1.8 inch.

Upper side uniform dark brown; primaries have three semi-transparent sub-apical spots on costa, a narrow bar in upper median interspace, a large sub-rectangular spot in next interspace, and a large spot with a deep angular incision on either side at end of cell; fringes of primaries dark brown, cinereous at extreme ends, of secondaries yellowish, mixed with cinereous next anal angle.

Under side dark brown; the apex of primaries thickly dusted with gray scales, the spots repeated; secondaries thinly dusted gray, which scarcely obscures the ground color; on middle of wing two transverse black-brown dashes, one extra-discal, and in this is a short, fine white streak, the other a little above the middle of disk.

Body above, color of wings; below, thorax gray, the sides darker gray, abdomen yellow-brown; legs brown; palpi dark gray with many black hairs in upper part; antennæ black, on under side annulated with yellow; club black, yellow at base on under side, tip ferruginous.

♀.—Exp. 1.9 inch.

Same color; spots as in male, but larger; a seventh long and narrow spot appears in sub-median interspace. On the under side this spot is lost in a yellow patch which covers the area next inner angle.

Taken in Arizona by Mr. Morrison.

There is about the same difference between the spots of *Lunus* and *Deva* that is found between *Bathyllus* and *Pylades*, in *Lunus* all being large, in *Deva* all small; on the under side *Deva* is decidedly gray, *Lunus* dark brown with comparatively slight dusting of gray. *Deva* has one dash across disk, *Lunus* two, and the outer one includes a white

streak; the fringes of hind wing of *Deva* are white, of *Lunus* yellow, and the difference between under side of thorax and palpi is of a like nature.

Pamphila Bellus, n. sp. ♂.—Exp. 1.2 inch.

Upper side uniform dark brown, glossy; stigma on primaries dull black, narrow, straight; fringes long, orange.

Under side brown, over disk of primaries, to hind and inner margins; the remainder of primaries and all of secondaries, except next inner margin, where the brown ground appears, has a greenish black reflection, and under the glass is seen to be thickly covered with green scales; fringes as above.

Body dark brown; legs same; palpi orange, the terminal joint black; frontal hairs orange; collar and the hairs at base of antennæ same; antennæ black, luteous on under side; club dark red.

From one ♂ taken in southern Arizona by Mr. Morrison, 1883, and in Mr. Neumoegen's collection. Stands near *Vestris*, Bois., = *Kiowah*, Reak., = *Osceola* Lintn.; and is distinguished by its orange fringes, palpi, etc.

Pamphila Cestus, n. sp. ♂.—Exp. 1.5 inch.

Upper side brown, densely covered with yellow-green scales, and on secondaries yellow-green hairs; primaries have seven semi-transparent spots, three sub-apical on costa, three in the median and sub-median interspaces, forming an oblique row, the two upper ones large, and one in cell, next arc, large, with a deep angular incision on either side. Secondaries have a similar spot in cell, and a demi-band of four large spots across outer half of wing, with a slight fifth spot concealed under the long hairs; fringes largely fuscous on primaries, white next inner angle, a little cinereous in middle of each interspace towards apex, of secondaries white, with a few brown hairs at ends of nervules on upper half of wing. Under side mottled greenish gray and brown, with a purple tint; the spots repeated, enlarged; on secondaries the five spots are confluent, and two in addition appear in the sub-costal interspace, one near outer angle, one near base.

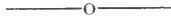
From one ♂ taken by Mr. Morrison in southern Arizona.

The species is conspicuously marked with spots, and is prettily variegated on the under side, much resembling *P. Python*, Edw., in the coloration. It stands near that species.

Phyciodes Nycteis, var. **Drusius**.—I give this name to the Western form of the species; distinguished by the excess of black on upper side, and consequent restricted fulvous spaces. The fulvous is dull, and the black pale. This is the Colorado and Arizona form of *Nycteis*.

Phyciodes Harrisii, Scud.—I should place this species in *Melitæa*, Group II, next before *Hoffmanni*. The larva shows affinity with *Me-*

litæ rather than *Phyciodes*, and the markings of under side give it place near *Hoffmanni* and *Gabbii*. I have a singular variety of *Harrisii*, bred by me in 1877. The normal larva at last stage is red-fulvous, crossed by red stripes, much as in *Phacton*. One of the brood at last stage came up almost wholly black, the fulvous being restricted to a few specks and dots on back of each segment. The butterfly from this larva is black on both sides, the fulvous pattern obscured, as if washed with black.



ON THE GENERIC DISTINCTION OF MEGONOSTOMA.

BY A. G. BUTLER.

In a paper describing the early stages of "*Colias Eurydice*," Mr. W. H. Edwards advocates sinking the genus *Megonostoma* as a synonym of *Colias*, on the ground chiefly that the species of the two groups do not show generic differences in the preparatory stages.

It is seldom, indeed, that my opinion on entomological matters differs from that of Mr. Edwards, but in the matter of genera we do not, as the saying is, think through one quill.

In a large group like *Papilio* I hail with joy the creation of any genus founded upon easily discoverable structural characters as being a real blessing to one who has to deal with the *Papiliones* of the world, and when that genus has been thoroughly broken up I shall certainly adopt the whole of the fragments as genera.

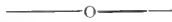
A genus is avowedly a convenience; in LEPIDOPTERA it is, and always has been, based upon characters to be found in the imago; and, since the LEPIDOPTERA have been scientifically studied, it has been considered imperative that such characters should be structural. I believe that generic differences commence in the imago, and therefore that strong resemblances may be looked for in allied genera; such differences as may be shown in color certainly do not indicate distinct genera, as is evidenced by the larvæ of the different species of *Macroglossa*; whereas, on the other hand, certain characters are indicative of family distinction, as in the case of the species formerly associated under *Acronycta*.

Mr. Edwards says that Reakirt has indicated certain appendages which he calls "*Eupronychia*," as the most important character for distinguishing his genus from *Colias*; well, it seems that as these appendages are apocryphal, *Megonostoma* is to be abandoned; yet, in my "*Revision of the Genera of the Sub-family Pierinæ*" (*Cistula Entomologica*; Vol. I, Part III, pp. 33-58, Plates I-IV, 1870), for which I traced the wing of nearly every genus then known and reproduced it on stone, I did not see fit to sink Reakirt's genus. If Mr. Edwards

will compare my figure of *Colias* on Plate I, Fig. 10, with that of *Megonostoma* on Plate II, Fig. 4, he will see that the outline of the primaries is not the only character which allies *Megonostoma* to *Gonepteryx*, although the affinity to *Colias* as shown by the branching of all excepting the first of the sub-costal nervules of the primaries is certainly greater; the neural differences from *Colias* are as follows:

First sub-costal branch of primaries emitted considerably further from anterior angle of cell, so as completely to alter the shape of the cell; median branches almost equidistant at their origins; costal area of secondaries broader and more rounded at base; angulation of lower disco-cellular veinlet pretty nearly equal, so that the inferior angle of the cell is less produced.

Lastly, I do not think the pattern of the imago should be taken into account at all; the *Colias* type of pattern occurs in other genera, and in the case of *Teracolus* I can trace its gradual modification into a totally different form closely resembling the orange-tipped butterflies (*Euchloe Cardamines*, and allies).



NOTES ON MEXICAN LEPIDOPTERA, WITH DESCRIPTIONS OF NEW SPECIES.

BY HENRY EDWARDS.

(Second Paper.)

BOMBYCIDÆ.

Pericopsis Schausii, n. sp.—Jet black, thorax with a few white spots in front. Abdomen with the tip rosy red, and with white linear bands beneath. Primaries with a red dot at the base near costa, and an oblique sub-median band of bright lemon-yellow; terminating near the internal angle. Behind this and near the apex is an oblique oblong yellow spot followed on the middle of the margin by a small yellowish white spot. Secondaries with a median band of white, oblique outwardly and broken in the middle. Tibiæ and tarsi streaked with white. Markings of wings repeated on under side, with the course of the nervules at the base marked with white. 1 ♂.

Exp. wings 53 mm. Length of body 20 mm.

Arctia eminens, n. sp.—Head cream-color on crown, black in front. Thorax cream-color; collar with two large black spots; three spots on disc, and the tegulæ in the middle black. Abdomen black above, with orange lateral stripe, below dull cream-color, with three rows of small black spots. Pectus and fore tibiæ dusky black; middle and hind tibiæ black with cream bands. Primaries black, with four oblique macular bands of cream-color, the basal bent forward on costa

and enclosing a longitudinal streak. Behind the basal band is a sub-triangular blotch, and on costa two small dots. The median and sub-median bands are near together, parallel from internal margin to median nervule, where they join and become confused, the median band broken into blotches, and running forward to costa, the other reaching costa more directly, and widening as it approaches it. The sub-marginal band is narrow, widening near apex. Margins cream-color, enclosing seven black spots, the apical largest. All these bands, as well as the nervules, cream-color. Secondaries smoky black, the fringes and a spot on costa, cream-color. Beneath, the markings are repeated a little more faintly. 1 ♀.

Exp. wings 45 mm. Length of body 18 mm.

Except in the coloration, I see nothing to separate this from the genus *Arctia*.

Antarctia expressa, n. sp.—Primaries smoky brown, mottled with dull white, especially along the course of the nervures. Secondaries unicolorous, much darker than the primaries. Head and thorax smoky brown; fore tibiae rosy red at the base, the rest of the legs smoky; abdomen bright rosy red above, with dorsal row of small black spots, dull black beneath. All the wings smoky beneath, a little reddish at the base. 1 ♀.

Exp. wings 34 mm. Length of body 14 mm.

Elysius russatus, n. sp.—Primaries roseate brown, discal mark ovate, white, placed behind the cell. At the base are eight orange patches surrounded by a roseate ring. These are irregular in shape, the middle three being fused into a band, the basal spot smallest. An oblique dusky sub-marginal line. Hind wings bright rosy, palest in the middle. Thorax orange-red, with three fawn-color streaks, and two blotches of the same shade on collar. Head, palpi, pectus, tibiae and abdomen bright rosy red; tarsi whitish. Beneath, the primaries are rosy, the white discal spot very distinct, and a dull brown ovate spot near the base. The secondaries are a little fainter rose-color than on the upper side. 1 ♂.

Exp. wings 40 mm. Length of body 18 mm.

This insect agrees with Walker's diagnosis of this genus (Lep. Heter. B. M. p. 714), and appears to be allied to *E. Sanguinolenta*, Cram., and *D. Dorothea*, Cram.

Robinsonia perfecta, n. sp.—Closely allied to *R. formula*, Gr. (Proc. Ent. Soc., Phila., Vol. V, Plate 4, Fig. 3), but differs in having the secondaries clouded with brownish along abdominal margin, and by the abdomen being bright orange for its posterior half, and wholly so beneath; the pectus and base of all the legs are also orange. The costal band of primaries is of nearly equal width to the apex, and the

oblique band across the middle of the wing joins the band running along the inner margin *at* the internal angle, and not *above* it as in Grote's figure; the bands on the lower side of primaries almost obliterated. 2 ♀.

Exp. wings 50 mm. Length of body 19 mm.

Euchætes emendatus, n. sp.—Allied to *E. inopinatus*, mihi. The primaries are pale fawn-drab, with the nervules distinctly marked. The secondaries are a paler shade; sordid white for two-thirds of the wing, darker on the margins. Head fawn-color in front, dull orange on crown; collar dull orange, the rest of thorax concolorous with primaries. Abdomen, with base, fawn-drab; posterior segments orange, with row of black dorsal spots fused into a line at the base. Abdomen, beneath, as well as the legs, fawn-drab. 2 ♂.

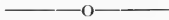
Exp. wings 32 mm. Length of body 13 mm.

Euchætes fumidus, n. sp.—♂. All the wings smoky black, without any markings above or below; collar cream-white; base of antennæ, fore femora, fore tibiæ and abdomen rosy red, the latter with three black dorsal spots.

Exp. wings 30 mm. Length of body 11 mm.

♀. In this sex the costa is wholly cream-white; the wings beneath have a whitish tint, and the broad tip of abdomen is also cream-white; the primaries have the posterior margins much flecked with white scales, giving a pale appearance; all else as in the male.

Exp. wings 39 mm. Length of body 14 mm.



NOTES AND QUERIES.

EUDAMUS ZESTOS, Hübn.—In a letter under date of March 10th, Mr. C. E. Worthington writes as follows: "Your remarks on *Zestos* (= *Oberon*) are interesting. I depended on others to examine Hübner, etc., as the books are not in Chicago, and I was assured that the species was not described therein. I had about eighty examples, all singularly uniform, and a number of *Tityrus*, of the usual type, from near by. I distrust such forms, and had there been but one or two pairs would not have described them, for I greatly dislike to add to the burdensome synonymy." He adds: "I shall try to do some collecting during the coming summer (if we have any summer); just now there is no limit to the ice-field, which is said to solidly fill the lake clear across to the Michigan shore. I have once pursued butterflies *over the ice*, and may do so again this year."

Mr. Worthington would like to obtain "a few live pupæ of *Gloveri*," and can supply quantities of the pupæ of *Cecropia* and *Polyphemus*. E. M. AARON.

INFORMATION ACKNOWLEDGED.—I wish to acknowledge replies to my inquiry in the January number of PAPILO, from Messrs. W. H. Edwards, Philip Nell, John B. Smith and Rev. George D. Hulst. The latter has described the method used by him very fully, and for the benefit of certain readers of PAPILO who may be as much in the dark as I was, I reproduce it here.

E. M. AARON.

DENUING THE WINGS OF LEPIDOPTERA.—Put the wing in alcohol; then into a saturated solution of chloride of lime, leaving there until the colors are pretty well faded. Have an ordinary microscopic slide at hand with two or three drops of pure water on it, somewhat spread out. Take the wing out of the chloride of lime and put in carbolic, or dilute hydrochloric acid, leaving only a moment; take out and put in the water on the slide. Carefully put it in the shape you wish, which in the water can be done without difficulty. Touch the edge of the water with blotting-paper till it is about drained off; then put the blotting-paper flat on the slide, wing and all, thoroughly drying it. On taking up the paper the wing will remain on the glass; slightly dry over a lamp, brush off the wing lightly with camel-hair brush to remove dust, etc.; put on Canada Balsam; heat a little and put on a microscopic cover, sufficiently large; let it dry as any ordinary slide with mounted object. You have then the wing perfect, entirely transparent and in a permanent form. Legs and other parts of insects can be treated in the same way. I have had little satisfaction with pasting the wings in a book after bleaching; the wings are rarely well spread, and are easily broken. The above method is very satisfactory to me. GEO. D. HULST.

LIMENITIS EROS, Edw.—Mr. Strecker, in his Catalogue, indicates *Floridensis* as a variety of *Disippus*: "The form found in Florida and other parts of the extreme South." That applies to the mahogany-colored form of *Disippus*, of which I have several examples, *but it does not define Eros*. That species, among other points, is characterized by a white median band not found in *Disippus*, and nothing was said of that; I had no idea that *Eros* was what Mr. Strecker had in mind. Now it is a rule that, *where two species are confounded under one name*, the author who disentangles them has a right to apply *the first name to either*, and his *new one to the one he pleases*. Mr. Strecker published to the world that I had encroached on his manor (Can. Ent. vol. xiii, p. 29), but Mr. Mead in the same volume (p. 79) gave the sense of the New York Entomological Club that the name *Eros*, under the circumstances, was properly given by me and should hold. The rules of Entomological Nomenclature are decided as to the definition of species required to give priority. "Unless a species or group is *intelligibly defined* when the name is given, it *cannot be recognized* by others." (Remarks under Rule II.) W. H. EDWARDS.

PAMPHILA CERNES, Bd.-LEC. *versus* MANATAAQUA, SCUD.—I would be glad to receive any information of the geographical range, dates of appearance, etc., of either, or both of these forms, that the readers of PAPHILIO may be able to afford me. I shall consider myself under lasting obligations to any one who can tell me how these forms may, *with certainty*, be separated. I have always considered *Manataaqua* a variety of *Cernes*, at best, but have come to the conclusion that the intergrades outnumber the typical specimens of either form, and that, therefore, it is not even entitled to that rank. I hope to be able to throw some light on the subject by breeding them this summer, and should be glad to receive information as to their pre-imaginal habits, etc. E. M. AARON.

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—EDITED BY—

EUGENE M. AARON.

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1884.



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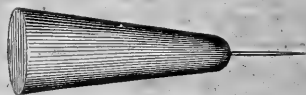
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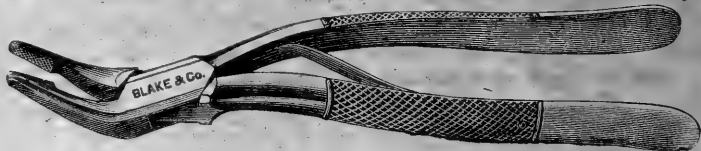
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Philadelphia, April, 1884.

VOL. 4.
No. 4.

DESCRIPTION OF THE PREPARATORY STAGES OF MELITÆA CHALCEDON, BOIS., WITH SOME NOTES ON LARVÆ OF M. PHÆTON.

BY W. H. EDWARDS.

EGG.—Sub-conical, the base rounded and flattened, the top truncated, depressed, and finely reticulated in irregular five-sided figures around a central rosette of five; surface smooth; the upper third marked by about twenty low, vertical, sharp ridges, which increase gradually in elevation and end at the rim of summit; color when laid lemon-yellow, later changing to crimson, and before hatching, to black. Duration of this stage about fourteen days.

YOUNG LARVA.—Length .1 inch; cylindrical, even from 2 to 11, the segments slightly rounded; color dark green-yellow; on each segment are several black tubercles, each of which gives a long tapering black hair; 2 has a sub-oval black chitinous patch on dorsum, and on either side of the medio-dorsal line are three fine tubercles, the six arranged so that four come to the front, and two behind, each of the latter midway between the front pair; besides these, there are three tubercles on either side this segment, two in vertical line in front, and one higher up and behind; each segment from 3 to 12, inclusive, has six dorsal tubercles; on 3 and 4 these are nearly in cross row, the two middle ones standing a little in front; on the succeeding segments there are four in front, in line, and one behind and between each pair; these tubercles form six longitudinal rows; along base of body is a row of finer tubercles, on some segments two; 13 has the four in front, but close together, and the other two are outside and below; at the extreme end is a chitinous patch, from which two hairs; the hairs on 2 to 7, and the lower of the six rows to 9 turn forward, those on dorsum of 6, 7 and 8 stand upright, on the other segments they turn back; the basal row has one hair each on 2, 3 and 4; on 5 to 12, two each,

not in line, the posterior one being at the back of the segment, and higher up; all the hairs bent down; head rounded, depressed a little at the top, the vertices rounded; color dark brown, smooth, with a few black hairs curved down. Duration of the stage about eight days.

After first Moulting: slender, cylindrical; color dark brown, a medio-dorsal stripe, greenish yellow; there are seven principal rows of spines, one dorsal, three on either side, disposed as hereinafter described for mature larva; all but the dorsals black, these are the color of the band or stripe they stand on, greenish yellow; the spines are long, slender, tapering, with divergent black bristles placed at a small angle; along base a row of minute spines; 2 has a chitinous cross-band, with several fine points, each with a long black hair; head ob-ovoid, truncated at top and depressed, the vertices rounded; color black, shining, thickly beset with long black hairs which hang over the front. Duration of this stage nine days.

After second Moulting: length .24 inch; very much as in preceding stage; the dorsum and upper part of side brown-black, the lower part of side brown-gray; the dorsal spines and bases green-yellow, and a little of same color at base of second laterals on the outer side; head as before. Duration of this stage twelve days.

After third Moulting: length .33 inch; color black; along dorsum a whitish band, or double stripe, the intervening space making a black medio-dorsal line; the whole surface of upper side thinly dotted with white points, each of which gives a long white hair; the dorsal spines black from orange bases; the first laterals black from shining black bases; the second laterals black, but on the lower side at base is an orange patch encircling the spine, except on the dorsal side; the third laterals orange, from bases of same color, on 2 and 3, the rest black with a little orange on upper side; the row over feet all orange; head ob-ovoid, flattened frontally, deeply bilobed, the vertices rather high, sub-conic, the face rough with tubercles of various sizes, each giving a long black hair. Duration of this stage eleven days.

After fourth Moulting: length .45 inch; closely like previous stage; there is a great difference in the last two stages in the clothing of body, some larvæ having a few white points, and corresponding white hairs, but the greater number have these points thickly sprinkled over whole upper side, and the numerous long hairs from them give a very woolly covering. Duration of this stage nine days.

After fifth Moulting: length .7 inch; at about eight days is fully grown.

MATURE LARVA.—Length 1.1 inch; greatest breadth .2 inch; cylindrical, of even size to near the extremities; color black over upper part of side and dorsum, lower part of side brown-black; along dorsum a double whitish stripe, and a macular whitish stripe in line with second lateral spines; whole surface covered with white tuberculous points, of varying sizes; these are sometimes comparatively few in num-

ber, but usually they are many, and as each gives a long curved white hair, the surface is woolly; the spines are in seven principal rows, one dorsal, three on either side; in addition there is a row of smaller spines along base, from 3 to 11, over the feet and legs two to each segment in horizontal row; on 4 two in vertical row; on 5 two in horizontal and a third below, the three making a triangle; on 11 and 12 one each; on under side of body, on 5, 6, 11 and 12 are numerous small spines on the cross ridges; the dorsal spines run from 5 to 12, and together with their bases, are orange; the first laterals run from 3 to 13 and are black; the second laterals run from 3 to 13, are black, with orange around base, but usually wanting on the dorsal side; the third or lower laterals run from 3 to 11, the one on 3 small and orange, that on 4 orange, both orange at base, the rest orange with a little patch of same color at base on upper side only; the row along base wholly orange; the spines are moderately long, slender, tapering, rough with tuberculations, from each of which springs a long hair, those of upper rows partly white next base of spine, the others black; 2 has a collar of low black spines with many long black hairs; feet black, pro-legs brown; head ob-ovoid, truncated, depressed at top, the vertices low, sub-conic, and rough (as well as upper part of face) with tubercles, each of which gives a long stiff black hair, so that the top of the head bristles with these; color black. From last moult to pupation about fourteen days.

CHRYSALIS.—Length .8 inch; breadth across mesonotum .26 inch, across abdomen .22 inch; head case narrow, truncated, the top a rounded transverse ridge, the sides incurved; mesonotum rounded, slightly prominent at top and angular, followed by a rounded excavation; the abdomen stout; the larval spines of dorsal and two upper rows on either side are indicated by low conical tubercles; the spines of third row by a slight elevation on surface; color gray and pearl, marked and spotted with black, or brownish black, these marks and spots often edged with orange; the tubercles each edged on front side by a black crescent; behind the dorsals two short, oblique black bars, on some segments confluent with the crescents of the first lateral row; on segments 7 to 11 is a row of short black bars on the posterior part of each; on the ventral side, a blackish band of irregular outline from last segment to head, there bifurcating; the antennæ cases alternate black and gray; a long black patch lies on middle and basal part of wing cases, usually edged with orange, and crossed by orange neurations; along the hind margin of wing a series of stripes or small black spots, rounded or serrated, and there is a second interior row varying in like manner; on the sides of mesonotum two curved bars meeting at an angle on the carina; a straight bar higher up running with the dorsal line; a few patches on top of head case. Duration of this stage about twelve days.

The mature larva and chrysalis of *Chalcedon* are figured in But. N. A. Vol. I, from drawings by Mr. Stretch. This larva indicates rather indistinctly the white points which cover the surface, but gives no idea of the tangle of white hairs which proceed from these points, which often quite conceal the surface of the body; other larvæ, however, have a minimum of points and hairs, and the figure more correctly represents such. The first lateral spines are represented as coming from blue-black bases, instead of black; otherwise the figure is correct. The figure of the chrysalis is a good one. The larvæ, in But. N. A., are stated to feed on *Dipsacus*, *Castilleja*, and *Lonicera*, but chiefly on *Scrophularia*.

Mr. W. G. Wright, of San Bernardino, in 1883, sent me multitudes of eggs and larvæ. The first larvæ were from *Penstemon antirrhinoides*; others, or eggs, were from *Penstemon ternatum*. On 25th April came about fifty larvæ nearly full grown, a few past third moult, and two which were smaller than the rest, were thought by Mr. Wright to be either *M. Gabbii*, or *Leanira*. They all at last proved to be *Chalcedon*. I put the larvæ in a jar with leaves of *Chelone barbata*, *Actinomeris squarrosa* (on both which *M. Phaeton* feeds) and *Aster*, and an hour later found them eating the first two. On 27th the first larva pupated. They suspend themselves in form of a ring, as does *Phaeton*, also the species of *Phyciodes*. My larvæ did not flourish, and, from the fifty received, there resulted but fifteen pupæ. I attributed this in great degree to lack of sunshine, as Mr. Wright says the larvæ delight in the hottest sun.

On 16th May came four larvæ which Mr. Wright said he had found the preceding fall,—part of a large colony within a web, high on the mountains, not less than about 5000 feet. What species they might be he did not know. Certainly not *Chalcedon*, which butterfly he had never seen at such an altitude. The web was as large as a man's hand, and in it were hundreds of larvæ. Mr. Wright kept the web and contents through the winter, and was much astonished on finding that the larvæ gave *Chalcedon* butterflies; because, in the low grounds, the habits of *Chalcedon* are different from this. Mr. Wright says: "Down in the valley they form into small colonies, and make small webs near the ground, at the ends of twigs, on the lower branches of the food-plant. At third moult, or closely after, they drop to the ground, or run down the stems and hibernate in the ground. The little webs are very inconspicuous; even when there are eight or ten of them on a twig, they are not noticed, except on searching for them, and they are so small that they each hold but few larvæ. Now, apparently, here is a clear case of the influence of climate on the habits of larvæ. Both colonies came out *Chalcedon*, and yet had widely different habits. It would seem as if in the cold altitudes the larvæ ought to hide in the ground, and that in the valley they might be comfortable in a web on

a twig, but the case is reversed. How can a colony, passing the winter out on the end of a swaying twig be more protected from the weather than the separated larvæ which hide in the ground." Mr. Wright is a first rate observer, and his remarks are pertinent. I suggested to him that perhaps the answer to these queries would be this: that in a cold latitude or altitude, where there is no danger of the larvæ being prematurely roused from lethargy by excess of heat, a web gives protection from weather, rain, or snow, and also from enemies of some description. In the Eastern States *Phaeton* passes the winter in webs, and on slender plants like *Chelone*, which are broken to the ground. The larvæ, nevertheless, get well through the winter, though for weeks or months covered by snow. So long as larvæ of *Argynnis* are kept artificially in an ice-house, or in a snow-bank, they are healthy. It is the waking up out of season which is fatal to them, starvation or exhaustion being the consequence. On the other hand, where the winter is warm, as in the valleys in southern California, the ground would seem to furnish the most equable temperature. So the species of *Argynnis* and *Satyrus* go to ground and hibernate.

To this Mr. Wright replied: "As to why the lowland larvæ go into the ground, I judge it is because of the heat. The valley where they do most congregate is narrow and sandy, between low, bare hills. About the time when the larvæ go into the ground—say in July—the whole country, valleys and hills, becomes perfectly dry and hot. There is not a tree or bush to afford shade; no water, no grass. For four rainless months the country is thus parched and torrid. It is hot enough there in August to bake the larvæ, if any where above ground. As to the woolly coat, I think it is a protection against water in the wet season. On the other hand the larvæ at 5000 feet elevation, hibernating in their web, would be protected by that against water, and do not need a woolly coat."

In PAPILIO, Vol. III, p. 26, Prof. J. J. Rivers says of *Chalcedon*: "This species hibernates socially *after the first moult*, selecting a place below the radical leaves of cumbrous herbage, from which situation the larvæ do not stir for several months. I have kept them all the winter," etc. I apprehend that for "first" we should read "third."

The four larvæ from the web and the two before spoken of, supposed to be *Leanira*, were alike in that they were nearly naked, whereas the other larvæ were woolly. But one from the web became woolly at last moult. Whether the colony of hundreds were all so thinly clad it was too late to ascertain; but it seemed as if nature, for further protection of the webless larvæ, had given them a good warm fleece in which to hibernate.

From hibernating larvæ I got the stages after fourth and fifth moult. On 5th May, I received about seventy-five eggs, and on 7th, another large lot. These began to hatch on 10th at fourteen or fifteen days

from the laying. On June 6th, I received a lot of young larvæ, and at least one hundred eggs. Mr. Wright says: "These eggs are easiest to get of any; the females confined in bags lay all over the bags, or on sticks, and they want no shade. I set the plant close to the window, and the butterflies like the sun and will not lay without it." Following the first lot, of May, I gave the young larvæ leaves of *Scrophularia*, which Mr. Wright had sent me, and which came in good condition, and also gave *Chelone*, and the latter was preferred by them. They were kept in a half-pint glass, and showed a tendency to do much spinning, though not to make a regular web. On 16th, the day being fine, and some larvæ near their first moult, I put several out of doors, on the terminal leaves of a plant of *Chelone*, in my garden, to see their behavior. They at once went to work, and next day had spun together the leaves and were concealed within. Four days later we had a cold rain, and the web was broken, and I could see but two or three of the larvæ; the others seemed to have been swept away. But, on 23d, weather wet and cold, I found the whole colony lying snug between two leaves, as well protected as if under a slate roof. The 24th was fine, and I put out nearly all the remaining larvæ, putting them close by the others, within leaves pinned together. I did this, supposing they would soon find their fellows, and that the two lots would unite. But they continued separate, and formed two light webs, nothing like so close as the web of *Phaeton*. So they passed two moults, adding to the web as it became necessary, taking in one leaf after another along the stem. On 29th came a furious rain storm, and on examining the webs during the storm, the older one was found to be quite empty, the larvæ probably having gone down the stem to ground. The other was broken, and the larvæ were busy repairing, but there evidently were not enough of them to do the work in a proper manner. After this these larvæ gave up living in their web, and returned to it from feeding, gathering in a cluster on the outside. There had originally been about fifty, but they were now reduced to half a dozen; all past third moult. On 11th July there were but two visible, and these I brought into the house and put in glass. One of them shortly after passed third moult, and both soon went into lethargy between two leaves, and are so passing the winter. Part of these larvæ I had kept in the house and followed their stages. In this way I have the complete history, first from egg to hibernation after third moult; then from hibernation to pupation, two moults being passed.

It so happened that I had at same time a lot of *Phaeton* feeding, and under very peculiar circumstances. Formerly, larvæ of *Phaeton* were found in a small swamp about two miles from my house, near the Kanawha River, the only locality in this region known to me for the species. In 1878 came a flood, which exceeded anything known in this valley, overflowing a large part of the river bottoms. This swamp was

under water fully two days; several feet under. Any larvæ of *Phaeton* would have been in web, hibernating, the month being August, and no doubt the last one was drowned. And from 1878 to the present time not one butterfly have I seen. About ten years ago I set a plant of *Chelone glabra* in the garden, in order to have food at hand when needed, but it had never been visited by a *Phaeton* butterfly, and as I live on a hill, off the river bottom, I did not suppose the butterfly would ever find it. But on 25th June I noticed a little knot of twisted leaf fastened by a web as large as a filbert, on the plant, and knew it for *Phaeton*. How a stray butterfly should find that single plant, entirely out of its range, is more than I can understand. *Phaeton*, unlike *Chalcedon*, is restricted in its food-plant to a single species, *Chelone glabra*, or possibly two, the other being *Lonicera ciliata*, but on what authority this last has been given I do not know. *Chelone* is the food-plant in this region. Later, same day, the larvæ were observed outside, extending the web, and they were in first stage, very recently out of egg. On 27th the day began with showers, but cleared up in afternoon, and all of a sudden the whole colony was found actively at work. I entered in my note-book that I believe the unusual stir was owing to a change of weather for the worse which these creatures had a prevision of, for I had noticed some years ago, that before a storm great efforts were made by *Phaeton* larvæ to put the webs in order. Two days later the rain came, and this web was tight and all larvæ housed, in contrast to the web of *Chalcedon* on same plant, which was broken by the rain and wind, and the larvæ were out in the rain trying to repair it. By 7th July they had passed second moult. After the first moult, which took place inside the original web, the larvæ moved up the stem and made themselves a new one quite at the top, and there passed second moult. Then they extended the web. In pleasant weather they worked actively, but when rain fell they were all inside. And whatever damage was done they repaired it as soon as sunshine came. On 10th July the web was beaten in pieces by a storm, and next day the larvæ were lying about in great clusters on the leaves. But during the morning they set at work and built a new web, evidently intended as the final one, and for hibernation. Work went on daily, when sunshine permitted, and by 13th the larvæ were inside it. It was double, and three round holes were left on the sides for egress. Early on 14th the rain fell in torrents, and I expected to find the web dashed in pieces. But it was not. At noon not a larva was to be seen, and the web was uninjured. I looked at it daily, but saw no larva thereafter. The holes spoken of were closed by an inner coating, plain to be seen. On 26th I brought the web to the house and cut it open. It was double, the inner part being thin, the outer of a dense texture like thin silk; in parts it was triple. There were the casts of face and body made at third moult, and about fifty caterpillars, lively enough. I removed

these with forceps; putting them in paper pill-boxes, and they ran about so fast that I had much trouble to secure all. The same day I sent these larvæ to Dr. Jewett, at Dayton, Ohio, to go in an ice-box, and there they are now wintering.

It will be seen, therefore, that while *Phaeton* and *Chalcedon* are both web builders, there is a difference. The climate of California does not require a web as a protection against rain while the larvæ are in their first stages; whereas in the Atlantic States rain is the very thing to be provided against. One web is slight, therefore, the other close, and the *Phaeton* larvæ have learned to be industrious at the proper season, either when foreseeing damage, or in repairing damage. The lowland *Chalcedon* go to ground for hibernation, not taking the trouble to build webs, but the highland members of the species seem to have found a web most suitable for their requirements, and build one as large and strong as that of *Phaeton*.

Since the foregoing pages were written, Mr. Wright has given me a list of all food-plants of larvæ of *Chalcedon* known to him as follows:

“1. *Penstemon antirrhinoides*.
 2. “ *cordifolius*.
 3. “ *ternatum*. It was on this plant that I found a large colony of half-grown larvæ in a web at altitude of 5000 feet or more,” (as before related). “This is the only large colony I have ever seen.

4. *Scrophularia Californica*.

5. *Rosa minutifolia*, Engelm., a new species, a rose recently found in lower California, where on Jan. 25th, 1883, I found the larvæ feeding. At same time there were others alongside feeding on *P. antirrhinoides*. As this rose is a plant of quite different order from any other in the list, I affirm the fact of such feeding as coming under my own observation.

Dipsacus, *Castilleja* and *Lonicera*, are all found here and known, but I have never seen any larvæ on either of them. Nine-tenths of all the larvæ in this country live on *P. antirrhinoides*. The female lays her eggs upon the upper twigs in masses of 50 to 100, or more. The young larvæ separate into small colonies and build small webs on the outer ends of the lower branches. I am pretty sure that they change their place of abode and build a new web at every moult, but cannot positively affirm that such is the case. At any rate, I frequently see deserted nests with cast-off skins at an early date in the life of the larvæ. At third moult the larvæ disappear, doubtless dropping to the ground, to hibernate at the base of the bush, under leaves and loose soil. In April, they are again seen, solitary, feeding on the fresh leaves of their plant. The chrysalis is found suspended to dry sticks and to stems of other plants, near by.”

ON THE DIMORPHISM OF TERAS OXYCOCCANA, PACK.

BY C. V. RILEY.

The following notes are essentially as they will appear in Bulletin No. 4, Division of Entomology, Dept. of Agriculture:

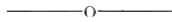
In the "General Index and Supplement to the nine reports on the Insects of Missouri," 1881, in speaking of *Tortrix cinderella* Riley, we remarked as follows (pp. 82-83):

"From specimens reared from cranberry-feeding larvæ received from Mr. John H. Brakeley of Bordentown, N. J., I am satisfied that this is the same species briefly characterized by Packard in the first edition of his *Guide* (p. 334) as *Tortrix oxycoccana*, and that *T. malivorana* Le Baron (my Rep. IV, p. 47) is but a dimorphic orange form, subsequently described by Packard as *T. vacciniivorana* (Hayden's Report of the U. S. Geol. and Geogr. Survey of the Territories, 1878, p. 522). The orange and ash-gray specimens are thus bred both from Apple and Cranberry. I have reared both forms from Cranberry and from Apple, and they are undistinguishable in the larva and pupa states. The gray form is often more or less suffused with orange scales and the orange form less frequently with gray scales. This is the most remarkable case of dimorphism with which I am familiar in the family, and points strongly to the important bearing of biological facts on a true classification. The dimorphic coloring is not sexual, but occurs in both sexes. The eggs of this species are very flat, circular and translucent, with a diameter of 0.7 mm., and are laid singly on the under side of the leaf near the midrib. The species belongs to the genus *Teras*, and as Packard's specific name *oxycoccana* has priority, the insect should be known as *Teras oxycoccana*, Pack. The insect, according to Mr. Brakeley, who gives an account of it in the Report of the Seventh Annual Convention of the New Jersey Cranberry Association (1879, p. 7), commonly affects, also, the high-bush whortleberry. The gray form of the moth is most frequent in autumn."

Prof. C. H. Fernald, in his "Synonymical catalogue of the described Tortricidæ of North America, north of Mexico," 1882, still retains the four insects as distinct species, and thus doubts the correctness of our conclusions. We therefore took pains to put the question to so full a test as to leave no reason for doubt. The experience of Mr. J. B. Smith, in the field, is confirmatory; but from material which he sent on to Washington, we not only actually bred the orange form from the first brood of larvæ received in May and produced from the hibernating slate-colored form, but also the slate-colored form from larvæ hatched from eggs laid by the orange form. Over two hundred

specimens, reared from larvæ received in August, and produced by the second brood of orange moths were all referable to the slate-colored form. In fact all the moths which issued after September 23d were of this form, though there was but a difference of five days between the issuing of the last yellow and the first gray specimens, the latter continuing to issue through October. Many of the gray specimens, especially those which first appear, are so suffused with orange or reddish scales as to appear somewhat intermediate between the two extremes, but there are none which are not at once referable to the gray form. It is in fact an interesting case of seasonal dimorphism, and how far it is influenced by temperature, future experiment, which we hope to make, will determine.

Many species of the genus *Teras* are well known to vary in a remarkable degree, but none other known to me presents such a marked case of seasonal dimorphism.



DESCRIPTION OF A NEW SPECIES OF SPHACELODES.

BY W. J. HOLLAND.

Among a number of specimens recently obtained from the Indian River region of Florida are four moths, which I was for some time inclined to identify as *Sphacelodes Vulurraria* of Hübner and Guenée. A more thorough examination, however, leads me to the conclusion that they are sufficiently distinct to deserve a specific name. I append herewith a description:

Sphacelodes Floridensis, n. sp.—♂. Expands 42 mm. Primaries reddish brown, secondaries slightly darker. About the middle of the costa of the primaries a large, triangular, flesh-colored spot, extending back to the first nervule. Three dark bands, the outermost forming at the costa the exterior margin of the light flesh-colored spot, divide the fore wings into three portions, of which the marginal portion is the largest. The outermost band is curved from the discal region towards the internal angle of the primaries. The basal and median bands are continued over the secondaries, the median band being triply waved and shaded very slightly on its external edge by gray. There is a very obscure, whitish discal spot on the upper surface of the secondaries, and a very delicate gray marginal line disposed in scallops intervenes between the main body of the hind wings and the concolorous fringes. The under surface of the primaries and secondaries are of a uniform, velvety, leaden-gray, with a broad marginal shade of a darker hue. The abdomen and thorax are of the same general color

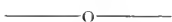
as the upper surface of the wings, a trifle lighter beneath. The antennæ, the head, and the palpi flesh colored, with a yellowish cast, and a trifle lighter than the conspicuous costal spot.

Guenée gives Brazil as the habitat of the two species of *Sphacelodes* described by him, and the presence of the genus in Florida is an interesting fact.

It is but proper to call attention to the fact that Guenée, in his description of the genus *Sphacelodes*, says that it is characterized, among other things, by the absence of the discal spot on the wings. With this exception the insect before me agrees thoroughly with his generic description, and the discal spot is so obscure in a slightly rubbed specimen I have, that its presence would elude ordinary observation. I have no hesitation in referring the insect to Guenée's genus.

It is barely possible that *Floridensis* may prove to be a climatic variation of *Vulurraria*.

Described from 3 ♂ in Coll. W. J. Holland, and 1 ♂ in Coll. J. B. Smith.



CITHERONIA INFERNALIS AND CATOCALA BABAYAGA, NEW SPECIES.

BY HERMANN STRECKER.

Citheronia Infernalis, n. sp.—♀. Expands 5 inches. Head, body and legs deep orange or brick red, unicolorous, and devoid of all markings whatsoever. Wings on both upper and under surfaces same red color as the body. Primaries, above, slate colored in the interspaces, leaving only the red color visible on the nervures and a narrow accompanying lining; a large red sub-apical blotch or spot at and near costa, also a smaller one midway between it and the inner margin; another still smaller at base of wing as in *Regalis* and *Sepulchralis*. Secondaries with a row of slate-colored sub-marginal spots, and interior to these a row of streaks or dashes of like color. Under surface; primaries much as above, but more of the red ground color prevailing; an indistinct red discal dash. Secondaries with the gray markings only on the apical half of wing; a small, darker, red, discal mark.

Hab.—Maryland, North Carolina.

Described from one female now in my collection, which was bred from a blackish blue larva with shining black horns, after the manner of the other species of the genus. The male I was unable to examine, but was informed it resembled the female.

Catocala Babayaga, n. sp.—Male and female expand from $3\frac{1}{4}$ to $3\frac{3}{8}$ inches. Primaries, head and thorax above, of an even, warm, reddish gray or ash color, quite unlike any other described species,

though coming nearer to that of some examples of *Irene* than to any other. The markings of the primaries in the several males in my possession are sufficiently distinct and pronounced, though not intensely defined; in the two females before me they are heavier and accompanied by dark brown shading more or less. The general style of marking is that of *Walshii*, *Arizona* and *Aspasia*, to which group it belongs. Secondaries with mesial and marginal bands shaped much as in above mentioned allied species; but the red ground color is far more pinkish than in any of them, and exactly the same tint as in *Amatrix*. The body is, beneath, tawny white, or inclining thereto; the wings differ in nothing decided from allied forms.

This is the insect taken several years since by the indefatigable Jacob Doll in Arizona, and which, by some curious mistake, has been so generally distributed as the *C. Arizona*, Grote, from which it is in a moment distinguished by its warm maroon or reddish gray color, whilst in *Arizona* the color is, as Mr. Grote says in the description, "dark grayish brown, with a glaucous shade over the more grayish median space."

In *Babayaga* the lines of primaries are reddish brown (an intensification of the paler ground color); in *Arizona*, to use Mr. Grote's words in the description, "black." Further, in *Arizona*, says its author, is "a whitish shade before the brown-tinged broadly bis-annulate reniform;" there is no vestige of any whitish shade in the remarkably even unicolorous surface of *Babayaga*.

There are other differences of minor importance, but the above, which have been carefully noted with the types of both *Arizona* and *Babayaga* before me side by side, will doubtless suffice. The description of *Arizona* is in the Can. Ent. Vol. V, p. 163, where any one doubtful of the distinctness of the two, can convince themselves. The original type of *Arizona* is in the Museum of the American Ent. Soc. at Philadelphia.

There are five insects in this group, all of a large size, that are easily distinguished from each other, though whether they be of different species or only varieties of one species, is for each one to decide as best may suit his own pet theory in that direction. They are:

Walshii, W. H. Edws., with obscurely marked ashen primaries and brick-colored secondaries.

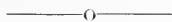
Arizona, Grote, with bluish gray, heavily marked primaries. Secondaries same red as in *Walshii*.

Aspasia, Streck., with very pale, somewhat yellowish gray primaries, with markings not as dark, and scarcely as pronounced as in *Arizona*, and secondaries same color as the two preceding.

Babayaga, Streck., with reddish gray primaries and markings of deeper tint of nearly same color. Secondaries bright deep pink, same color as in *Amatrix*.

The fifth one alluded to has not yet, I believe, been described; it comes nearer to *Arizona* than to any of the others, but the bluish gray color of the primaries, head and thorax is heavier, darker and of a more even unicolorous appearance, and the markings are not near as distinct and black as in *Arizona*, having more of a blurred effect, and in some examples are almost obsolete. Secondaries as in *Walshii* and *Arizona*, but of a little deeper tint. Hab.—Colorado.

Of all these five I have examined, and possess large series, and each one holds steadfast to its own type with little or no tendency to merge into either of the others, but that all—*Babayaga* is the most aberrant—are closely allied, and came from one stem, there can not be the least doubt, call them species or varieties or what best suits your notion for the time being.



NOTES ON MEXICAN LEPIDOPTERA, WITH DESCRIPTIONS OF NEW SPECIES.

BY HENRY EDWARDS.

(Third Paper.)

Euchætes immanis, n. sp.—Whole upper and lower surface of wings dark fawn-drab, without any markings whatever; the sides and tip of the abdomen are dull orange; the head is cream-white in front, orange beneath the eyes; all else the same color as the wings. 2 ♂.

Exp. wings 60 mm. Length of body 20 mm.

It is possible that this species may form the type of a new genus; the greater size, more produced wings and longer antennæ, with very deep pectinations, inclining me to that conclusion. There is, however, no difference in the neuration, and the coloration is like that of some *Euchætes*.

Halisidota mansueta, n. sp.—Allied to *H. Edwardsii*, and resembling it greatly in point of coloration. The primaries, however, want the dark bands of the California species, and the abdomen is without black spots. The ground color of primaries is fawn-color, made up of minute specks, and traversed by six imperfect, macular bands of pale buff, that behind the cell being the most perfect. These bands are nearly straight, the sub-median being slightly oblique; apices much produced. Secondaries sub-diaphanous, pale buff, stained with rose color, broadly, along abdominal margin. Thorax concolorous with primaries; abdomen very bright rosy red above, buff beneath, and along the sides. Fore tibiæ rose color within, rest of legs buff. The markings of the wings faintly repeated beneath. 1 ♀.

Exp. wings 58 mm. Length of body 20 mm.

Halisidota armillata, n. sp.—Pale buff; the wings shorter and more rounded than in most species of the genus. There is a wide median band of pale brownish, the basal space being also flecked with brown, and behind the band, which is paler on the costa, is an oblique row of spots edged with brown, and another row near margin, neither of which reaches to the internal margin. Thorax and abdomen buff, darker dorsally. All the rest of the insect buff. 1 ♂.

Exp. wings 37 mm. Length of body 14 mm.

Halisidota propinqua, n. var.—I regard this form as a strongly-marked variety of *H. Caryæ*. It is, however, smaller in size, paler in color, the spots of the macular bands much less in size, and the oblique brown line running from the internal angle to near the base of costa, is very dark, and in greater contrast with the ground color of the wing. In other respects I can see no difference from *H. Caryæ*. 1 ♂.

Exp. wings 40 mm. Length of body 15 mm.

Halisidota cinctipes, G. and R.—Several fresh and apparently bred specimens of this little-known species were in Mr. Schaus' collection, and from them I venture to give a redescription. It is allied to *H. Tessellaris*, and is probably the form described by Walker (Lep. Het. B. M. p. 733) as a variety of that species. My copy of the B. Museum catalogue formerly belonged to the late Dr. A. Fitch, and against Walker's description is written in the doctor's hand: "does not at all agree with our *Tessellaris*, it must be a new species." Walker's "variety" is quoted as coming from Mexico and Venezuela. The general color of *H. Cinctipes* is bright buff. Head blackish in front. Thorax with three sea-green stripes, the lateral pair diverging hindward. The primaries have four pale fawn-colored bands, all of which, except the marginal one, terminate on the costa in orange spots, edged with black. The basal band is double, and does not reach the internal margin. It is, more properly speaking, composed of four marks, three of which are transverse, and the other oblong. The second (the median band) is straight, widest on internal margin. The third is oblique, with irregular edges, widest in the middle, and the fourth (the marginal) widens out at apex, and does not reach the internal angle. Between the third and fourth is a divided spot, something like the letter U, orange, bordered with black, and on the costa a triangular spot of the same color. Secondaries pale buff, darker along the abdominal margin. Abdomen concolorous above, pale buff beneath, with a row of small lateral black spots. Pectus and fore tibiæ at base a deeper yellow; hind tibiæ and tarsi distinctly ringed with black.

Exp. wings 58 mm. Length of body 18 mm.

Euhalisidota aperta, n. sp.—Primaries smoky drab, speckled with dull yellowish scales. Secondaries yellowish white, buff at abdominal margin, and smoky at external margins. Beneath, the wings have all a yellow tint. Head and thorax smoky brown; abdomen dull orange at base, smoky brown in the middle, three posterior segments orange, with a row of black dorsal spots; anal tuft smoky brown, as is also the under side of the entire abdomen. Pectus and base of legs dull yellow. 2 ♂.

Exp. wings 46 mm. Length of body 17 mm.

Euhalisidota cervina, n. sp.—Primaries dark fawn-color, with a lilacine tint, the veins all very distinctly marked in a darker shade. Secondaries smoky, lighter at the base, becoming almost sordid white. Beneath, the wings are all dull fawn-color, with a golden reflection. Entire thorax and abdomen bright orange, with a dusky shade on the disc of former, and on the three basal segments of the latter. Head also bright orange, as are the basal joints of the palpi. On the base of the primaries are four black spots, three on front, one on the crown, one on each basal joint of the palpi, and ten on the thorax. There are six transverse bands on the abdomen dorsally, a double row laterally, and ventrally there are three spots. All these spots and bands are velvety black. The tibiæ are orange, the anterior pair black externally, and the posterior pair with black spots on the joints; tarsi all dull fawn-color. Antennæ very long, chestnut brown. 1 ♂.

Exp. wings 48 mm. Length of body 18 mm.

This beautiful and striking insect is placed provisionally in *Euhalisidota*, as structurally it is more like it than any other genus known to me. It is congeneric with *E. aperta* (described above), and it is possible that they may form a new genus.

Apatelodes vivax, n. sp.—♂. Primaries bright reddish brown, mottled with shades of lilac and dark orange. The basal line is white, indented and not reaching the internal margin. Behind it on costa is a lilacine patch of irregular, triangular shape, then a broad, oblique, brown line, bent forward on sub-costal nervure. This is followed by a narrow brown line edged with white towards costa, and very slightly dentate, and the sub-marginal line is black, very deeply dentate. The orange shades are most conspicuous at the base and near the apex. Secondaries chestnut-brown, lighter at the base of costal margin, and with an irregular sub-median band. Fringe of primaries red-brown, blotched with dull yellow; of secondaries, dull yellow towards apex and anal angle, dark brown in the middle. Beneath, the primaries are light fawn-color, darker at posterior margin, with a sub-marginal brown, slightly waved line, and some brown spots near the apex. Secondaries rich pinkish brown, beautifully mottled with chestnut-brown shades, a broad median band of same color not reaching the

abdominal margin, a dark sub-apical spot, and some dark patches at the middle of wing. Thorax, abdomen and legs concolorous; the latter, as well as the extremity of abdomen, with many white hairs.
2 ♂.

Exp. wings 38 mm. Length of body 16 mm.

♀. Very different in color, which is here golden testaceous. The lines are all the same as in the ♂, but there are no orange blotches; a whitish triangular patch in the middle of the costa; fringes alternately golden-brown and dull yellow. Secondaries darker than the fore wings, with a still darker median shade. Beneath, the wings are marked as in the ♂, but the shading has an olivaceous tint, and the bands, etc., are not so distinct. Legs, abdomen and thorax concolorous. In both sexes the discal mark is a whitish cloud. 2 ♀.

Exp. wings 48 mm. Length of body 25 mm.

A very beautiful insect, beyond all doubt referable to Packard's genus.

✓ **Acronyctodes**, n. genus.—Closely allied to *Apatelodes*, Pack., but differs in the following particulars: The fore wings are longer proportionately in their costal length, acutely produced at the apex, without the excavation on margin so visible in *Apatelodes*, and the posterior margin is more oblique to the internal angle. The feet and legs are less densely clothed with hair, and the abdomen is a little longer. Palpi shorter and more slender, and the antennæ with pectinations smaller than in the ♂ of *Apatelodes*, while those of the ♀ have the pectinations longer than the ♀ of *Apatelodes*. Markings somewhat similar, but less pronounced. Hind wings slightly hyaline.

Acronyctodes insignita, n. sp.—♂. Grayish white, with darker markings. A black basal line most apparent on costa; a broad median space, enclosing black discal spot, behind which is a blackish cloud. The sub-marginal line is whitish, edged in front with black, dentated; near its apical extremity are three small almost equal teeth. The space behind this line is grayish, with darker shades, and the terminations of the nervules are marked by black points. Near the apex, and along internal margin are some faint fawn-color shades. Secondaries dull grayish, with a small black discal spot, and a faint median dentated line. Beneath, wholly gray, like many species of *Apatela*, with faint sub-marginal lines, and black discal spots on both wings. Head gray in front; thorax, legs and abdomen concolorous. 2 ♂.

Exp. wings 42 mm. Length of body 25 mm.

♀. Paler gray than the other sex, the thorax and abdomen being sordid white. The markings similar to those of the ♂, but a little darker behind the middle. 2 ♀.

Exp. wings 55 mm. Length of body 25 mm.

Lagoa superba, n. sp.—♂. Primaries bright brown for the basal half of the wing, with a few white streaks at base of costa. Posteriorly the brown shade is encroached upon by a white broad line, strongly dentate anteriorly in the middle, and passing off into narrow streaks behind. The margin is a paler brown than the base, and is clouded with small black blotches. Secondaries the same shade of brown as the posterior margin of primaries. Beneath, both wings are of this pale brown shade, with whitish clouds. Antennæ and head cream-white. Thorax brown, with the collar cream-white. Abdomen with three white dorsal tufts. Under side of body wholly smoky brown. 2 ♂.

Exp. wings 33 mm. Length of body 19 mm.

♀. The primaries are beautifully marked with long, wrinkled, cream-colored hairs along the basal half of costa, and there is a conspicuous brown discal patch not apparent in the ♂. The thorax is wholly cream-white in front; the white dorsal tufts of the abdomen are five in number, and the antennæ are black. In other respects resembling the ♂. 2 ♀.

Exp. wings 53 mm. Length of body 25 mm.

The cocoon of this showy species is spun in a leaf. It is very thick in texture, almost leathery. The hairs of the caterpillar are said to be very poisonous. The chrysalis is very similar to that of *L. crispata*, but it is much larger. Length of cocoon 50 mm. Width 25 mm.

Heterocampa muscosa, n. sp.—Primaries with a decided green cast, mottled with brownish; all the lines, except the sub-marginal, being obsolete, or at least only evident on the costa. The discal mark apparent, small and slightly lunate in form, edged with a pale shade. There is a whitish blotch in the middle of costa, another at the apex, the latter divided by the sub-marginal line. Another white spot at internal angle. Fringe fawn-color, intersected by the brown nervules. Secondaries smoky, darkest at the margins. Thorax concolorous with fore wings; abdomen smoky, greenish at tip. Beneath, the thorax is smoky; abdomen pale buff. Primaries smoky on disc, whitish at apex and along internal margin, with a few dark specks on costa. Secondaries sordid white, stained with dusky at the margins. Tibiæ and tarsi dusky, with darker bands. 1 ♂.

Exp. wings 40 mm. Length of body 18 mm.

Allied to *H. guttivitta* and *H. biundata*, but of a much greener tint, and also distinguishable by the strongly marked white patches.

NOCTUIDÆ.

Plusiodonta effulgens, n. sp.—Rather larger than *P. compressipalpis*, and brighter in color. The ground color of primaries is golden, as in *Basilodes pepita*, with a well marked, rather broad streak of lilacine brown reaching from apex to middle of internal margin. An-

terior to this is a brownish shade, which includes the distinct golden reniform, the space around it being covered with brownish scales. Near to the base are two sub-ovate golden spots, surrounded by a brownish ring, and behind the oblique line a long golden streak reaching nearly to apex, and a sub-quadrate mark on internal angle, also golden, surrounded by a brown line. The margins are shaded with golden brown, and the fringe is intermixed with gray. Secondaries and under side of both wings smoky drab, with slight golden reflection. Thorax and abdomen concolorous. 1 ♂.

Exp. wings 34 mm. Length of body 16 mm.

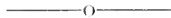
DELTOIDÆ.

Hypena inclyta, n. sp.—Primaries pale golden brown, grayish on costa, and with a reddish tint on internal angle, a pale arcuate median line not reaching the costa, and a sub-marginal line parallel with it enclosing a purplish black discal spot; fringe reddish. Secondaries dark orange, reddish along the external margin. Under side of wings chestnut-brown, paler at base and along internal margin of primaries, and a faint, slightly waved median line common to both wings. Palpi and tibiæ chestnut-brown; abdomen and rest of body paler. 1 ♀.

Exp. wings 40 mm. Length of body 16 mm.

A remarkable species, very different in coloration from its congeners of Europe.

NOTE.—The whole of the species described in this paper were taken by Mr. W. Schaus, Jr., in the province of Vera Cruz, Mexico.



BOOK NOTICES.

CHECK LIST OF INSECTS OF THE DOMINION OF CANADA, COMPILED BY THE Natural History Society of Toronto. Edited by W. Brodie, L.D.S., and J. E. White, M. B., 8vo., 67 pp., Toronto, July, 1883.

LABEL LIST OF INSECTS OF THE DOMINION OF CANADA, COMPILED AND EDITED as above; large 8vo., 70 pp., Toronto, July, 1883.

“In the preparation of this as well as the Label List, the compilers have been actuated by two motives,—the registering of the Entomological Status of Canada to this date, and the furnishing of a reliable Exchange List for the convenience of students and collectors. . . . In the LEPIDOPTERA, W. H. Edwards in the Diurnes, and Grote in the Nocturnes, have been followed.” (Preface to Check List.)

The list of LEPIDOPTERA is fairly complete, though the omission of all varieties, and of such species as *Pamphila Cernes*, *Eudamus Electra*, et al., mars it somewhat. As an exchange list its value would have been greatly enhanced by continuous numbering of the species in each order.

But these minor defects are all that the Lepidopterist will notice in the Check List. As for the Label List, which is merely a spaced reproduction of the other, it is all that could be desired in a work of that kind—a kind, however, that is always of doubtful utility.

SYNOPSIS OF THE N. A. SPECIES OF SATYRUS, WEST., WITH NOTES ON THE species collected by the N. Transcontinental Survey. By John B. Smith. From the Bulletin of the Brooklyn Entom. Soc., Vol. VI, pp. 125—135, April, 1884.

In this paper Mr. Smith reduces the 14 species of Edwards' Catalogue and the species (*Paulus*), since described by Mr. Edwards, to six, viz: *Wheeleri*, *Alope*, *Meadii*, *Sthenele*, *Baroni*, and *Silvestris*. Under *Alope* Mr. Smith has placed *Pegala*, *Alope*, and *Nephele* as forms, with *Maritima*, *Texana*, *Boopis*, *Olympus*, *Ariane*, and *Gabbii* as varieties of these forms, and *Incana* as a synonym of *Boopis*.

As is usual, Mr. Smith tabulates the species treated of—a most excellent plan, whereby a few well directed words take the place of much tedious descriptive matter. Nevertheless more minute descriptions, as well as remarks on various intergrades, and on localities, are not wanting. Occasional typographical errors somewhat destroy the sense, as for instance, the occurrence of *from* where *form* is intended, in two or three places. Mr. Smith evidently shares with his fellow Lepidopterists considerable uncertainty as to the proper use of the various terms to be applied to individuals differing from each other in less than a generic degree. Under "var. *Incana*, Edw." (p. 131) he comes to the conclusion that he "cannot believe this form entitled to a distinct varietal name;" but immediately afterwards he tells us that "Mr. Edwards very fully described the larva of this species and some of its varieties." Such slips as these, however, do not materially interfere with the great benefit that is done by a paper of this kind, giving the student, as it does, a clear insight into the modifications of wing-pattern in the genus treated of.

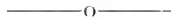
FIRST ANNUAL REPORT OF THE INJURIOUS AND OTHER INSECTS OF THE STATE of New York. By J. A. Lintner, State Entomologist. 8vo., 405 pp. Albany, 1882. (Issued Oct., 1883.)

As was to be expected, this report seems to leave nothing to be desired in its special field. Prof. Lintner begins by calling attention to the importance and value of a study of Economic Entomology, to which subject he devotes twenty-four pages; following with thirty-eight pages on the relative merits of the various insecticides. The chapter on "A new principle of protection from Insect attack," will prove of great interest to all students of life-histories. The new principle proposed is simply the use of certain substances which "shall furnish us a *safeguard against the deposit of insect eggs.*" This may be accomplished "by applying to the plant or to the soil certain odorous substances which are popularly believed to be disagreeable to the insect, and therefore, to drive it away. Such substances have been termed 'repellants,' but we doubt that they exert a repellent force, and we believe the name to be a misnomer. . . . They do so, by giving out an odor overpowering that of the plant (or animal), thereby preventing its recognition by the insect." (pp. 66—67.) Further, on p. 68, Prof. Lintner says: "All the wonderful phenomena attendant upon insect oviposition by selection, may readily be explained under the supposition that it is guided and controlled by the sense of smell." The twelve pages that are given to further consideration of this theory, for it "can only

claim, at present, theoretic value" (p. 66, foot note) contain food for much thought, and, we trust, may be the means of exciting a friendly rivalry among all students of Economic Entomology, which shall culminate in the discovery of that "fairy elixir" which, it is claimed, shall so modify insect economy that at last "all life is obliterated and vanishes *in fumo*." (p. 76)

Of most interest to the readers of PAPILO will be the chapter on "Injurious Lepidopterous Insects," to a consideration of which eighty-five pages are devoted. The life-histories of the following species are given, together with the best methods for their suppression: *Thyridopteryx*, *Ephemeræformis*, *Tolyte Laricis*, *Nephelodes Violans*, *Gortyna Nitela*, *Heliethis Armiger*, *Crambus Vulgicellus*, *C. Exsiccatus*, *Anarsia Lineatella*, *Bucculatrix Pomifoliella*, *Coleophora Malivorella*. Of these species unusually full bibliographies are given, and fifty-eight figures illustrate their various stages. From the pages of PAPILO and the CANADIAN ENTOMOLOGIST *Thanaos Nævius*, *T. Petronius*, *T. Propertius*, *T. Somnus*, and *Eudamus Electra* are redescribed.

A valuable addition to the work is the Appendix, containing a list of the entomological writings of the late Dr. Asa Fitch. This and the remarkably complete indices make this report a necessity to every student of Entomology, and the manner in which the whole subject is dealt with renders its perusal a positive pleasure.



NOTES AND QUERIES.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON has organized with the following officers: President, Dr. C. V. Riley; First Vice-president, Dr. J. G. Morris; Second Vice-president, George Marx; Recording Secretary, E. A. Schwarz; Corresponding Secretary, L. O. Howard; Treasurer, Benjamin P. Mann; Executive Committee, the officers and Dr. H. S. Barnard, P. R. Uhler and Dr. A. J. Shafhart.

The first regular monthly meeting of the society was held April 3d, in the Council Chamber of the United States National Museum. The following papers were read:

1. Some new Facts concerning the late Townend Glover. C. V. Riley.
2. On Insect Collecting at Pt. Barrow, Alaska. John Murdoch.
3. On the Insect Fauna of the District of Columbia. E. A. Schwarz.
4. On the so-called "Mistaken Parasite." L. O. Howard.

The active membership list of the society numbers over twenty names. Regular meetings are held on the first Thursday evening of each month.

L. O. HOWARD, *Corresponding Secretary*.

THE INDEX TO VOL. III.—In reply to numerous inquiries I desire to say that the Index, which is now in course of preparation by Mr. Henry Edwards, will probably be sent out with the June number. Subscribers are reminded that in addition to the fact that the work thereon is entirely a labor of love, the deficit on the last volume will throw the expense of publishing, as well, on Mr. Edwards.

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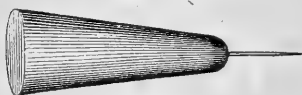
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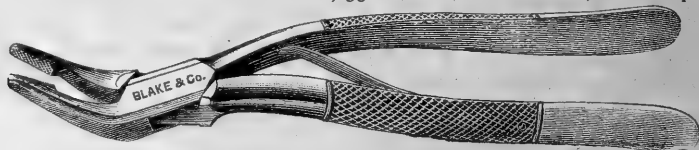
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{ VOL. 4.
No. 5.

ON THE CATERPILLARS OF NORTH AMERICAN PAPILIONIDÆ AND NYMPHALIDÆ.

BY DR. AUGUST GRUBER, Professor of Zoology in Freiburg.

JENA, 1884.

Translated from the *Jena Zeitschrift für Naturwissenschaft* (Bd. XVII, N. F. X.)
by CHARLES E. AARON, A. M.

Prof. Weismann, in his "Studies on the Theory of Descent," in the chapter on the origin of the markings of butterfly-larvæ, indicates how valuable would be the extension of his researches to other groups of LEPIDOPTERA. He says: "An elaboration of the *Papilionidæ* would appear to me of especial value, not merely of the few European species, but, above all, of the American and Indian. At this time we know almost nothing of the early stages of their caterpillars." I have it from Prof. Weismann, himself, that he had for some time entertained the purpose to pursue this line of study, and had sought to possess himself of the requisite material. At his request the distinguished student of the North American butterflies, Mr. W. H. Edwards, of Coalburgh, sent to him from time to time several almost complete series of the preparatory stages of various species of *Papilionidæ* preserved in alcohol. In addition to these Mr. Edwards presented him with a still larger number of the caterpillars of other butterflies, also in complete series.

As Prof. Weismann was detained by other studies from the elaboration of the collections sent by Mr. Edwards, he handed over to me this valuable, but, as it proves, difficult material. I have now analyzed and figured the greater part of these caterpillars in reference to the finer details of their external structure, and have thus arrived at the results which I now propose to present in this paper. The observations are, it must be admitted, quite imperfect, and if, nevertheless, I proceed to publish them, it is with the conviction that not for a long time, if ever,

shall I succeed in filling the void. Meanwhile I cherish the hope that in presenting these observations, however imperfect they may be, I offer a not entirely valueless contribution to our knowledge of the Ontogeny and Phylogeny of caterpillars.

My researches have been guided by the ideas which Weismann has presented in the above-named treatise, except that my object has been less to represent the coloring and markings of the caterpillars, which, indeed, are not always distinctly seen in alcoholic specimens. I have given more prominence to the appendages of the skin, that is to say, the form and distribution of the bristles, and the size and position of the warts, which serve as a base for the bristles. However insignificant these for the most part microscopic objects may be, it will be seen that many interesting inferences may be drawn from their changes in the course of Ontogeny.

I proceed to give, first of all, a description of the caterpillars as named, in order that I may, in conclusion, arrive with greater certainty at the general results.

DESCRIPTION OF THE CATERPILLARS.

PAPILIONIDÆ.

I have before me nearly complete series of five species, viz.: *Papilio Asterias*, *P. Turnus*, *P. Troilus*, *P. Ajax*, and *P. Philenor*, all from North America, while of our own *P. Machaon*, I have received only the first and second stages. Of *P. Brevicauda*, Mr. Edwards' work (*Butterflies of N. America*) gives figures of all the preparatory stages, which have been of use to illustrate certain points.

Papilio Asterias. FIRST STAGE (fig. 1). The general color of the caterpillar at this stage is deep black, interrupted only by a white spot, which lies like a saddle across the back of the third and fourth abdominal segments. The caterpillar is thickly beset with hairs or bristles which, for the most part, do not spring directly from the skin but from warts or knobs. These are chiefly arranged in four rows, namely, a sub-dorsal and a supra-stigmal row on each side. In addition to these, smaller infra-stigmal warts may be seen, and also similar ones near the dorsal line, which bear only a single bristle. On the head and on the last abdominal segment, as well as near the ventral space of every segment bristles are also distributed in moderate numbers.

Looking at the two principal rows of warts, namely the sub-dorsal and the supra-stigmal, it will be seen that the largest warts are on the thoracic and the last abdominal rings; indeed, the most prominent are on the first thoracic and the last abdominal, and from these to the middle the warts gradually become smaller.

The bristles standing on these warts are rather stout in proportion to their length (therefore not like hairs) and show at the extremity a highly characteristic shovel-formed enlargement (fig. 1*a* and 1*b*).

SECOND STAGE (fig. 2). This stage scarcely differs from the first; the color is still black with the white saddle on the third and fourth abdominal rings. The bristles are fewer, especially on the head and the last abdominal segment. The bristles on the warts are shorter in proportion to the warts than in the first stage and are no longer shovel-formed at the extremity, but are uniformly broad and merely rounded at the point (fig. 2*a*).

THIRD STAGE (fig. 3). After the second moult we still find no essential differences, but the dark color is now more replaced by bright spots, and the white saddle has descended farther on the sides. The warts and bristles scarcely differ from those of the preceding stage, though the former have decreased in size in proportion to the circumference of the caterpillar.

FOURTH STAGE (fig. 4). From the preceding stage to this one the transition is so abrupt that we seem quite unprepared for it. The heretofore unicolorous caterpillar now shows the coloring and markings which are so familiar in the similar stage of *Papilio Machaon*, viz.: a bright green ground with black bands, which are narrow in the joints and broad on the middle of the segments; these bands are interrupted by brick-red spots, which are arranged in three rows,—sub-dorsal, supra-stigmal and infra-stigmal. The warts, on which the bristles are scarcely perceptible, are still retained, and visibly project, especially on the sub-dorsal line, though in proportion to the size of the body they have plainly diminished; in other words, they have evidently become rudimentary. The bristles have entirely disappeared from other parts.

FIFTH STAGE (fig. 5). In the last stage the green ground color is more conspicuous, because the black bands on the segments have diminished somewhat, and in some parts only form spots between the red dots; this is especially the case on the middle abdominal segments. The warts, together with the bristles, have totally disappeared, and no indication remains of the previous hairy covering.

Papilio Breviceuda. I have not personally examined this caterpillar, but all of its preparatory stages have been figured by Mr. Edwards. Although the enlargement is not sufficient to show the shape of the bristles, yet it is clearly seen that the warts are very much as in *Asterias*.

Up to the third stage the warts and their bristles are distinctly visible; the color is black, interrupted by a white saddle which lies across the third and fourth abdominal ridges, exactly as in *Asterias*.

In the fourth stage the warts have become rudimentary, while the characteristic markings of the full grown caterpillar have already be-

come established, consisting of a bright green ground, black rings running over the segments and interrupted by yellow dots, sometimes even on the places where the warts had stood.

In the next stage the warts entirely vanish, and the markings become still more regular.

Finally, after the fourth moult, the color is much brighter, the green predominates as the black bands begin to diminish. According to Mr. Edwards, however, there are variations from this pattern in which the bands are still quite broad, and this stage, therefore, in color and markings more nearly resembles the fourth.

I remark that the last stage of *Brevicauda* more nearly resembles the fourth stage of *Asterias* than it does the fifth.

Papilio Machaon (European form, fig. 6). **FIRST STAGE.** The well known rows of warts are present, and bristles growing on them with a shovel-formed enlargement at the end. The color is black, interrupted by a white saddle on the third and fourth abdominal rings.

SECOND STAGE. With the first moult no essential alteration appears, and I am not able to state at what period the change to the green form, furnished with black bands and red dots, takes place. I think I may assume, however, that this change appears after the third moult in this species as well as in *Asterias* and *Brevicauda*.

Papilio Turnus.* **FIRST STAGE** (fig. 7). The brown ground color is interrupted by a white, oblique band, which crosses from the back of the sixth to the ventral side of the first abdominal segment, and appears to divide the caterpillar into two parts. The hairy covering is not very heavy. The bristles stand on warts, which are most fully developed in the sub-dorsal row and sensibly decrease from the ends to the middle. The bristles are short, and have a shovel-formed enlargement (fig. 7*a* and 7*b*).

SECOND STAGE (fig. 8). Of this stage I have had but one badly preserved specimen, yet by comparison with Mr. Edwards' figures I have been able to prove that it does not materially differ from the first stage.

THIRD STAGE (fig. 9). This does not differ from the preceding stage in color, except that an ocellate spot begins to appear on the third thoracic ring.† The warts have become rudimentary, except they still project somewhat more distinctly on the first two thoracic, and especially the last abdominal rings. By the aid of a stronger magnifying power very small bristles, tapering to a point, can be seen on the warts (fig. 9*a*).

* Mr. Edwards, in his "Butterflies of North America," has figured all the stages of *Papilio Turnus* from life with the natural colors, which were not visible in my alcoholic specimens. I therefore depend on Mr. Edwards' drawings. As regards the bristles and warts, his enlargement is not sufficient.

† I cannot decide from my preparation, or from Mr. Edwards' figure, whether this spot had begun to appear in the second stage, as it does in *Troilus*.

FOURTH STAGE (fig. 10). The brown gives place to an entire green color, on which there is now only a faint indication of the bright oblique band. The ocellate spot is now fully formed. Only an indistinct trace of the warts is now visible on the last abdominal segment.

FIFTH STAGE (fig. 11). According to Mr. Edwards, beside the green specimens, brown ones are also found. Every indication of the previous hairs and warts has entirely disappeared.

Papilio Troilus. FIRST STAGE (fig. 12). In the alcoholic specimens, which were the only ones at my command, the coloring was not distinguishable, but it is probably brown, as in the related species *Turnus*. The numerous bristles stand on warts, which are arranged in longitudinal rows. On each side is a dorsal row of warts, each bearing only one bristle, a sub-dorsal, a supra-stigmal and an infra-stigmal row; there are additional bristles on the head, on the last abdominal segment, on the abdominal legs, etc. The warts of the sub-dorsal and supra-stigmal rows are largest in front and in rear, and smallest on the middle segments. The bristles are stout, and have a shovel-formed enlargement at the extremity (fig. 12a).

SECOND STAGE (fig. 13). What was said about the coloring in the first stage holds good here, except that on the third thoracic ring a dark spot now appears, which afterward becomes ocellate. The warts have begun to disappear, and they are still clearly visible only on the thoracic and the last abdominal segments in the sub-dorsal row; toward the middle they have almost entirely subsided. The bristles have become much smaller in proportion to the warts, and have entirely lost the shovel-formed enlargement (fig. 13a).

THIRD STAGE (fig. 14). After the second moult the caterpillar is greatly altered. The color has probably become green (as in *P. Turnus*), interrupted by a bright band running obliquely over the first abdominal segments, like that found in *Turnus* up to the fourth stage. On the last abdominal segments also is found a trace of a band running in a similar direction. The black spot on the third thoracic ring has increased in size. The warts and bristles have almost entirely disappeared, and only on the thoracic and the last abdominal rings faint traces of them are still found.

The FOURTH STAGE has not been at my disposal.

FIFTH STAGE (fig. 15). The general color is still probably green, but distinct bright spots with a dark outline now appear where the sub-dorsal, supra-stigmal and infra-stigmal warts had previously stood. On the third thoracic ring an ocellate spot of intricate pattern has been formed, while the indication of a similar one is seen on the first abdominal segment. No further trace can be found either of the warts or the bristles; the body of the caterpillar appears perfectly smooth.

Papilio Ajax. FIRST STAGE (fig. 16). The color of the little caterpillar is very dark, probably black. Four rows of warts appear on each side,—dorsal, sub-dorsal, supra-stigmal and infra-stigmal. Only a single bristle stands on each of the small dorsal warts, while the others bear many. The bristles on the upper rows of warts are very long, and of a peculiar form, having a furcate division at the extremity. In this they entirely differ from the form of bristles seen in the first stages of the other *Papilionidæ*, which have a shovel-formed enlargement. Nevertheless they may be traced back to the latter, since they are formed by the division of an enlarged extremity.

SECOND STAGE (fig. 17). This stage seems scarcely to differ from the first; the general color, as well as the form of the warts and bristles, is exactly the same as before the moult.

THIRD STAGE (fig. 18). The change from the second to the third stage is an abrupt transition. The color has been suddenly altered; instead of the uniform dark hue, the ground color is now quite bright, and is interrupted by a large number of black bands, four of which are seen on every segment. The lower part of each ring is enclosed by two curved longitudinal stripes. The warts and the long forked bristles have suddenly vanished, and the skin appears quite smooth. I have a preparation in Canada-balsam, in which the skin is just beginning to be loosened, so that under it is visible the form of the caterpillar in the third stage; by the aid of a high magnifying power it may be seen that bristles are still present even in this stage, but very small, and without furcation, and in proportion to the size of the body almost invisible.

FOURTH STAGE (fig. 19). The only alteration in this stage is that the black stripes have become much narrower, and often appear interrupted, so that the bright general color is now more prominent; between the last thoracic and the first abdominal segment a broad black band appears.

The FIFTH STAGE has not come under my notice, but I do not believe that it will be found to differ essentially from the fourth.

Papilio Philenor. FIRST STAGE (fig. 20). I cannot decide with certainty as to the color from alcoholic specimens, though it seems to be dark. The young caterpillar is beset with very long bristles, which stand on small warts. Each wart in the two dorsal rows bears only a single bristle, while those in the sub-dorsal, supra-stigmal and infra-stigmal rows bear several. In addition to these there are also stout bristles on the head, the last abdominal segment below the infra-stigmal row, and finally on the thoracic feet. Two different kinds of bristles can be distinguished, namely: those having an enlargement above (fig. 20*a*), and others which run to a point. The latter seem to be the more numerous, while the former are confined to the dorsal and sub-dorsal rows of warts.

SECOND STAGE (fig. 21). With the first moult the exterior of the caterpillar undergoes a decided change; the hairs become so short as to be visible only by the aid of a strong magnifying power. The shovel-formed bristles have entirely disappeared. The warts, on the other hand, have not decreased in size; in fact, those on the thoracic rings, the last abdominal rings, and all in the infra-stigmal row have become longer in proportion to the size of the body; the warts standing on the middle abdominal segments in the sub-dorsal row are the only ones that have not grown larger.

THIRD STAGE (fig. 22). With regard to the hair the same may be said as in the preceding stage, while the warts, which after the first moult showed an increase, have become notably larger after the second. A long horn-like formation has arisen from the first thoracic segment.

FOURTH STAGE (fig. 23). This has not come under my inspection; it will probably be found to differ essentially from the previous stage only in the fact that the bristles on the warts have entirely disappeared.

FIFTH STAGE (fig. 24). The color of this, as well as of the preceding stages, seems to be uniformly dark. The entire body is smooth, the sub-dorsal warts of the middle abdominal segments have almost entirely subsided, while those which were previously said to be in process of growth have grown to be long horns, which lend, especially to the thoracic segments, a very peculiar appearance.

NYMPHALIDÆ.

Of this family I have also examined a few West Virginian forms from the same point of view, and will briefly give the results, remarking that the genus *Melitæa* was the most thoroughly studied.

Melitæa Phaeton. FIRST STAGE (fig. 25). The body of the minute caterpillar is covered with many separate bristles standing on small warts; the latter are arranged in regular rows, namely: one dorsal row, and on each side of the body a sub-dorsal, a supra-stigmal and an infra-stigmal row; in addition to these there are bristles on the head, on the last abdominal segment, and beneath the infra-stigmal row. The latter are slightly curved, and quite fine at the point, but visibly toothed (fig. 25a).

SECOND STAGE (fig. 26). After the first moult the exterior of the caterpillar has essentially changed, namely: in place of the small pimples, on which in the first stage the single bristles stood, large warts now project, covered with numerous bristles, as in the first stages of the *Papilionidæ*. In their number and position these warts correspond to the pimples of the first stage, and the bristles planted on them are, like those first described, finely toothed, but somewhat shorter than they in proportion to the size of the body.

The THIRD and FOURTH STAGES have no essential changes to show in comparison with the second. The toothed bristles are always present, and give to the caterpillar its well-known hairy aspect.

The FIFTH STAGE has not been under my inspection; but it does not seem to differ from the preceding ones, so far at least as we may judge from the figures given by Mr. Edwards. That author has figured the entire development of the *Phaeton* caterpillar from life, and with the natural colors, to which I here refer. The magnifying power used by Mr. Edwards is not adequate to the determination of the characteristic form of the bristles.

Melitæa Marcia. FIRST STAGE (fig. 28). One dorsal row, two sub-dorsal, two supra-stigmal and two infra-stigmal rows of single bristles can be seen on the young larva. The bristles are very long, somewhat curved and finely toothed.

SECOND STAGE. On the spots where, before the first moult, the single bristles had stood, high warts have now been formed, which are covered with numerous bristles. The greater part of these bristles resemble those of the preceding stage, but on the warts standing in the sub-dorsal row a part of the bristles are of different form, being destitute of teeth and swollen at the base.

THIRD STAGE (fig. 29). On the dorsal, the sub-dorsal, and the supra-stigmal rows the toothed bristles are entirely supplanted by smooth ones swollen at the base, while on the infra-stigmal row only a single bristle appears on each wart.

FOURTH and FIFTH STAGES. We find the same condition also in the last two stages, *i. e.*, the toothed bristles which were at first exclusively present have now given place to the second form with smooth surface and swollen base.

Melitæa Nycteis. FIRST STAGE (fig. 30). The young caterpillar is covered with long, curved, toothed bristles, which are arranged in the usual regular rows.

SECOND STAGE (fig. 31). After the first moult, in place of the simple bristles, large warts have appeared beset with numerous bristles. A part of these are toothed as in the first stage, a part swollen at the base.

The THIRD STAGE I have not been able to examine.

FOURTH STAGE (fig. 32). In this stage, *i. e.*, after the first moult following the hibernation, the bristles are no longer enlarged near the base, but taper uniformly to a point.

The FIFTH and SIXTH STAGES show no differences worthy of mention.

Melitæa Tharos (fig. 33). FIRST STAGE. This is the only stage of *Tharos* that I have observed, and I find that here also the long, slightly-curved, and finely-toothed bristles are present, arranged singly in the usual longitudinal rows.

Melitæa Didyma. Of this species I have only incomplete investigations to offer, from which, however, I infer that in its development it does not essentially differ from the previously named species.

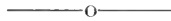
Argynnis Myrina. FIRST STAGE (fig. 34). The young caterpillar is beset with many bristles, which stand singly, and arranged regularly in longitudinal rows,—dorsal, sub-dorsal, supra-stigmal and infra-stigmal. These bristles, as in *Melitæa*, are long, slightly curved and finely toothed.

SECOND STAGE (fig. 35). After the first moult the single bristles are replaced by numerous ones which stand on high warts. A large part of the bristles are still toothed, though many smooth ones already appear among them.

THIRD STAGE. The teeth on the bristles are now scarcely visible, even by the aid of a strong magnifying power.

The FOURTH and FIFTH STAGES have not been at my disposal.

(To be continued.)



DESCRIPTION OF THE PREPARATORY STAGES OF LYCÆNA MELISSA, Edw.

BY W. H. EDWARDS.

EGG.—Shape of *Pseudargiolus*, round, flat at base, the top flattened and much depressed in middle; the surface covered with a fine lace-work, the meshes of which are mostly lozenge-shaped, and bear a low rounded process at each angle. Duration of this stage about five days.

YOUNG LARVA.—Length .03 inch; color yellow-green; surface pubescent; dorsum high, rising to a narrow, flat ridge, which slopes from segments 4 or 5 to 13; on either edge of this ridge is a row of long white clubbed hairs, one at the posterior end of each segment, those on anterior segments curved forward; the others back; along base, both on sides and around segment 13, are similar hairs, bent down; others from segment 2 fall forward, and the effect is that of a fringe around the whole body; head ob-ovoid, black, smooth. Duration of this stage five days.

After first Moulting: length .06 inch; color greenish white; shape very much as at previous stage; the dorsum high and flattened; the hairs and fringe as before. To next moult eight days.

After second Moulting; length .12 inch; color pale green; very much the same shape as before; same flat ridge, hairs and fringe; surface pubescent. To next moult five days.

After third Moulting: length .16 inch; color grey-green; shape as before; straight hairs along the ridge, curved ones around base; on segment 12, back of and between the stigmata, are two small swollen yellow spots indicating the position of the concealed tubes, just as in *Pseudargiolus*. To next moult five days.

After fourth moult: length .25; two days later .36 inch; at five days from the moult was full grown.

MATURE LARVA.—Length .44 inch; greatest breadth .12 inch; slender, of even width to near the ends, which are equally rounded, the head being withdrawn into segment 2; segment 2 lies flat, the edges thickened and rounded; the other segments rounded; the dorsum rather high, rising to a flattened ridge, which is broadest on segment 3, and narrows posteriorly to 10, where it ends; along either edge of the ridge are whitish bristles; around base a fringe of bristles; surface covered with short, fine, white hairs springing from black points; color of one shade, a pale or whitish green; along base a cream-colored stripe; under side blue-green; the tubes appear at will from segment 12, and on 11 is an orifice on mid-dorsum, as in *Pseudargiolus*; head small, obovoid, smooth, black-brown; the ocelli black. From fourth moult to pupation eight days.

CHRYSAEIS.—Length .28 inch; breadth across mesonotum .09 inch, across abdomen .11 inch; abdomen broad, thence to head narrowing; head rounded, blunt at top, narrow; mesonotum low, rounded, and from top of this to head a regular slope; a slight excavation back of mesonotum; color yellow-green, abdomen whitish; surface smooth, glossy. Duration of this stage eight days.

I received one larva of *Melissa* from Mr. H. W. Nash, of Pueblo, Col., June 8th, 1883. The egg had been laid on a leaf of an *Astragalus*—pronounced by Prof. Goodale to be near *bisulcatus*, but not enough of the plant was sent to enable him to determine the species exactly. The larva had just moulted when it reached me in the mail, and the cast skin was by its side; length .25 inch. I afterwards found the moult to be fourth. I gave the larva blossoms of peas and clover, both which it ate. The organs on segments 11 and 12 corresponded with those found in larvæ of *Pseudargiolus* and *Comyntas*. On mid-dorsum of 11 was a transverse slit near the posterior edge of the segment, and on 12 were swollen spots behind and between the spiracles. On June 9th I introduced a small ant to this larva, which was confined in a glass tube. The ant soon discovered the larva, and ran about it in great excitement, caressing it with its antennæ. Immediately the tubes, which I had not hitherto seen, began to play, and one or the other, or both together, were exposed for some minutes, and indeed so long as the ant was near. Sometimes the tubes were fully protruded, with the tentacles expanded, at other times were partially withdrawn, in that case

coming together in a pencil just as has been observed in *Pseudargiolus* (see Can. Ent. 10, 136, figure 8). The ant always ended its caresses by putting its mouth to the orifice on segment 11, and by its motions evidently found the fluid it sought.

Next day I turned in two ants at same time, and of a larger species. They ran about the glass as if alarmed at finding themselves in confinement, and accidentally one soon touched the larva. At once a drop of green fluid bubbled up from segment 11 before the tubes made any movement. The ant saw it and rushed to it, and then the tubes began to play. They had been quiet for fully five minutes before, and while I was sitting by, but now they played intermittently for two or three minutes, the tentacles fully expanding and then partly retreating. The ants drank of the drops four times and then desisted, running about the glass again. I let them out and introduced one of the small ants, the same species as that experimented with the day before. Almost at once it found the larva, caressed it gently, and was favored with the coveted nectar, the tubes all the time in motion. On the 12th, larva now mature, I introduced an ant. As usual, as soon as the manipulations began, the tubes began to play, and presently a large drop issued from segment 11. In ten seconds, by the watch, another followed, but for some time after there was no more, though the ant begged urgently for it. The ant left segment 11, and ran up and down the body of the larva, caressing the anterior segments, and then returned to 11 and begged again. This was repeated several times, but the larva was obdurate. This larva was near pupation, and was probably exhausted. The solicitations are made by the antennæ alone, which fly about, drumming here, there and everywhere, the ant manifesting great excitement. I was observing ants in tubes with *Pseudargiolus* at this same time, and the behavior of the two species was identical. This larva fixed for pupation 13th; so it remained for three days, shrinking to .32 inch, and made chrysalis on the 16th. The butterfly emerged the 25th of June.

On 16th of June, I received from Mr. Nash a lot of eggs and young larvæ, hatched *en route*. I searched the hill-side for flowers of vetches to feed the larvæ on, but finding none, gave them pea blossoms and clover. But they died rapidly, and by the 19th there were only four left, and these had left the blossoms and attached themselves to the clover leaves, eating out narrow passages on the upper surface, as does the larva of *Comyntas*. On the 20th, one passed first moult, the second moult the 28th, the third moult July 3d, and shortly after it was accidentally lost. The other three had died, but after all I was able, through the first larva received and this one, to get at the whole larval history.

Lycæna Melissa is a small and pretty species, allied to *Acmon*, ornamented with bright red spots along the margins of both wings on under side. It flies from Arizona to Montana, through the mountains, and into British America.

NEW HETEROCERA FROM VARIOUS PARTS OF OUR CONTINENT.

BY B. NEUMOEGEN.

Varina, n. g.—Head prominent, front broad; palpi porrect; antennæ pectinated entirely, and as long as in *Parasa*; thorax hairy, patagiæ defined; abdomen long, slender, tapering towards tip and tufted, extending about one-third beyond secondaries; primaries well developed; costa straight, somewhat swollen near base; apex and inner angle rounded; exterior margin convex. Secondaries not quite equal in width to primaries; apex and anal angle rounded.

Varina ornata, n. sp.—Antennæ and legs light brown; head and body of dark chestnut-brown; thorax and primaries chestnut-brown; fringes concolorous, with a darker marginal line; lighter shades at base, along costa and exterior margin; two irregular transverse lines starting from costa; the lower half of them from median nervure to interior margin of brilliant white, the upper half being submerged by rich chestnut shades; the anterior line undulating inwardly as far as median nervure, whence it bulges out in a sharp angle towards interior margin, this angle being especially illuminated by white; beyond this line, at inner angle, a brick-red maculation, crowned by a few small black spots; the inner transverse line swinging in a semi-circular way around base; the space included by it having a brick-red shade along median nervure and a few black dots at base; the interspace between the two transverse lines of a deep, rich chestnut-brown, darkest at centre, with a prominent, large reniform discal spot of brick-red hue, encircled by brilliant white. Secondaries uniform, brownish black; fringes somewhat lighter. Beneath, primaries and secondaries blackish brown, with lighter shades along exterior margins; small black discal dots on both wings.

Exp. of wings 21 mm. Length of body 9 mm.

Hab.—Central Florida.

Type ♂ Coll. B. Neumoegen.

This handsome insect belongs to the *Cochliidiinae*, and should be placed between *Parasa* and *Phobetron*.

Basilodes mirabilis, n. sp.—Head and thorax greenish; abdomen and legs light yellow; antennæ yellowish; primaries of delicate, light greenish tint; fringes yellowish; cut of wings quite remarkable, bulging out at centre of exterior margin, then retracing and pointing outwardly at inner angle; a bright, dark green, large triangular costal spot at junction of base and costa, the point of the spot resting at base; another somewhat oval, large costal blotch of bright dark green near apex; from apex to interior margin, resting on latter near inner angle,

a transverse white line parallel with exterior margin, bent inwardly somewhat at centre, and shaded inwardly with bright dark green; a second transverse white line from very near apex to middle of interior margin, swinging inwardly quite considerably, and shaded with a dark green tint; a third transverse white line from costal spot near base, running towards centre of wing as far as median nervure, then turning in a sharp angle to interior margin and resting on same, thus giving the basal space inclosed by it a triangular point towards the centre; between this and the second transverse line a discal dot of long oval shape, and another smaller interior dot resting on sub-costal nervures; between the anterior transverse line and exterior margin a large irregular square spot resting on interior margin at inner angle, giving the latter a prominently pointed appearance by its strange markings. Secondaries uniform silvery greyish white, with broad black marginal band from costa to anal angle, fading gradually towards centre of wing. Beneath, primaries blackish; costa and fringes creamish white; at base and along interior margin shadings of the latter color. Secondaries of uniform creamish white with concolorous fringes.

Exp. of wings 31 mm. Length of body 9 mm.

Hab.—Southwest Arizona (Morrison).

Type ♂ Coll. B. Neumoegen.

This insect is remarkable for its odd markings and cut of primaries, and looks rather like a gigantic *Schinia*, but according to close examinations by Mr. John B. Smith and myself, bears out all the characters of *Basilodes*.

Stiria nanata, n. sp.—Head, collar, thorax and primaries of bright sulphur color; fringes concolorous, with brownish tints at intersection of nerves; some irregular brownish maculations along sub-costal and median nervures, connecting at junction of median and sub-median nervures, and forming there an irregular brown blotch; a small irregular spot on costa near apex; a transverse line of brown dots parallel to exterior margin from near apex to inner margin. Secondaries uniform grayish brown with yellow fringes; legs and body light yellow. Beneath, primaries blackish brown, fading somewhat into yellow near apex; along costa and fringes of exterior margin light yellow; secondaries straw-yellow, with some light dusting of reddish brown.

Exp. of wings 27 mm. Length of body 9 mm.

Hab.—Las Vegas, N. M.

Type ♂ Prof. F. H. Snow.

Snowia, n. g.—Head small, but broad; thorax hairy; abdomen long and slender; wings large, almost rectangular at apex, and well curved; hind wings rounded, with prominent anal angle, hairy along basal margin; tibiae long and slender, tarsi extended.

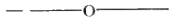
Snowia montanaria, n. sp.—Antennæ, head, thorax and primaries yellowish brown; legs and body of a somewhat lighter color; some grayish granulated sprinkling from apex to middle of exterior margin, and at inner angle; the following prominent markings in blackish brown: two irregular transverse lines from costa to inner margin; the interior line starting from middle of costa and the anterior from near apex; both lines pointed outwardly, the anterior line as far as second sub-costal nervure, the interior as far as discoidal nervure, but afterwards resuming their transverse course in a somewhat undulating way; the interspace between these lines of a darker brown shading, with prominent blackish brown horizontal dashes, broadest inwardly, along first median and sub-median nervures; a blackish brown dash from base to interior transverse line above sub-median nervure. Secondaries silvery gray, darkest along exterior margin and shading lighter towards base; a brown mesial line. Beneath, primaries and secondaries yellowish gray with some sprinkling of brown grains along exterior margins; costa and fringes yellowish; a blackish brown transverse line on primaries from costa to sub-median nervure; a prominent blackish brown, undulating mesial line, and a discal spot of same color on secondaries.

Exp. of wings 42 mm. Length of body 10 mm.

Hab.—Las Vegas, N. M.

Type ♀ Prof. F. H. Snow.

This handsome geometrid ranks between the European genus *Ellopia* and our *Caberodes*, and I take great pleasure in dedicating it to my friend Prof. F. H. Snow.



THE TYPES OF TINEINA IN THE COLLECTION OF THE MUSEUM IN CAMBRIDGE, MASS.

BY DR. H. A. HAGEN.

The growing interest in the study of the MICROLEPIDOPTERA of N. America may perhaps excuse the publication of a catalogue of the types now present in the collection. Collections of types will be archives of all that has been done in science. The better the facts of science are preserved, the better the archives will be. These collections should therefore be handled as carefully as archives are handled. Of course they are brought together to advance science, and can therefore be used by scientists in a manner agreeing with the rules and by-laws of the Museum. They cannot be sent to volunteers, or to beginners, and only by direct application to the Director of the Museum to scientists. It should never be forgotten that a future generation will have the same right as the actual one, to find the types preserved in

good and reliable condition. Visitors to the Museum for scientific purposes have always been contented with the use of the types allowed to them.

For *Tineina*, the collection is rich in types of the late Prof. Zeller, and principally the late Mr. V. T. Chambers, and some of Prof. H. Frey, in Zurich.

Prof. P. C. Zeller's types are described in his four papers: *Beitraege zur Kenntniss nordamericanischer Nachtfalter* in *Verhand. Z. B. Gesell.* Wien, 1872 to 1875. Three papers containing mostly Texas and Eastern species, one only Western species. All types in the collection are from Texas, collected by the late J. Boll in Dallas, Dallas County. The whole collection was bought by the late Prof. L. Agassiz, and sent to Prof. Zeller for scientific work. Of the Eastern species, which belonged to Prof. Zeller's private collection (now owned by Lord Walsingham), no types are present. To a certain extent this gap is filled by the types of Prof. H. Frey and J. Boll, collected by the latter around Cambridge, Mass., and described in *Stett. Ent. Zeit.* 1876. All specimens raised and spread by Mr. Boll are in good condition.

Mr. V. T. Chambers wrote to me in 1876 that he had the intention to present to the Museum all of his *Tineina* not destroyed by pests. As he himself had not sufficient time to take care of his collection, which had suffered extensively by several long absences from home, he wished the remainder, about one-half, to be preserved for the sake of science. A large lot arrived in 1876, and a similar one in 1877. Several smaller lots in the following years, the last one, forty types of Lord Walsingham, only a short time before his premature death. Mr. Chambers declared himself that the specimens were in bad condition. The first lot was in cotton loose in pill-boxes or in quills, and was carded by myself as well as possible. The second lot and the later ones were pinned, mostly set in pieces of pith, loosely enough, so that always a large number had dropped out during their transportation. I have tried to restore all that could be restored, and Mr. Chambers was so kind as to replace lost species if duplicates were at hand. The only species spread were those bought by him from Waco, Texas, collected by Mr. Belfrage. In general, and I am obliged to state the truth, the types of Mr. Chambers are in bad condition, sometimes in indifferent condition, and then scarcely fit to recognize the species, or even the genus. Nevertheless I have carefully preserved even rudiments, as they may give, perhaps, a negative result. Every where the labels in Mr. Chambers' hand-writing are preserved.

Prof. H. Frey had the intention to study carefully the N. American *Tineina*, and a part of them was sent to him. His failing health prevented the execution of his intention, but he was able to make some notes, which will be valuable for students.

I begin the catalogue of types with the largest genus, *Gelechia*. Zell. after the species' name signifies the presence of a type of Zeller; Chamb., a type of his; Frey, the same; two names after signify the presence of types of both. The number of specimens is given after the name; if there is no number, only one specimen is present. I have followed, for convenience, the alphabetical index given by Mr. Chambers in "Hayden's Bull." IV, No. 1, 1878. Species published later, or left out inadvertently, are put in the proper place. A number of typographical errors are corrected, also other errors after detailed notes given by Mr. Chambers in his letters. The copies of his papers presented to me by him contain a number of corrections and additions which have been used by me. Nevertheless the very large number of papers scattered in different periodicals make it very difficult not to overlook some statements. Notes of Prof. Frey are put in brackets.

GELECHIA, Zell.

- aberensella*, Chb. "MS. name of an undescribed species from Cala.; a species with neurulation like *Blastobasis*" Chb. letter. (probably a *Depressaria*, Fr.)
- aequepulvella*, Chb. 9 Col.
- albistrigella*, Chb. 2 Ky.
- albmargineella*, Chb. Ky (bad condition).
- amorphocella* Chb. 4 Col. (*Gelechia?* Fr.)
- anarsiella*, Chb. 8 Col. This species is given in "Errata and Addenda to Index of *Tineina*, with the quotation Hayd. Bull. Geol. Sur. V 3, p. 126. But it is not to be found in this vol. It must be an error, though I have before me a copy of these Errata with corrections by Mr. Chambers. (after the palpi an *Ypsolophus*, Fr.)
- apicistrigella*, Chb. Ky.
- basifasciella*, Zell. 8 Texas.
- basistrigella*, Zell. Texas.
- bicostomaculella*, Chb. Col.
- bicristatella*, Chb. 2 Canada (*Gelechia?* Fr.)
- bimaculella*, Chb. 4 Ky.
- biminimaculella*, Chb. 2 Waco, Texas. Cincinn. Journ., 1880, p. 5.
- bosquella*, Chb. 3 Waco, Texas.
- canopulvella*, Chb. Waco, Texas.
- cercerisella*, Chb. 16 Tex. Var. *quinella* (Zell.) Chb. Waco, Texas.
- ciliatiniella*, Chb. Waco, Texas.
- clemensella*, Chb. 5 Pa. (is a *Depressaria*, Fr.)
- collinusella*, Chb. Col.
- concinusella*, Chb. 2 Texas. (*Gelechia?* Fr.)
- consonella*, Zell. Dallas, Texas.
- costorufocella*, Chb. 2 Waco, Texas.
- crescentifasciella*, Chb. 7 Texas.
- cristatella*, Chb. 5 Ky.
- cristifasciella*, Chb. Ky.
- curvilineella*, Chb. Ky. (*Gelechia?* Fr.)
- depressostrigella*, Chb. 7 Texas.
- difficilisella*, Chb. 9 Ky.
- disconotella*, Chb. Ky.
- discoocella*, Chb. 3 Ky.
- dorsivittella*, Zell. Texas.
- dubitella*, Chb. 2 Ala. Two species labeled *badioverticella*, Chb., belong to *dubitella*, Chb. letter.
- elegantella*, Chb. 8 Texas.
- (*eupatoriella*, Chb. vid. *Nothris*; is a *Gelechia*, Fr.)
- fragmentella*, Zell. Texas.
- fuscoluteella*, Chb. Ky.
- fuscomaculella*, Chb. Ky.
- fuscoochrella*, Chb. 12 Ky. (related to European species, Fr.)
- fuscopallidella*, Chb. 3 Ky (very indifferent condition).
- fuscopulvella*, Chb. Ky.
- fuscotæniella*, Chb. Waco, Texas.

- gallæsolidaginis*, Riley. Chb. 3 Col. (not in condition to decide the genus, Fr.)
gilvoscopella, Zell. 2 Texas.
glandiferella, Zell. 6 Texas.
gleditschiæella, Chb. = *pallidochrella*, Chb. 3 Ky.
glycyrrhizæella, Chb. Col.
griseofasciella, Chb. Texas.
hermanella, Fabr. Chb. 2 Ky.
inaequipulvella, Chb. Mo.
innocuellæ, Zell. 2 Texas.
intermediella, Chb. Waco, Texas.
lactiflosella, Chb. Waco, Texas.
latifasciella, Chb. 3 Mo.
liturosella, Zell. Texas.
leuconota, Zell. Texas.
lynceella, Zell. 4 Texas.
maculomarginella, Chb. 2 Waco, Texas.
marmorella, Chb. 2 Waco, Texas.
minimaculella, Chb. Texas.
minimella, Chb. 2 Texas.
monumentella, Chb. Col.
montisella, Chb. (not in the Index; not described; from Col., and perhaps identical with *amorphocella*. Chb. letter.)
multimaculella, Chb. 2 Waco, Texas.
nigrella, Chb. Ky.
nundinella, Zell. 2 Texas.
obliquefasciella, Chb. Waco, Texas (not in the Index).
obliquistrigella, Chb. Ky.
obscuræella, Chb. 2 Ky.
obscurosuffusella, Chb. 2 Waco, Tex.
occidentella, Chb. 3 Col.
ocellella, Chb. 2 Texas. Col.
ochreocostella, Chb. Waco, Texas.
ochreostrigella, Chb. 6 Col.
octomaculella, Chb. Col.
olympiadella, Zell. 3 Texas.
operculella, Zell. 5 Texas.
pallidochrella, Chb. 3 Ky.
palliderosacella, Chb. Texas.
palpiannulella, Chb. 3 Ky. (in very different condition.)
palpilineella, Chb. 2 Ky.
pedmontella, Chb. Col.
physalivorella, Chb. Mo.
prunifoliella, Chb. 3 Ky.
pseudacaciella, Chb. 11 Ky.
pubibundella, Zell. 10 Texas.
quadrinaculella, Chb. 2 Texas.
quercivorella, Chb. 2 Ky.
querciella, Chb. 3 Ky.
quinqueannulella, Chb. Ky.
ribesella, Chb. Col.
roseosuffusella, Chb. 7 Col.
rubensella, Chb. 8 Ky.
rufusella, Chb. 2 Waco, Texas.
sapharinella, Chb. 2 Ky. ? (very bad.)
saundersella, Chb. 4 Canada. (scarcely a *Gelechia*, Fr.)
scutellariæella, Chb. Ky.
(sella, Chb. 16 Ky. = *glandiferella*, Zell.)
serratipalpella, Chb. Col.
serrativittella, Zell. Chb. 2 Texas.
sexnotella, Chb. Texas. (not in the Index.)
solaniella, Chb. 3 Texas.
suffusella, Chb. 6 Ky.
ternariella, Zell. Texas.
thoracealbella, Chb. 5 Texas.
thoracefasciella, Chb. Cal.
thoracénigræella, Chb. Cal.
trialbamaculella, Chb. 2 Texas.
trifasciella, Chb. Texas.
trilineella, Chb. 6 Col.
trimaculella, Chb. 4 Texas.
triocellella, Chb. 8 Col.
unctulella, Zell. Texas.
violaceofusca, Zell. Texas.
variiella, Chb. 2 Ky. (scarcely a *Gelechia*, Fr.)
versutella, Zell. Texas.

Of the 202 described species of *Gelechia* from N. America, the types of 114 are in the collection. Of the species described by Mr. Chambers, 46 are in the collection; of the species described by Prof. Zeller, 11 are wanting.

Prof. Frey remarks that of the 114 species not one is identical with a European species. Only *G. sequax* Hau. is mentioned by Prof. Zeller as a European species.

EARLY STAGES OF MEXICAN LEPIDOPTERA.

BY WM. SCHAUS.

Papilio Daunus, Bdv. LARVA.—Length when mature $1\frac{5}{8}$ — $2\frac{1}{4}$ inches. Head pale brown. On segment 2 are very long retractile tentacles of a brownish color. Body smooth, the fourth and fifth segments being very inflated, the other segments are rather small; color apple-green; on fourth segment are dorsally two small spots of a lighter green, edged by a fine black line and beyond these spots on each side are larger irregular spots of light green also edged by a black line; these latter spots enclose a spot of apple-green edged with black but having also a tiny blue central point; on segment 5, are four dorsal blue points and the segment is bordered posteriorly with light yellow; the sixth segment has anteriorly a broad transverse velvety black band, which joins the fifth segment; segments 8, 9, 10 and 11 have each four small dorsal blue points and segment 13 has a transverse yellowish ridge; laterally beginning at segment 4 is a pale blue point below stigma which is yellow and below these points the ground color is mottled with grayish points and lines. Underneath whitish, prolegs white, abdominal legs pale green. Before pupation the colors change, the apple green becoming rich brown, and the light green, yellow; the abdominal legs become gray. The pupa being already known I do not redescribe it. The imago is rare at this low elevation,* being found chiefly on the plains above.

Papilio Pilumnus, Bdv. LARVA.—Length 2 inches, rather slight, though general formation is the same as in the other species of this group. Segments 3, 4 and 5 are thicker, but not so inflated as in *Daunus*. Head, which is small, and anterior half of second segment are pale brown; second segment has centrally a transverse yellow ridge and the posterior portion as well as entire rest of body, dorsally, bright green. Anteriorly on segment 4 are two large fawn-color spots, edged with a very fine black line and having within each two black spots, the outer one large and round, the inner one very small and irregular. Dorsally on segments 5 to 12, under side, are four rows of little blue rings placed rather outwardly. Laterally, extending from transverse yellow ridge on segment 2 and passing through stigma and right around last segment is a yellow line; below this and underneath the color is light brown; prolegs and abdominal legs the same. Just below yellow line on segments 6 to 12, inclusive, is a brilliant and rich blue round spot, finely, almost imperceptibly, edged with a black line. Be-

* Vicinity of Vera Cruz.—Ed.

fore pupating, larva becomes dorsally of a very pale brown, and then gradually becomes paler, till segments 6 to 13 are dorsally pink. The lateral coloring and spots remain unchanged. Feeds on Laurel.

PUPA: length $1\frac{1}{4}$ inches. Wing cases projecting slightly; on head two small conical projections and a smaller one on thorax. Laterally ridged; pupa very slightly rough, pale green or pink; lateral ridges, conical projections and a sub-dorsal line purple. To either side of sub-dorsal line at segment one a large purple spot, and on following segments two rows of purple dots, the outer ones almost imperceptible; on leg cases a few purplish markings also. Before emerging, the markings on wings of Imago become distinctly visible. Pupal state lasts from four to six weeks, and although the larva is rare, the butterfly is common during the entire year.

Papilio Helleri, Feld.—General appearance and size the same as *Daunus*. Head pale gray, second segment the same, with a broad pale-green transverse band. Segments 3, 4 and 5 dorsally grayish green; anteriorly on fourth segment a broad, gray, transverse band enclosing a few black spots, and outwardly two buff ones; posteriorly green, edged by a white line, interrupted by four pale blue spots; between this line and anterior gray band the green is thickly dotted with white; laterally and posterior portion of fifth segment dorsally, gray; between fifth and sixth segments is a transverse black band as in *Daunus*. Segments 6 to 13 dorsally green, laterally gray. The green is dorsally interrupted on segments 8 to 11 by two large triangular gray spots, having their apices sub-dorsally between ninth and tenth segments. These triangles enclose each a large green spot on segments 9 and 10; posteriorly on segment 13 is a white transverse ridge; laterally on segment 13 and underneath gray; abdominal legs gray; prolegs brownish.

PUPA: Length $1\frac{1}{2}$ inches, very similar to *Daunus*, but shorter and stouter, and the projections on head are a little less conspicuous; entirely dark brown and mossy green, mottled.

Double brooded, but uncommon at all times.

Smyrna Karwinskii, Hübn. LARVA.—Length when mature two inches, body rather stout and flattened dorsally. Head round, black, having two long, very rough, truncate horns. Body smooth, brown, with four irregular black dorsal streaks; on each segment are six small spines of a dirty yellow, forming four dorsal and a lateral row; these lateral spines are wanting on segments 2, 3 and 4; just above abdominal feet are a few stiff hairs of same color as spines.

PUPA.—Length one inch, rather stout, slight ridge on thorax, and depression at first segment. This depression is colored deep brown, and there are two velvety dark brown spots on either side of thorax. Dorsally on segments are four rows of short conical protuberances,

the two inner rows being the most prominent; except spots mentioned the color is pale brown, slightly mottled with darker brown; on each wing case is a discal cuneiform spot of brown, very small and indistinct.

Larva feeds on Malhombre.

Pupal state lasts about six weeks, and the Imago is very common, especially during the summer months.

Smyrna Bloomfieldia, Fab. LARVA.—Length $1\frac{1}{2}$ – $1\frac{3}{4}$ inches, rather slight in formation. Head flattened and entirely brown, two thick and rough truncated horns of same color; skin of body smooth, with three or four transverse folds on posterior portion of each segment. Segment 2 has two dorsal and two lateral bristles. Segments 3 and 4 have each two dorsal and one lateral spine, and the other segments to twelfth have each three dorsal and two lateral spines. Segment 12 has four dorsal spines, the inner two being sub-dorsal, one anterior and one posterior. The anal segment has also four, two being extremely short. The color is dorsally black, with two narrow irregular yellow streaks, which join at each sub-dorsal spine, and there are also numerous small yellow spots where the segments join. Laterally the body is pale yellow, with a greenish streak, interrupted on each segment by a black stigma. Underneath greenish white.

PUPA: very similar to *Smyrna Karwinskii*, but the segments are quite smooth, and without any protuberances. The velvety spots on the thorax are the same, but the depression at first segment is not so conspicuous nor darkly colored. The general color is brown, mottled with minute black lines.

Larva feeds on Malhombre.

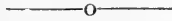
This species and *Smyrna Karwinskii* are commonly called by the natives "Caseras," owing to the frequency with which they alight on the walls and eaves of the houses.

Anisota Suprema, Hy. Edw. LARVA.—Length $2\frac{1}{4}$ inches. Head, second segment and anal segment yellow, other segments dorsally black, the third having, however, a yellowish sub-dorsal line. The second segment has three dorsal spines, the centre one having a red spot at its base; this segment has also four small black spots dorsally and one laterally. Beginning on third segment are four dorsal and a lateral row of short pointed spines, black. The two inner dorsal spines on segment 3 are, on the contrary, long and blunt at tips; anteriorly on each of these segments are four, and posteriorly two patches of small white spots; laterally on first three segments of body the color is yellow, and on successive segments reddish brown, showing between the same the black spots which mark the exterior portion of the abdomen. Abdominal legs yellowish, with a small black spot at extremity, and at base a short black line and circle of small white spots. Underneath segments 2, 3 and 4 are yellow, the following segments

having a yellow line; centrally and exteriorly a large black spot. The anal segment is covered with horny excrescences. The young larvæ differ in being dorsally of a greenish black and not having the patches of white spots.

Feeds on Oak.

PUPA similar to our northern species of *Anisota*.



ON A COPY OF "PEALE'S LEPIDOPTERA AMERICANA" IN THE LIBRARY OF THE ZOOLOGICAL DEPARTMENT OF THE BRITISH MUSEUM.

BY W. F. KIRBY, Assistant in Zool. Dept., B. M.

Peale's "*Lepidoptera Americana*" is so rare in Europe that the present copy is the only one which I have seen. It is chiefly known to European Entomologists, owing to Duncan and others having copied or referred to Peale's account of *Saturnia Promethea*. Percheron and Englemann have not noticed the work, and Agassiz's reference is curiously inaccurate. Hagen refers to 16 pp. and 4 colored plates, but our copy consists of wrappers of Vol. 1, No. 1, 14 pages of text, 8 colored plates (not consecutive) and 5 plain plates, not numbered, one being a duplicate of a colored one. The title on the wrapper is as follows:

Lepidoptera Americana;
or
original figures of the moths and butterflies
of
North America:
in their various stages of existence,
and the plants on which they feed.
Drawn on stone, and colored from nature,
with
their characters, synonyms and remarks on
their habits and manners.

By Titian R. Peale,
Curator of the Philadelphia Museum.

Vol. I, No. I.

Philadelphia:
Printed by William P. Gibbons,
S. W. corner Sixth & Cherry Sts.,
1833.

On page 3 of the wrapper is a prospectus, stating that the work was to consist of 100 plates, containing the transformations of species observed by the author himself, and that a part containing 4 plates, colored or plain, was to appear every two months.

The plates and text are of an ordinary 4to size, and the text is not paged. The following species are figured:

Name.	Plate.	Col. or plain.	Text.
Saturnia Promethea Dru. ♀	3	col.	4
“ “ Dru. ♂	4	col.	2
Zeuzera Regalis Fabr.	5	col.	—
Lasiocampa Io Fabr.	6 (plates in text)	col.	4
Danaus Plexippus Linn.	7	col.	4
“ “		plain (duplicate)	—
Xanthidia Lisa	8	col.	—
(Represents <i>Eurema Nicippe</i> , Cram.)			
Geometra Domestica	9	col.	—
(Represents <i>Prothurodes transversata</i> , Dru. var. <i>transpinta</i> , Walk.)			
✓ Colocasia Zebra	10	col.	—
(Represents a <i>Noctua</i> , which can readily be identified in America by its transformations.)			

The remaining plates are plain, have no text except the names of the species, and only the figures are numbered.

[Pl. I.] figs. 1, 2 *Papilio Lewisii* (= *P. Eurymedon*, Boisd.)
figs. 3, 4 *P. Multicaudata* (= *P. Daunus*, Boisd.)

[Pl. II.] figs. 1, 2 *Aglaia Anmilata* (evidently a misprint for *Annullata*) (= *Pseudohazis Eglanderina*, Boisd. var.)
2, 2a *Lasiocampa Designata* (= *Hyperchiria Janus*; Cram.)
3, 3a *Aglaia Nuttallii* (= *Pseudohazis Eglanderina*.)

[Pl. III.] *Pavonia Iris* (= *Caligo Atreus*; Koll.)

[Pl. IV.] No names given; represents a setting-board (with *Papilio Turnus*, Linn. upon it); nets; and the mode of pinning a beetle.

I presume that Part I included plates 3, 4, 6 and 7. It would be important to know whether any of the other plates which I have enumerated were ever published at all, and if so, the exact date and manner of publication, as if published, several of the names used would probably displace later ones now in use. Whether the four last plates were intended to form part of the same work as the others, appears very doubtful.

THE GENUS *GLOVERIA*, Packd.

BY HENRY EDWARDS.

This interesting genus of BOMBYCIDÆ was first characterised by Dr. Packard in the 4th Ann. Rept. Peabody Ac. Sc. 1871, p. 89, and was founded upon a ♀ specimen taken by Dr. Palmer on the border of Arizona and New Mexico. The single species then known was called by its describers *Gloveria Arizonensis* and has hitherto been one of the greatest rarities among N. American Lepidoptera. An excellent figure of it is given by Mr. H. Strecker, in "Lepidopt. Rhop. et Heteroc. Plate 15" and in "PAPILIO, Vol. 1, p. 100." I have fallen into the somewhat careless error of redescribing the ♀ as an example of the other sex. Mr. A. R. Grote also, in "PAPILIO, Vol. 1, p. 175," compares his *Quadrina Diazoma*, with *Gloveria*, from which he says his genus differs "by the larger head, broader clypeus and smoother body clothing". Mr. Grote's example of *Quadrina* was also a ♀ taken by Prof. Snow in New Mexico, and I have very little doubt that when the ♂ is known the genus will be found to be identical with *Gloveria*. So far, this is all that has been recorded with reference to this beautiful and interesting group. The discovery by Mr. J. Doll, two years ago, of the ♂ of *G. Arizonensis* (differing in a most remarkable degree from the other sex) and the still more recent capture of the other species in both sexes by Mr. W. Schaus, Jr., in the state of Vera Cruz, Mexico, have given us a better guidance to a knowledge of the group than we heretofore possessed. Of course, the diagnosis of the genus from one sex alone (and particularly in the BOMBYCIDÆ) is bound to be incomplete and unsatisfactory, and I deem myself justified in adding to Dr. Packard's description, at the same time taking the liberty of copying the same in full, so that the present paper may contain as complete information as can be given with reference to the insects under consideration.

GLOVERIA. nov. gen.

"Head nearly as large as *Lasiocampa*. Eyes a little smaller, front broad between the eyes. Antennæ much as in *Lasiocampa*, but the pectinations about three times as long as the joints from which they arise, and pectinated to the tip. Palpi unusually small, short, ends rather blunt, not reaching the front, a little depressed. Body stout. Wings unusually long and narrow; fore wings long, costa well curved beyond the middle; apex rather produced, sub-acute, outer edge unusually oblique, of about the same length as the inner; hind wings long, very obtuse and much rounded at the apex, when expanded not reaching to the tip of the abdomen. Venation much as in *Lasiocampa*, but

interspaces much longer, owing to greater length of wing; discal venules situated on inner third of wing, the discal space being unusually small and discal spot forming a mere dot. Costa of hind wings and venation similar to *Lasiocampa*, but the base of costa is much less convex. Legs long and stout but less hairy and the body much less woolly than in *Lasiocampa*.

This remarkable genus is the type of a separate section of the LACHNEIDES (LASIOCAMPADÆ of Duponchel) from *Gastropacha* and *Clisocampa*. but for want of material, I have been obliged to compare it with *Lasiocampa* alone. That it belongs, however, to this sub-family, is evident by the form and peculiar squamation of the antennæ, form of head and venation, so well marked in this group, and form of costa of hind wings." A. S. Packard Jr. loc. cit.

To the description of the species Dr. Packard adds: "It is more nearly allied to *Gastropacha*? *Otus* (Drury) Westwood's edit. (*Bombyx Agrius*, Oliv. Ency. Meth. 5, 39, 56, Westw.) from Smyrna, than any moth with which I am acquainted. It agrees closely in the general form of the body and wings, with the same style of markings. That is a ♂, while *G. Arizonensis* is a ♀, and differs in the longer and more rounded hind wings, the body not extending so far beyond the wings as in *G. Otus*." That Dr. Packard is right in creating for this fine insect a new genus I have no doubt whatever, though it is very closely related to *Lasiocampa*, and more particularly so to the species known as *L. Pini*, L. But, as formerly understood, the genus *Lasiocampa* of European authors is liable to create confusion, including as it did, the genera now separated under *Gastropacha*, *Clisocampa*, *Odonestis*, *Bombyx* and others. Dr. Packard, if I apprehend him rightly, takes this view and confines *Gastropacha*, Ochs. to the species which have somewhat foliaceous wings in repose, as *G. Quercifolia*, L. and our *G. Americana*, Harris; *Clisocampa*, Curtis, to the tent caterpillars, feeding in large webs and in societies, as *C. Neustria*, L. of Europe, and our own *C. Americana*, Harris; *Lasiocampa*, *Odonestis* and the rest having no true North American representatives. *Otus* should certainly form the type of a new and distinct genus, the antennal structure serving to distinguish it. These are widely pectinate at the base in the ♂, becoming suddenly finely so at the apical third, reminding us strongly of the structure of the antennæ of *Cossus*. In the shape of the wings and other characters, it is near the African genus *Lebada*.

Gloveria, as has been said, approaches most nearly to *Lasiocampa* Latr., and by some entomologists may possibly be regarded as only a sub-genus. From the ♂, in addition to the characters already given by Dr. Packard, the following may be noted, the more remarkable features being marked in italics:

Fore wings very broad from internal angle to apex, and *more distinctly rounded on external margin* than in *Lasiocampa*, though in our

species, *G. olivacca*, there is a slight excavation below the apex, the general shape of the wing being, however, the same. *The wings are transparent across the median space both in the upper and lower pair*, and the vestiture is finer and thinner throughout than in the allied genus. *The abdomen is very long and slender, extending for half its length beyond the margin of the hind wings, and furnished with a very long anal tuft, proportionately much longer than that of Lasiocampa.* *The palpi are shorter, the front narrower, and the antennæ more closely approaching each other at the base.* The clothing of the legs is thinner, but the tarsi in *Gloveria* are covered with long fine hairs, while in *Lasiocampa* they have the appearance of being almost naked.

It will thus be seen that while approaching the European genus very closely, *Gloveria* has special characters of its own, and the discovery of a number of species of a genus so remarkable cannot be regarded but as a matter of great entomological interest. The transformations of the group will shortly be made known by Mr. W. Schaus, Jr., who is endeavoring to raise more than one of the species hereafter mentioned. I have not deemed it advisable to reprint the description of *G. Arizonensis* ♀, as it will be readily found in its original publication, and has also been quoted by Mr. Strecker.

Gloveria Arizonensis Pack. ♂.—Bright coffee-brown, slightly approaching the shade of *Bombyx Quercus* L. On primaries the color is deepest at the base, on the edge of the dark shade being a clear white discal spot. Behind the middle is a grayish cloud, through which, near the centre, runs an even line curving a little inward near costa. In the pale shade the nervures are distinctly brown. This pale shade terminates posteriorly in a deeply dentate brown line, behind which the margin is brown. Some grayish scales are scattered over the whole surface, which, when held obliquely with the light, has an exquisite purplish sheen. Secondaries have a pale median band, which is on both wings slightly transparent. Beneath, the markings are repeated more distinctly, but there is no trace of the lines on the primaries, and the pale shades are resolved more into the form of bands. Thorax, abdomen and legs concolorous.

Exp. wings 60 mm. Length of body 25 mm. Length of anal tuft 10 mm.

Five examples, Arizona, J. Doll. Coll. B. Neumoegen.

G. dentata n. sp.—♀. Color of *G. Arizonensis*, ♀, but smaller, and totally different in its markings. The primaries are deep brownish gray, darkest on the external margins, the nervures being very strongly marked, the lines being also very well defined. Over two-thirds of the wing is a whitish shade, most distinct in the median space, and terminating at the sub-marginal edge in a row of acute, prolonged

teeth, very prominently marked. From the costa, about the middle, runs along the sub-costal nervure towards the base for about three lines, a dark shade, which abruptly turns back before reaching the median nervule nearly opposite to the starting point on costa, then obliquely to internal margin, forming in the middle two slight dentations. Near the base is a double line almost lost in the darker shading of the wing. The discal spot is small, whitish. Secondaries brownish gray, with white fringes. Thorax and abdomen concolorous with wings. Under side wholly brownish gray, with faint indications of the median band, most prominent on secondaries.

Exp. wings 80 mm. Length of body 33 mm.

1 ♀. Jalapa (W. Schaus). Coll. B. Neumoegen.

Easily distinguished from *G. Arizonensis* by the paler field of primaries, and the very much dentated sub-marginal band.

Gloveria Olivacea, n. sp.—♂. Olive-brown, very different in color from *G. Arizonensis*. Primaries with a clear white, very prominent discal spot, and behind this a large pale shade crossing the wing from the internal margin, but not quite reaching the costa; this shade also occurs on the lower side, and has there a bright golden tint. The fringes of both wings are also golden. Thorax and abdomen concolorous, the former with some reddish brown hairs.

Exp. wings, 48 mm. Length of body, including tuft, 25 mm.

♀. Pale brown, widely distinct in color from the other sex. The base and posterior margins of primaries are lightened with a white shade, thrown into strong contrast by a median band of brown enclosing the dull white discal mark. In the pale marginal space are two faint brown lines, the inner one straight and even, the outer sinuate-dentate. Secondaries the same shade of brown as the band of primaries; fringes whitish; beneath, all one shade of uniform light brown. Legs, thorax and abdomen concolorous.

Exp. wings 66 mm. Length of body 28 mm. 2 ♂. 2 ♀.

Jalapa, Mexico, (W. Schaus.) Type, Coll. H. E.

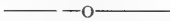
G. Venerabilis, n. sp.—♀. Primaries grayish brown, distinctly gray towards posterior margin, with some faint blackish transverse streaks and an oblique whitish dentate line behind the middle. There is also a black dentate sub-marginal line, bending back a little from the apex, the field behind it being wholly gray. The discal spot is small, white; fringe alternately brown and white. Secondaries and under side wholly copper-brown, a little darker at the margins and along the costa. Thorax concolorous with primaries, with a grey stripe at the sides. Abdomen same shade as the hind wings. 1 example. Jalapa, Mexico. (W. Schaus.)

Exp. wings 86 mm. Length of body 38 mm.

In coloring and markings, this species very nearly approaches some specimens of *Lasiocampa Pini*, L. of Europe.

G. Jalapæ, n. sp.—♀. Primaries rich reddish coffee-brown, with the margins broadly grayish, edged anteriorly with an oblique dentate dark brown line. There is also a faint whitish band behind the middle bent forward as it reaches the costa; fringes and edges of the wing rich reddish brown. Secondaries dark fawn color, with a slight pinkish tinge, darker on the edges. Beneath, wholly dark fawn-color, with a whitish triangular spot on costa, and the sub-marginal space a little paler than the ground color. Edges of both wings a little darker. Thorax above and below coffee-brown, as are also the legs. Abdomen concolorous with the hind wings. 1 example. Jalapa. (W.Schaus.)
Exp. wings 53 mm. Length of body 25 mm.

I have before stated it as my opinion that *Quadrina Diazoma*, Gr. may belong to this genus, but its description does not in any way apply to either of the species mentioned in this paper.



EDITORIAL COMMENT.

MR. EDWARDS' NEW CATALOGUE.—We are glad to be able to announce that a revised edition of the Catalogue of 1877 is now in the hands of the printer, to be published in the Transactions of the American Entomological Society, and will soon be ready for distribution. Students of the *Rhopalocera* have felt the need of this revision for some time, as the number of species known in 1877 has since been increased by about thirty per cent., and very many changes in synonymy have also been made.

We note with pleasure that after each reference, the date of its publication is given, thus greatly aiding the student to a just conception of the various and conflicting work that has been done in so many cases. Another decided improvement over the former edition is the introduction of a complete index, the need of which was constantly felt heretofore.

It is probable that only a limited edition will be printed, a few copies of which will be interleaved, and therefore, it will be advisable for all who are not regular subscribers to the Transactions to send in their names promptly, stating how many copies are wanted, and whether interleaved or not. Subscriptions should be sent to Mr. E. T. Cresson, Box 1577, Philadelphia, Pa.

APPRECIATIVE ENTOMOLOGISTS.—It may be of interest to the readers of PAPHOS to state that up to the present time (June 1st), less than forty-five per cent. of the subscribers thereto have sent in their payments. This fact is grievously discouraging to an Editor who, besides having given the magazine many hours of time taken from

profitable employment and from the hours allotted to sleep, finds himself over one-hundred dollars out of pocket with just one-half the year's work done; but it is doubtful if this fact alone would discourage us sufficiently to reconcile us to abandoning a work in which we have always felt so much interest. We have, however, recently tried an experiment which, while it has given us a more intimate knowledge of the various idiosyncrasies of our Entomological Brethren, has given us a most positive assurance that our Editorial labors are for the most part unvalued, and, therefore, largely thrown away. This experiment consisted, simply, of the sending out of bills to all subscribers who had not paid their subscription for 1884 by the 15th of March. To these duns, for they were nothing less, answers were received from seventeen per cent. of those to whom they were addressed. Of this number nearly half simply replied by asking that their subscription be canceled, only one of them being gentlemanly enough to acknowledge his legal responsibility by returning the number just received and paying for those already taken out of the Post-Office. Even he seemed to forget that this treatment of the matter was not a moral one even if it could be excused from a legal standpoint. Inasmuch as he, in common with many others, had been subscribers during 1883, and had taken the January, 1884, number out of the Post-office it was thought safe to calculate the edition therefrom. Of course no calculation could be made for those who would see fit to stop their subscription in the middle of the year, and therefore at the end of the year a considerable number of broken sets will be on hand, the most of which will, doubtless, be sold for the price of old paper.

Another class of some size, for whom it is a rare privilege to labor, consists of those who write about as follows: "I have never had to pay for PAPHILIO, as Mr. — has always paid for it for me. If he is not willing to continue doing so I shall have to ask you to discontinue sending it." As in a number of cases the Mr. — has not sent in his own payment it has hardly seemed worth while to dun him for a payment on behalf of his alms-asking brother. Consequently, as PAPHILIO is conducted on business principles, the subscription list has been very materially decreased by this cause and the one already given. Of course PAPHILIO has a number of names on its list to whom the Editor is proud to be able to send copies without any charge, knowing that they will be appreciated for their merits and fairly criticised for their shortcomings. Such copies are, however, sent only to two classes; to a few who are personal friends of the Editor, and to a somewhat larger number who by their constant and long-continued labors in the field of Entomology have earned the lasting gratitude of their fellows. Many of these however have paid their subscriptions, and in some cases those of others, though they must have been aware that it was not expected of them.

PAPILIO numbers among its friends four or five gentlemen who have cheerfully offered to protect the Editor from any pecuniary loss, claiming that his gift of the time necessary to read, and in many cases correct the copy for the printer, and to read the proofs twice, and in some cases three times, besides carrying on the correspondence (which has already exceeded three hundred and fifty letters) is about all that ought to be expected of him. But as this simply means that they are willing to pay to have copies of PAPILIO sent free to persons who are either too indifferent to its work or too glad to avail themselves of the charity of others, it would naturally seem useless to continue its publication for a comparatively small number to whom the columns of the organs of the various Societies are always open.

While it is a cause of disappointment, it nevertheless, affords us considerable relief to announce that, unless a more self-sacrificing and less impecunious and business-like Editor can be found, PAPILIO will probably cease to exist at the end of this year.

EUROPEAN VERSUS AMERICAN ENTOMOLOGISTS.—It has frequently been said that the unseemly quarrels that have from time to time been indulged in by certain American Entomologists have caused them to be looked upon with a feeling of mingled wonder and disgust. This has also been given as the principal difference between the brotherhood on the two sides of the Atlantic, it being urged that, with the exception of their inability to keep their temper long at a time, the American Entomologists are in no way inferior to their European fellow-students.

We think, however, that we have found another difference, which, from our standpoint, seems a very grave one. PAPILIO has a comparatively large number of subscribers in Europe, but only one debtor, whereas the American subscribers have only paid up thirty per cent. of their indebtedness. If this difference is to be found on the books of the various Entomological magazines published in Europe (and it is probable that the difference would be found to be even greater), then there is very good reason for the very evident prejudice that is at first encountered by all Americans who attempt to establish exchanges across the water.

THE DELAY IN THE MAY-JUNE NUMBER has been caused by the vexatious lack of punctuality on the part of the photo-lithographers, who have had the reproduction of Prof. Gruber's plates in hand. Work that was to have been finished in "less than two weeks" has taken over two months.

PROF. LINTNER'S FIRST ANNUAL REPORT.—We hear with pleasure that the Legislature of New York has authorized the publication of a second edition of this valuable work for distribution among the agriculturists of that State.

NOTES AND QUERIES.

GNOPHÆLA ARIZONA.—Some time last year I received several specimens of a *Gnophæla*, from H. K. Morrison, collected in Arizona, that seemed to be different from anything catalogued in "Grote's New Check List." After some hesitation I described it under the above name, and sent the description to PAPILIO, but fearing there might be something I had overlooked, I sent Mr. Henry Edwards a specimen with the request that if he recognized it as already described to suppress my description. After some hesitation he wrote me he thought it *G. Hopfferi* var. *Discreta*, Stretch. I had the description of this form but it not being in the Check List I had overlooked it. Accordingly my specimens were marked *Discreta*. Upon receipt of the January number of PAPILIO I found it contained my description of *G. Arizona*. Feeling that this was a mistake arising from the transfer of papers to the present editor at the beginning of the year, I wrote Mr. Stretch the circumstances and sent him a specimen. He writes me that the specimen sent is his var. *Discreta*. *Gnophæla Arizona*, French, will be known then as a synonym of *G. Hopfferi* var. *Discreta*, Stretch.

As to the varietal or specific position of this form I am inclined to think that under the present acceptance of the term it will rank as a species. I have had eight specimens and Mr. Stretch writes he has "now seen four specimens and they are all alike". If on the border lands, where this form and *Hopfferi* and *Vermiculata* occur, they breed as constant to type as they do in the part of *Arizona* from which these were taken, then, according to usage, they would take rank as a species unless proved to be otherwise by breeding.

G. H. FRENCH.

EDITOR PAPILIO.—Dear Sir:—In your notice of my *Salyrus* paper there is one sentence which calls for an explanation on my part; that is, in reference to my supposed uncertainty of the terms to be applied to various forms—*incana* in particular. By transposing the reference to Mr. Edwards' description of the larva to the end of the next paragraph, and thus making it form the concluding sentence of my remarks on *Alope*, it will not conflict with what I had previously stated, and will mean what I had intended it should mean—*i. e.*, that Mr. Edwards had described the larva of *Alope* and some of its varieties. I never was guilty of considering *incana* a good species. In reference to the unfortunate typographical errors, I will say that I was in Washington while the paper was being printed; saw only part of the proof myself, and depended upon others to see that the corrections were made.

JOHN B. SMITH.

EDITOR PAPILIO:—While recently examining a large number of old cocoons of *Samia Columbia* I was surprised to find that nearly all of them contained cocoons of *Ophion macrurum*. I believe this insect has never before been observed as a parasite of *Columbia*, although known to infest many other of the larger *Bombycidae*. Out of about fifty *Columbia* cocoons thirty contained *Ophion* pupæ. Nearly all of the latter had died while pupæ, probably because of the presence of a parasite upon them.

CLARENCE M. WEED.

UNUSUAL OCCURRENCE.—Mr. Charles A. Blake tells me that on the 25th of January last, a specimen of *Hypena baltimoralis*, Guén., was found on the wing, and settling from time to time on the ice, in the neighborhood of Gray's Ferry Philadelphia. This is the more remarkable, as the thermometer that day registered 4° below zero. Are any of this genus known to hibernate? EDITOR.

CONCERNING SO-CALLED SPECIES.—In answer to Mr. Butler's remarks in *PAPILIO*, Vol. IV, pp. 39, 40, I will only say that I am not going to enter into an argument with that gentleman, because it would be useless. When a man is firmly convinced, as he seems to be, that every slight variation observed in a butterfly from a country where, owing to the want of resident collectors, little or nothing can be learnt about its limits of variation should be at once described, possibly from one or more imperfect or faded specimens, as a "new species," and when the analogous variations in better known allied species are ignored, and such species are described wholesale without the slightest reference to forms so close that no one can help suspecting a relationship, without figures, and with long wordy descriptions which often omit the only distinctive characters which are important in discriminating such species, then I have no common ground on which to reason with him.

I only ask your readers who have never had the misfortune to have to work out such species to look at Mr. Butler's paper on Japanese *Terias* in *Trans. Ent. Soc. London*, 1880, p. 197, and Mr. Pryer's subsequent remarks in the same publication for 1880, p. 485.

If they will imagine the same sort of thing repeated a hundred times in other genera they will then understand the nature of the Augean stable which some day or other will have to be cleaned out by Mr. Butler's successors.

H. J. ELWES.

OCCURRENCE OF *CALLIDRYAS PHILEA* Linn. and *TERIAS MEXICANA* in Wisconsin.—Dr. J. P. Hoy, of Racine, writes me as follows: "There is a butterfly taken in this county, ten miles from Racine, that I do not know. Color bright yellow; a large blotch of orange near middle of primaries, and a broad (orange) margin to secondaries; expands three and a half inches. As it is in a case I cannot see the under side, but I think it belongs to genus *Callidryas*." This is undoubtedly *Cal. Philea*, Linn., catalogued as occasional in Texas, but also as having been taken in Illinois, as per *American Entomologist*, Vol. II, p. 340.

The species abounds in the tropics from Mexico to Brazil, but I know no other instance of its capture north of Texas. Dr. Hoy also sends an example of *Terias Mexicana*, taken in same locality as the other, but says that he has seen it also in Grant Co., Wis., on the Mississippi River.

W. H. EDWARDS.

COLLECTING IN SOUTHERN CALIFORNIA.—The earthquake in Java, or some other disorganizing thing, has played the mischief with butterflies on the Pacific Coast, for this Spring rainy and cloudy weather has been the rule, where heretofore it has been the rare exception, and the butterflies have suffered correspondingly.

During February and March there was in Southern California scarcely a fine day, and two consecutive not once, and where usually six or seven inches of rainfall is a very fair allowance for the entire winter, twenty-six have now fallen.

This excessive cloudiness and dewing has apparently killed the brood of *Pap. Zolicaon* (there is but one brood, in March, and an occasional precipitation of solitary examples in July). I have seen but one lone specimen of it this spring, where usually I get dozens. Also *Anthocharis Cethura* is very scarce; *Lep-tarctia Lena* and her three twin sisters have been delayed a month, and all the *Geometers* have been scarce or entirely wanting. On the other hand *Chryso-phanus Helloides* was taken March 12th, three months earlier than ever before by me. *Lycæna Sagitifera* came a month sooner than heretofore, and I also took a dozen fine *L. Sonorensis* some weeks in advance of ordinary years. *Syneda Socia* and *S. Edwardsii* have also come early.

I have not yet reached conclusions as to what all these curious changes signify.

W. G. WRIGHT.

DESCRIPTION OF *POLIA VORAX*, Behrens.—Primaries even, dark brownish gray; stigmata obsolete; transverse lines barely indicated by black venular dots; a slightly darker s. t. shade, intensified into blackish on the veins; an interrupted lunate terminal line, or more properly a series of lunate terminal spots. Fringes yellowish at base, else concolorous. Secondaries pearl-gray, veins and outer margin more smoky; a yellowish line at base of fringes. Beneath, primaries glistening smoky gray, paler on disc; secondaries as above, a transverse line of venular dots beyond the middle. Head, palpi and collar dark red brown; thorax concolorous with primaries; abdomen concolorous with secondaries. Legs robust, woolly. Expanse 1.5–1.6 inches; 39–41 mm.

Hab.—California.

Several specimens in Mr. Hy. Edwards' collection, most of them more or less imperfect, though perfectly well marked, as the damage consists of various breakages in transit, and not in rubbed wings.

In *PAPILIO*, Vol. IV, p. 21, was described the larva of *Agrotis vorax* Behrens, n. sp., but no description was given of the imago. Dr. Behrens wrote me that he had intended a description of the imago to be prepared to go with this description of the larva, and on mentioning this fact to Mr. Edwards, he requested me to write it. Examination of specimens convinced me that the insect, though with a somewhat marked general resemblance to *Agrotis havila* or *clandestina* in coloration, yet could not be referred to *Agrotis*. The unarmed tibiae and lashed eyes forbade that: the larval habit seems to be somewhat *Leucaniform*, and, in shape, the imago is not unlike *L. unipuncta*; however, the eyes are not hairy, so this insect cannot be referred to *Leucania*. With *Polia*, the insect agrees in all essential structural details, while somewhat aberrant in color.

For the generic reference of this species I am therefore responsible; with the determination that it was undescribed, I had nothing to do.

JOHN B. SMITH.

ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The annual meeting of the Entomological Club of the American Association for the Advancement of Science will be held in a parlor of Hotel Lafayette, Philadelphia, commencing at 2 P.M. Wednesday, September 3d, 1884.

In accordance with the rules of the Club the meeting is called the day before the opening of the general meeting. Entomologists who desire to read communications are requested to notify one of the undersigned as early as August 15th.

O. S. WESTCOTT, *Secretary*,
Maywood, Ill.

D. S. KELLICOTT, *President*,
Buffalo, N. Y.

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E. M. AARON.

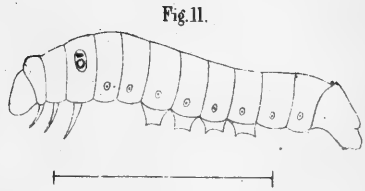
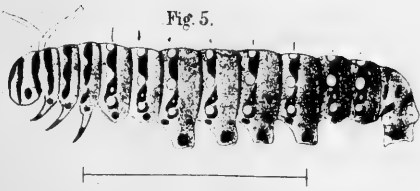
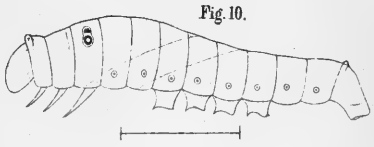
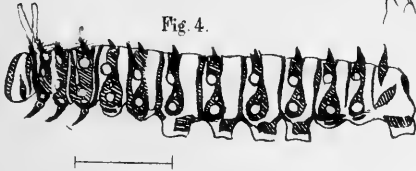
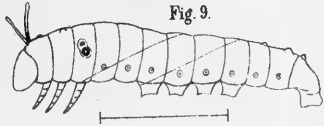
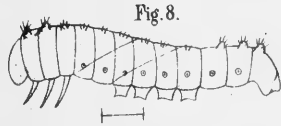
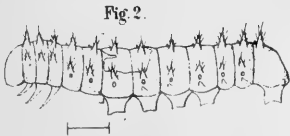
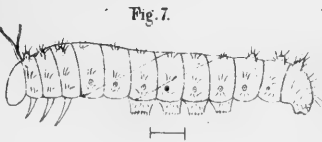
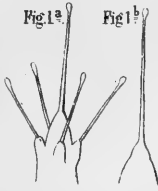
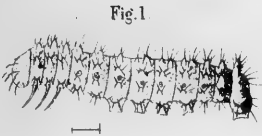




Fig. 12.

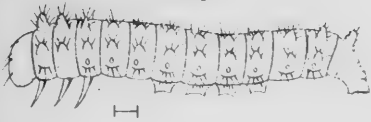


Fig. 12 a



Fig. 16.

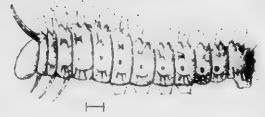


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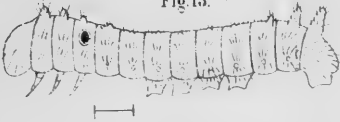


Fig. 17.



Fig. 13 a



Fig. 14.

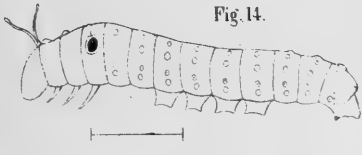


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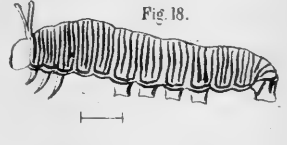


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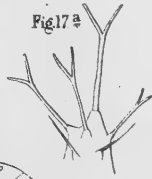


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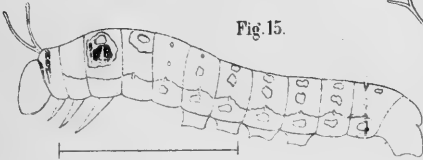


Fig. 19.



Fig. 20 a



Fig. 22.

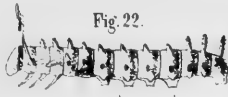


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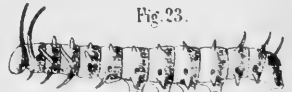


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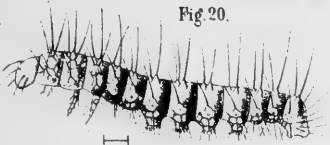


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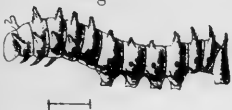


Fig. 21 a



Fig. 24.

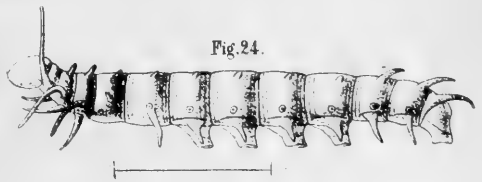


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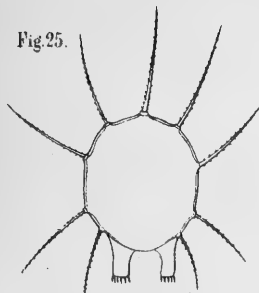


Fig. 25 a.



Fig. 28.



Fig. 30.



Fig. 33.



Fig. 34.



Fig. 26.

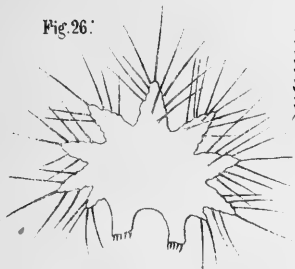


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Fig. 29.

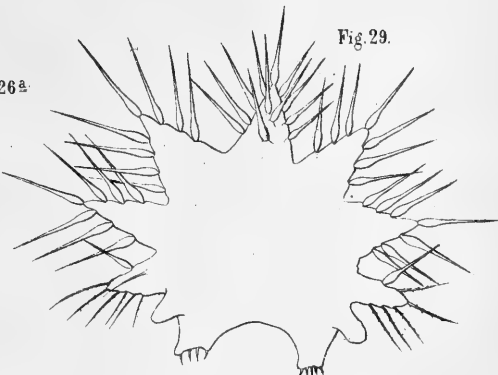


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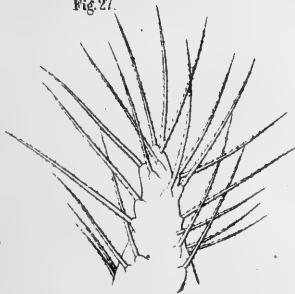


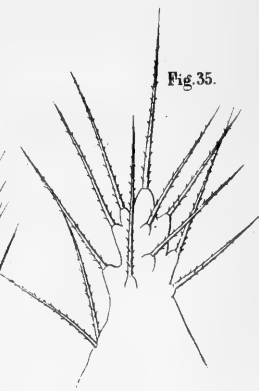
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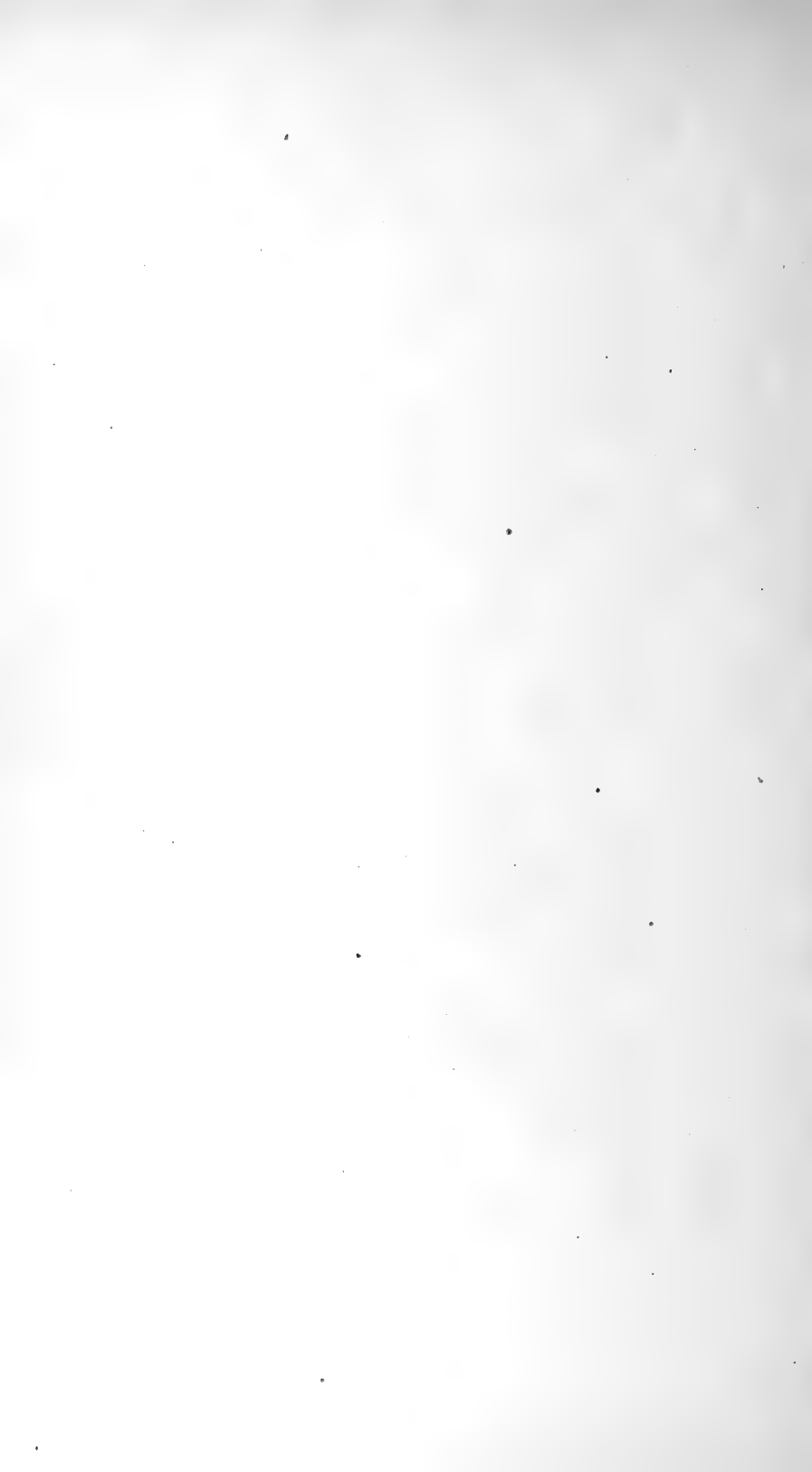


Fig. 32.



Fig. 35.





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—EDITED BY—

EUGENE M. AARON.

PHILADELPHIA.

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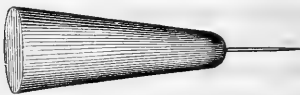
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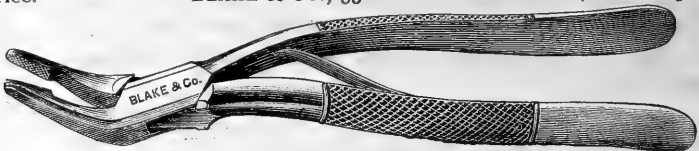


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Philadelphia, September, 1884.

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ON THE CATERPILLARS OF NORTH AMERICAN PAPILIONIDÆ AND NYMPHALIDÆ.

BY DR. AUGUST GRUBER, Professor of Zoology in Freiburg.

JENA, 1884.

Translated from the *Jena Zeitschrift für Naturwissenschaft* (Bd. XVII, N. F. X.)
by CHARLES E. AARON, A. M.

(Continued from p. 91.)

SUMMING UP AND CONCLUSIONS.

I have in the foregoing pages traced the development of the several species of caterpillars of the two families *Papilionidæ* and *Nymphalidæ*, so far as they have been at my command, independently one of the other. My next step will be to determine what characteristics are common to these species and what are not so, and whether from this comparison, any general conclusions can be drawn.

I believe that inferences with regard to the genetic relations of these species may fairly be drawn from my observations, however scanty the material may be.

Looking first at the *Papilionidæ*, we find the caterpillar in the first stage always covered with large warts, on which long bristles stand, giving to the insect a hairy appearance. These warts are arranged in parallel longitudinal rows, of which we can distinctly trace four on each side,—a dorsal, a sub-dorsal, a suprastigmal and an infrastigmal row, of which the two middle ones are the most prominent. At the same time it appears that the warts on the foremost and the hindmost rings of the body are longest, and that, in fact, the two longest of all stand on the first thoracic ring and the last abdominal ring; also that from each extremity toward the middle these prominences grow smaller and smaller, so that those standing on the middle segments are the least of all.

We find, therefore, a correlation between the thoracic segments and the three last abdominal segments, which is especially marked in *Papilio Philenor*, where the warts are prolonged into horn-like appendages.

A further instance of this correlation is afforded by *Danais Archippus* and *Limenitis Disippus*, also from West Virginia, both of which I have carefully examined. On the first-named species two long horns, quite similar to those on *Papilio Philenor*, stand on the second thoracic ring, and very similar ones on the next to the last abdominal ring; in fact, rudiments of these are conspicuous even in the first stage. *Limenitis Disippus* has horn-like warts on several of the segments, the most prominent being found again on the second thoracic and the last abdominal ring. They are not, however, equally large, as in *Danais Archippus*, but the horns on the second thoracic ring are by far the longest, and these are undoubtedly the ones which have a purpose to subserve, perhaps as a means of inspiring terror. The warts on the other rings only seem to repeat the organs referred to, just as we sometimes see in segmented animals characters of one segment carried over on the others. In *Limenitis Arthemis*, according to Edwards, the horns on the second thoracic ring appear to be decidedly larger in proportion to the other warts.

To return to the *Papilionidæ*, the normal course of the warts is to decrease in size after each successive moult, and sooner or later to vanish entirely. Those standing on the middle segments, as they were the smallest from the start, are the first to disappear, while those on the thoracic rings and the last abdominal rings remain the longest.

Hence we conclude that the warts with their bristles lose their meaning for the caterpillar, and are therefore abolished. If we observe the stages of development of the *Papilio* caterpillars on plate VII, we shall at once notice that, with the exception of the easily distinguished *Papilio Philenor*, these warts, even as early as the second or third stage, are to be set down as rudimentary organs. Their original intention is to form suitable and prominent points of support for the bristles, which at all events must have a meaning for the caterpillar. Whether they have any meaning in the *Papilionidæ*, however, seems to me questionable; at any rate this is the case only in the earliest stages. On the whole we are inclined to believe that the warts and the bristles attached to them may be an inheritance from ancestors for which these features had an important purpose, as is undoubtedly the case with the *Nymphalidæ*. The warts become rudimentary in proportion as the markings come out on the body of the caterpillar; in other words, the markings take the place of the warts, as both together would evidently have the effect to interfere with each other. Natural descent chooses as the objective point of its creative skill the markings, and in many cases the bright coloring of the larvæ of *Papilionidæ*. Other

elements, therefore, which by the side of these have lost their meaning, or would have a disturbing effect on the development of the new character, are gradually compelled to yield. The particular kind of markings will also have a part to perform; thus, on a uniformly brown or green color, such as the nearly related *Papilio Turnus* and *Troilus* display, the protuberances project very prominently, and on the other hand they disappear almost entirely after the second moult. The warts and bristles would exert a still more disturbing influence on the peculiar markings of *Papilio Ajax* with their numerous black rings; hence we may account for the remarkably sudden change from the second to the third stage. All at once the markings make their appearance, and at the same time the previously strongly developed warts and bristles vanish. I have already mentioned that I possess a preparation in which the second skin is just becoming detached, and under it the characteristic form and color of the third stage are plainly visible.

With such markings as, for example, *Papilio Asterias*, *Brevicauda*, *Machaon* (and *Alexanor*) display, the warts will on the contrary be much less disturbing, as they scarcely project on the dark, oblique bands. Accordingly we find that they do not entirely disappear until the last moult.

We may then probably infer that the larvæ of the *Papilionidæ* descend from forms which, with dull coloring and inconspicuous markings, were covered by strong, bristle-bearing warts. All the caterpillars examined by me in the first and even in the second stage, conform to this hypothetical prototype.

The larvæ of the *Papilionidæ* now existing show for the most part brilliant colors and conspicuous markings (rings, bands, ocelli, etc.), and the original forms were forced to yield to these elements. Many intermediate steps have bridged over the great gap between that prototype and the larvæ of our own period, and these steps are perpetuated to us in the various forms of the successive stages of development. Every caterpillar repeats during its moults, in a more or less perfect manner, the history of its descent.

I have heretofore attempted to prove that the kind of markings sometimes shows the necessity of a very sudden disappearance of the rudimentary organs. Were this not the case we could very easily determine from the rudiments of the warts the age of *Papilio* larvæ, that is to say, the remoteness of each species from its ancestral form. Those caterpillars, namely, which kept the warts longest would be the oldest, standing nearest to the prototype; those which lose the warts in the early stages would be the most recent, furthest removed from the prototype. In the first category, therefore, we should include, for example, *Papilio Machaon*, *Asterias* and *Brevicauda*; and this seems not unreasonable, because in them the dark color remains to the third stage without decided markings. *Brevicauda* would appear still older

than *Arterias*, because in the former the warts are still visible in the fourth stage, and the markings are not so fully developed as in the corresponding stage of *Asterias* (see Edwards).

The bright-colored saddle, which interrupts the prevailing dark color, is found in these two species, and in a somewhat similar form—as oblique bands—in *Papilio Troilus* and *Turnus*, as well as in other caterpillars, such as *Limenitis Arthemis* (see Edwards). Interrupting the dark outline which makes the caterpillar visible at a distance, the saddle may serve to render it less conspicuous, less easily detected by its enemies.

Papilio Philenor occupies an exceptional position among its congeners, but is on that account none the less interesting and instructive. The first stage corresponds substantially to that of the other forms, but after that period the development takes another direction. The bristles vanish, it is true, but not the warts; on the contrary, these become longer and grow into horn-like appendages. This process, however, takes place only on the thoracic and the last abdominal rings; in fact the longest horns stand on the first thoracic and the last abdominal.

In this species also the warts are suppressed on the middle segments, but only gradually, and even after the last moult they still remain visible. In the infrastigmal row they still remain very long.

While the coloring and markings of *P. Philenor* are of secondary importance, the warts are inherited from the prototype, and have been chosen by natural descent as the objects of its formative power; here, too, the bristles vanish and the long horns are perfectly smooth. I see little reason to doubt that we must regard these horns as means of inspiring terror, especially those standing on the thoracic segments. Those on the last abdominal segments, as I have before intimated, probably owe their origin to a correlative transfer of the thoracic formations to the abdominal rings. Correlation may also account for the fact that the warts remain so long on the infrastigmal row, as the purpose which they subserve for the insect is not easily perceived. The formidable horns on the thoracic segments belong to the infrastigmal series, and it may hence be inferred that on the remaining segments also there would be a tendency to enlarge, or at least to maintain, the corresponding warts.

Turning our attention to the form of the bristles standing on the warts of the *Papilionidæ*, we see that in the first stage they have a long shaft and a shovel-formed, enlarged extremity. This typical form I have found in all the *Papilionidæ* which I have examined; and although *Ajax* is an exception with its bifurcate bristles, yet even this form, as I have already remarked, reverts to the other, as the furcate division may be regarded as a widened extremity.

What may be the purpose of the bristles, and upon what conditions their diversity of form depends, I am not able to state, because the life-history of these caterpillars is not sufficiently known, in fact upon this point no observations have as yet been made. The shovel-formed bristles are undoubtedly an inheritance from the ancestors of the *Papilio* caterpillars, and we find them in the larvæ of quite different families, as, for example, in *Danaïd Archippus*, *Colias Philodice* and *Satyrus Eurytus*, all of which I have examined. If they have any meaning at all in the *Papilionidæ* it is only in the first stage, for they lose their shovel-formed enlargement after the following moults, become proportionately shorter, and finally quite obsolete. In brief, we conclude that in the early stages we must regard them as rudimentary organs, which, like the warts on which they stand, have lost their meaning for the insect, and are replaced by other elements.

In *P. Philenor*, which constitutes in its development an aberrant form, the bristles become rudimentary at a still earlier period, and in the first stage we find on each wart for the most part only one long bristle corresponding to the typical form. As the warts are developed into the prominent horns already mentioned, the bristles are soon suppressed.

Let us now try whether my observations upon the few species of *Nymphalidæ* which have been at my disposal may be utilized in the same manner as I have done with the *Papilionidæ*.

Here also we see that the early stages resemble each other more or less completely; that in all the species examined of the genus *Melitæa*, for example, these stages are quite in accordance. The young caterpillar is covered with hair, that is to say, provided with long bristles which are arranged in the usual longitudinal rows. In contrast to the *Papilionidæ*, the bristles stand singly on inconspicuous elevations of the skin. But after the first moult a state of affairs is introduced such as we find in the first stage of the *Papilionidæ*, namely, tall, conical warts appear, beset with numerous bristles, so that the caterpillar appears much more hairy than in the first stage. These warts continue to increase with every new moult, so that they lose nothing in circumference in proportion to the size of the caterpillar. The course of development, therefore, is exactly in inverse ratio to that seen in the *Papilionidæ*. In that family the warts were present in the first stages only as a heritage from a supposed prototype, and from that point continually diminished. In the *Nymphalidæ* they are a newly-acquired character which does not appear until the second stage, and which in the following stages is maintained or still further perfected.

In the *Papilionidæ* the coloring and markings take the precedence, and suppress the warts and bristles; in the family we are now considering the first named elements play a more subordinate part, and in their place the hairy covering acquires an important meaning for the species

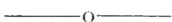
and rules the exterior form of the caterpillar. The intention of this hairy covering, as I have already said, it is not in my power to explain.

As to the form of the bristles, a few observations, not without interest, may be offered. In the species of *Melitæa* and *Argynnis* which I have examined the bristles present in the first stage are always long, slightly curved and finely toothed on the margin. These primitive bristles, as I will call them, are now, in the course of the development, replaced by bristles which are either smooth and simple, or swollen near the base. This process of replacement is less rapid in some species than in others, but it becomes effectual either in the later or the earlier stages. Thus, *Melitæa Phaeton* retains its primitive bristles to the fourth stage; whether it does so to the fifth I know not, as that stage was not at my disposal. In *Marcia* and *Nycteis*, on the contrary, single bristles of the second with swollen shaft are seen directly after the first moult. They make their first appearance, mingled with the primitive bristles, on the warts of the sub-dorsal row. Not until the following stages do they crowd out the primitive bristles on this and other rows. In *Melitæa Marcia* we find in the second stage a few club-shaped bristles on the sub-dorsal warts, while in all other positions the bristles are toothed; in the third stage, on the contrary, the latter are confined to the infrastigmal row, and even there a clubbed bristle occasionally appears among them. In the fourth stage of *Nycteis* (the first moult after the hibernation) the second form of bristles gives place to a third, while the swelling has almost entirely disappeared from all the bristles.

In the fifth stage of *Marcia*, also, there would seem to be a tendency to change the swollen bristles for simple staff-shaped ones. If we designate the three kinds of bristles, viz., the toothed, the swollen and the staff-shaped, as A, B and C, we may arrive at the following conclusion: *Melitæa Phaeton* is the oldest species, standing nearest to the prototype, because in it the primitive form of bristles A persists until the fourth (perhaps the fifth) stage; *Melitæa Marcia* is a more recent species, because the form B appears as early as the second stage, while a tendency to form C does not become observable until the fifth. The newest of the three species would be *Melitæa Nycteis*, because the form C entirely supplants B as early as the fourth stage. In *Argynnis Myrinna* the toothed primitive form is also found in the first stage, but it is immediately supplanted after the first moult by the form C, and not by B.

In the species of *Grapta* which I have examined the bristles of the first stage are not generally toothed, but mostly quite smooth. The warts make a more considerable growth than in *Melitæa* and *Myrinna*, while the bristles become proportionately shorter.

The ideas which I have developed in the foregoing pages make, of course, no claim to perfection or infallibility, because the empirical facts on which they were based were quite insufficient. A certain degree of probability, however, will perhaps be conceded to them, and they may hereafter receive confirmation from other sources. Those who have at their disposal more abundant material than I have had may accept my challenge to use such material for the purpose of testing the conclusions to which I have arrived. Whether these conclusions shall in part be overthrown or shall be proved correct,—in either event such an investigation will be exceedingly rewarding, and cannot fail to bring to light much that will prove interesting.



APPARENTLY NEW SPECIES OF N. AMERICAN HETEROCERA.

BY HENRY EDWARDS.

ZYGÆNIDÆ.

Pseudalypia Crotchii, Hy. Edw. Var. *Atrata*, n. var.—Entirely brassy black, excepting the costa, which is narrowly cream-white. The rather broad and distinct transverse band so characteristic of the typical form, is here entirely wanting. 1 ♂.

Los Angeles, Cal. Coll. A. J. Bolter.

BOMBYCIDÆ.

Seirarctia Bolteri, n. sp.—Size of *S. Clio*. Primaries bright chestnut-brown, with the usual stripes as in *S. Echo*, very clear silvery white, thus showing a strongly marked contrast with ground color. The stripes are thus arranged: one dull costal streak not reaching the apex, a median streak from near base to external margin, and one from base along the internal margin to internal angle. At the apex are two short streaks, and between the median and internal streaks are three others resting on the median nervule. The secondaries are sordid white with a very distinct roseate tinge along the abdominal margin. Beneath, the markings are repeated with a few streaks of brown on secondaries. Head and thorax chestnut-brown, with pinkish streaks; abdomen brownish rose color. Feet and legs as well as the whole of the under side rusty brown.

Las Vegas, N. Mex., 7000 feet. Type, coll. A. J. Bolter.

Heterocampa superba, n. sp.—Ground color of primaries pale yellowish fawn color. Behind the middle, resting on the costa, is a

peculiar lunate mark, composed of two brownish lines, behind them a blackish cloud, and nearer the apex a purplish shade. The exterior margin is a little darker than the rest of the wing, with a fine dentate line, and there are also some blackish dashes at the base. Secondaries smoky brown, paler at base, with indications of two faint bands. The under side of the primaries is dull fawn color, with the outer half smoky brown, and on the secondaries is a dark brown spot at the anal angle. Thorax and abdomen concolorous. 1 ♀.

Exp. wings 1.15 inch.

San Antonio, Texas. Coll. A. J. Bolter.

Hepialus confusus, n. sp.—Allied to *H. Matthewi*, Hy. Edw. Ground color of primaries yellowish fawn-drab; the whole of the markings pale drab, edged with brown. The base is pale, and along the median nervure the light shade widens out, and is connected on the internal margin with other light streaks of irregular shape. A sub-marginal line of the same pale shade, irregularly toothed, runs to the apex, and on the costa are other patches of drab. The margin is also pale between the nervures; the whole of the pale spaces edged with dark brown scales. Secondaries dull fawn-drab, as is also the whole of the under side, the margins being slightly tinted with dull orange. Thorax and abdomen concolorous. 1 ♀.

Exp. wings 1.35 inch.

Sitka, Alaska. Coll. A. J. Bolter.

NOCTUIDÆ.

Perigea benigna, n. sp.—Fawn color, the median space speckled with greenish black scales, giving a somewhat stained appearance. The lines are all dull white, almost equally dentate, the t. a. and basal being parallel with each other. The t. p. is produced outwardly behind cell. The sub-marginal is a little broader than the rest, and is edged outwardly with pale fawn, the same color as the fringe. The reniform and sub-reniform are white. Secondaries pale stone-drab at the base, clouded with a darker shade on the margins. Under side wholly stone-drab, the primaries darkest, with a few brownish patches along the costa. Thorax and abdomen stone-drab. 1 ♂.

Exp. wings 0.80 inch.

Arizona. Coll. B. Neumoegen.

Perigea continens, n. sp.—Pale fawn color, all the lines brown, in strong contrast with the ground color of the wing. Basal line obsolete on internal half; t. a. oblique, slightly dentate; t. p. produced a little behind the cell, thence oblique to internal margin, where the space between it and the t. a. line is much narrower than on the costa. Median space clouded with whitish. Reniform, white, lunate; sub-reniform

almost obsolete. Behind t. p. line is a rather broad brown shade, darkest towards the costa. Secondaries silvery white, shaded with dusky on the margins. Under side of the primaries with dusky shades, particularly at the margins. Secondaries silvery white, with darker shades; a sub-median band being common to both wings. Thorax and abdomen fawn color, the latter palest. 1 ♂.

Exp. 0.85 inch.

Arizona. Coll. B. Neumoegen.

Perigea dilecta, n. sp.—Fawn color, with a very decided reddish tinge. Basal and t. a. lines obsolete, or at least very imperfectly indicated; t. p. very strongly marked in rich brown, indistinct for its external half, but branching at the middle of the wing in dark thick streak towards the costa, and above the reniform, which is thus left unenclosed posteriorly. The reniform is drab, much paler than the ground color, and below it is a minute white dot. Sub-marginal line indicated only on costa by a small triangular patch of brown, and a row of very small intranervular black dots. Secondaries dusky, deepest at the margins. Under side wholly dusky, paler at the base, discal spots well defined, and a faint darker band common to both wings. 1 ♂.

Exp. wings 0.85 inch.

Arizona. Coll. B. Neumoegen.

Tamila arefacta, n. sp.—Primaries cream-white, the bands of a pale shade of brown; basal shade not reaching the costa; central and sub-marginal shades broadly waved, the former with a broken band of rich dark brown in strong contrast with the rest of the wing; a few dark brown scales at both terminations of the sub-marginal shade. Secondaries reddish buff, with indistinct trace of double median band. Beneath wholly deep buff, the primaries with a reddish tinge, the discal mark being quite prominent. Thorax and abdomen concolorous. 1 ♂.

Exp. wings 0.80 inch.

Florida. Coll. B. Neumoegen.

A very beautiful and peculiar species, allied both to *T. nundina* and *T. tertia*, but decidedly distinct from either.

Anthœcia petulans, n. sp.—Primaries bright buff, the lines and bands more deeply orange; basal space darkest. T. a. line slightly dentate on sub-costal vein, thence oblique to internal margin; t. p. line as in many species of this genus, arcuate, bent inwardly at the middle, thence touching internal margin exactly opposite the starting point on the costa. Median space shaded with orange, with small paler discal dot. Marginal space and fringe pale buff. Secondaries pale orange, with black shading at the base, a small discal dot, and a moderate mar-

ginal band of black, the latter distinctly broken and shaded with orange on the anal margin. Under side pale orange, primaries with black sub-marginal band, most distinct in the centre, a black discal spot, and a few black dots near the base. Secondaries with the anal margin clouded with black, and black discal spot. Antennæ, thorax, abdomen and legs dull orange. 1 ♂.

Exp. wings 0.60 inch.

Florida. Coll. B. Neumoegen.

Melicleptria exalta, n. sp.—Primaries stone-drab, with the lines all compressed and indistinct, the basal and t. a. being almost obsolete; they are, however, indicated by a slightly darker shade; the t. p. line is dull crimson, the space behind it being very clear fawn-drab. The secondaries are dull crimson at the base, with a very broad marginal band of black; fringe dull white. Beneath, the primaries have the centre rosy, with the base, external margin and large discal spot, dusky black. The secondaries are dull rosy, with a black shade on the margins near the middle. Thorax and abdomen dull yellow, the tip of the latter orange, and with a pink tinge beneath. 1 ♂.

Exp. wings 0.60 inch.

San Antonio, Texas. Coll. A. J. Bolter.

Fruva modesta, n. sp.—Primaries pale ochraceous, with a faint oblique half band resting on the interior margin. Posterior margins and fringes dusky. Secondaries dusky ochraceous, with the fringe white. Under side dusky, with the margins pale ochraceous; thorax and abdomen concolorous. 3 ♂ 2 ♀.

Exp. wings 0.75 inch.

Virginia City, Nev. Coll. Hy. Edwards.

Fruva deleta, n. sp.—Primaries dusky ochraceous, with some scattered black scales, posterior margin dusky. Secondaries rather paler in color; fringes of both wings concolorous; there is no trace of the oblique band of the preceding form. Under side as in *F. modesta*, of which this may be a variety.

1 ♂, Virginia City, Nev. Coll. Hy. Edwards.

1 ♂, Hudson Bay. Coll. B. Neumoegen.

Catocala Dionyza, n. sp.—Size of *C. Zoe*, Behr., and somewhat allied to it. The primaries are blackish brown, beautifully and clearly mottled with white and gray shades; the lines are all velvet-black, and very distinct. Behind the t. a. line is a rather clear white patch reaching from costa across the open sub-reniform to the middle of the wing; another whitish patch mottled with gray behind the blackish reniform. The t. p. line is very oblique on costa, running to a little above the median nervure, and then produced into a double acute tooth; behind this is a brownish shade following the line to the internal angle;

a blackish sub-apical shade, and the nervures very distinctly blackish as they approach the margin; intranervular spaces marked with a paler square spot, joined to the pale margin of the wing; fringe brown-gray. Secondaries bright orange, median band narrow, constricted in the middle, and passing into a cloud on the abdominal marginal. Marginal band very broad on the costa, narrowing gradually to anal angle (which it does not quite reach), and slightly sinuous internally. Apex bright orange, same as ground color; fringe sordid white. Thorax above grayish brown, concolorous with primaries. Abdomen dull orange above, brownish at the tip, dusky drab beneath. Under side of wings pale orange, a good deal freckled with brown at the margins and along the costa of the secondaries; on the primaries a black sub-basal cloud, a black median band, widest in the middle, and bent anteriorly as it approaches the internal margin, and a black sub-marginal, less distinct band, nearly equal throughout its length. The secondaries have the median band still narrower than above, and by the passage of the nervules broken into four nearly oblong spots; sub-marginal band less distinct than on upper side; on all the bands and spots of the lower side is a purplish reflection. 2 ♂.

Exp. wings 1.60 inch.

Arizona. Coll. B. Neumoegen.

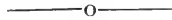
Catocala Phœbe, n. var.—This is a form decidedly intermediate between *C. Badia* and *C. Cælebs*, and is probably that which has given rise to so much discussion with reference to those two species. It is, however, so distinct in general appearance as to deserve a name. *C. Badia* has the primaries always a uniform brown color, while the t. p. line is straight on its outer edge. In *C. Phæbe* this line is bent outwardly into a tooth on the second sub-costal, the space behind the line being shaded with fawn color, another fawn color shade also appearing behind the t. a. line; the black margin of the secondaries, also, is continued to the fringe in the middle, but in *C. Badia* it is cut by the orange margin; in this latter respect *C. Phæbe* approaches *C. Cælebs*, from which, however, it differs in having all the lines and marks of primaries more confused, browner, and not so distinctly black and gray as are the markings in typical *Cælebs*; the median band of secondaries, also, always reaches the abdominal margin nearer the centre than in *Cælebs*, thus leaving a broader space of orange.

All the examples of *C. Phæbe*, examined by me (seven in number), have been taken in New Hampshire.

Catocala Hero, n. var.—I apply this name to a form of *C. fratercula*, in which the space immediately behind the basal line is broadly marked with clear white; this white space runs backward on the internal margin as far as the t. p. line, but does not include the reniform, which is brownish, as usual.

Two examples, ♂ and ♀, are in my collection, both taken in Florida by Mr. A. Koebele.

The three forms of *Catocala* here described have already been quoted by the Rev. G. D. Hulst in his admirable essay on the genus, recently published in the "Bulletin of the Brooklyn Entomological Society."



NOTES ON THE PREPARATORY STAGES OF *LYCÆNA AMYNTULA*.

BY W. G. WRIGHT.

Astragalus Crotalaræ is a plant of ill repute. Locally it is known as rattle-weed, bladder-pod, and loco-plant; loco signifying crazy or lunny. Horses eating the plant are affected with trembling and weakness in the limbs, and worse, a far-sightedness that causes them to think an obstacle to be a yard nearer than it really is, and to fatally stumble over the object when actually reaching it; such disorders being permanent and rendering the animals worthless; such a horse is called "locoed." Cattle eating the plant are rendered worthless, their milk and flesh being considered poisonous. If sheep eat the leaves their wool falls off prematurely. Bees after sucking the flowers are stupefied, being unable to recognize their own hives when they reach home, and are often stupefied so that they die near the plant.

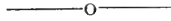
Such is the dark record written against *Astragalus Crotalaræ*. Without endorsing the whole, I merely recite what every one relates and believes. But what is poison to one is health to another. The leaves are the larval food-plant of *Colias Harfordii*, and the immature seeds are the food of three kinds of larvæ, the principal one being *Lycæna Amyntula*.

For two or three years I had observed the then unknown larvæ feeding upon the young seeds, and had noted that the pods were apparently whole, no opening being seen, but on account of this strange habit of inside feeding I had always passed them as the larvæ of some moth. At length, however, I confined some of the larvæ, and in due time was rewarded with disclosure of *Amyntula*. Then began the research. From the first matters were complicated by the presence of the two other species of larvæ, and it was but slowly that bit by bit each item of fact was cleared up and established. Even now there are two points yet indicated, namely: how does the young larva get into the pod, and when does pupation of the hibernating brood take place? but as the season for investigation is now closed for this year I am advised to give the facts as far as obtained.

The eggs, green, of usual *Lycæna* style, are deposited one in a place, at the base of the young pod, usually on the calyx of the flower, or that part which envelopes the base of the pod. Sometimes the egg is found on the pod itself or upon the stem, but only exceptionally so. Soon after hatching the young larva makes its way into the interior of the young pod, the hole by which it enters being as yet undiscovered, and thenceforth to maturity it lives upon the immature seeds. In the earlier brood one pod is usually sufficient for the complete maturity of one larva, but later, as the increasing heat and dryness causes a more speedy ripening of the pod and seeds, the larva is often only half grown when the seeds are all eaten up, and starvation awaits the larva if it remains in the pod. It then gnaws a hole in the side of the now mature pod, and coming out, wanders about to find a fresh pod. This having been found it eats a hole just large enough to squeeze its body through with great labor, and, entering, explores the interior to see if it be suitable and unoccupied, and if so found it returns to the hole and seals it over on the inside, spreading over first a fibrous, silky tissue, and then smearing over that a coating of mucilage that closes the aperture both air and water tight. I have seen a half-grown larva make the opening and go in in fifteen or twenty minutes, and again others will try to enter by so small a hole that they will occupy an hour in squeezing their bodies through. If the new pod is satisfactory they come back in half an hour to seal over the door-way by which they entered. Established thus in their new house, they remain till mature, when they come out, the early brood to pupate and the latter ones to hibernate. From the behavior of mature larvæ in confinement I judge that the early ones suspend on twigs or sticks to transform, after orthodox fashion. Such as I have had pupate in tin-boxes always go up into the corner of the cover and attach themselves to both angles. The latter brood I believe hibernate in larval stage in a slight cocoon in the ground, or under leaves and rubbish. It would seem more proper that they should hibernate in chrysalis, being mature, but some larvæ that I have seen in confinement have remained unchanged nearly a month, neither eating nor pupating, nor dying. If they were to hibernate in chrysalis they would have pupated upon reaching maturity. In the spring they must pupate and transform without eating.

As will be seen by the foregoing, ants have nothing to do with these larvæ in any stage. I cannot even surely make out any organs on posterior segments as in some species. To still further test the matter I placed some ants upon a larva, and while the ants paid no extraordinary attention to the larva, the larva shrank away from the touch of the ants in evident dislike or fear. And of the thousands of pods I have opened I have never seen ants in but one, in which case it was full of them, and they had evidently just devoured the larva.

Aware that this life-history is in some respects unique, I will say that I have seen what I describe; also, that a full series of material, from egg to chrysalis, both in alcohol and living, has been sent to Mr. W. H. Edwards, to whose ripe experience and competent pen the subject is promoted, as it was at his instigation and encouragement that the research was pushed to its partial success.



DESCRIPTION OF THE PREPARATORY STAGES OF PHYCIODES CAMILLUS, Edw.

BY W. H. EDWARDS.

EGG.—Conoidal, truncated, slightly depressed at top, the upper third marked by low vertical ribs, the lower part irregularly, thickly and shallowly indented; color greenish yellow. Duration of this stage about seven days.

YOUNG LARVA.—At 12 hours from egg, length .05 inch; cylindrical, thickest anteriorly, each segment well rounded; on 2 a chitinous dorsal long oval patch, on front of which are six long black hairs which bend over the head, and on rear two short straight hairs turned back; below the patch are four hairs to base, one above and one below the spiracle in vertical line, and two shorter, close together, in front of the spiracle; 3, 4 and 13 have each six long curved hairs across dorsum to line of the spiracles, a little in advance of the middle of the segment; 5 to 12 have similar rows of four hairs; on 2 to 7 these hairs are turned forward; from 8 to 11 they are upright; those on last segments turned back; from 5 to 12 there are also two short hairs turned back, on the posterior part of each segment, one on either side mid-dorsal line; below spiracles on 5 to 12 are two short hairs each, the hinder one always a little higher up than the other; there is a further row of one hair to each segment over the feet and prolegs, and in same line on the last three segments; 13 has a chitinous rounded patch with hairs long and short; color green, including the feet and legs; head obovoid, depressed at top, the vertices rounded; color black, shining, with a few short, fine hairs, bent down. Duration of this stage four to five days, in September.

In all respects the larva at this stage is undistinguishable from *Picta*, the hairs arranged in same manner.

After first Molt: length at 24 hours from the molt .12 inch; color yellow-green, under side and prolegs same, feet brown; on dorsum are traces of longitudinal brown lines, in some examples obsolete; along upper part of side, outside the upper lateral spines, a brown stripe from 2 to 13; on 2 is a black, long, oval, dorsal patch, with many long

black hairs; the spines as in this genus in seven rows,—one dorsal, three lateral,—besides a row of smaller ones over feet and along base; all the spines are slender, tapering, each thickly beset with short hairs or bristles, and the color of these as well as the spines and tubercles is same as that of the body, yellow-green; head obovoid, the vertices rounded; color black, or brown-black, with fine tubercles and hairs. Duration of this stage three to four days.

After second Moulting: length at twelve hours from the moult .18 inch; color brownish green on dorsum with a brown line running with the dorsal spines; the lateral band darker; spines shaped as before, brownish green, except the lower lateral row, which, with the bristles, are yellow-green; so the small spines at base; head as before.

At thirty-six hours from the moult there appear three brown lines on dorsum, running with the upper three rows of spines, and the tubercles and spines on the dark band are nearly concolored with it; on each vertex of head is now a whitish bar from back to front. Duration of this stage three to four days.

After third Moulting: length at twelve hours .25 inch; the dorsum now shows distinctly the three brown lines; the blackish band as before; at one day later the dorsum has become darker by the expanding of the brown lines; the five upper rows of tubercles and spines are blackish, the others yellow-green. To next moult five to six days.

After fourth Moulting: length at twelve hours .5 inch; the whole upper part, including the five rows of tubercles, black, or brown-black, dotted sparsely with sordid white; some examples have a whitish line running with upper lateral tubercles, others have no line, but an indefinite streak of whitish between dorsals and lateral; the lower part of side a little dotted and mottled with sordid white; in about 4 days reaches maturity.

MATURE LARVA.—Length .8 inch; cylindrical, even; color of dorsum blackish brown, somewhat dotted with sordid white, or yellow-white, and on either side the dorsal spines runs an indistinct whitish line; next below the dorsal area, and occupying half the side, is a black band ending a little over spiracles, and from this to base is as broad a space, greenish brown, dotted with yellow-white; the whole under side also greenish brown; 2 has a chitinous, black dorsal collar, from which proceed thick tufts of black hairs on either side, the hairs long and short; the dorsal and upper lateral spines are brownish green from more green tubercles; the spines and tubercles of second lateral row are black; the spines of lower lateral row greenish yellow, with a little orange at base, and the row along base are greenish yellow; the spines are short, thick, conical, and all are thickly beset from top to base with short black and brown hairs or bristles, except the lower lateral and basal rows, where the hairs are concolored with the spines; feet black, head obovoid, bilobed, the vertices rounded; color black-brown,

shining; across each vertex from back to front a narrow whitish bar; surface much covered with fine tubercles, from which come long black hairs. From 4th moult to pupation about six days.

CHRYsalis.—Length .38 to .44 inch; breadth across mesonotum .14 to .15 inch; across abdomen .16 to .17 inch; cylindrical, the abdomen stout; head-case short, beveled roundly on both sides to a transverse edge, this either very little convex or square; the sides incurved; mesonotum not prominent, rounded, not carinated, with a low tubercle on either side, followed by a slight depression; the posterior ends of segments 8 to 11 on dorsum raised above surface, that of 8 decidedly, making rather a prominent ridge; color variable, yellow-brown to blackish brown; the wings and head-case one shade, not mottled; the rest specked and mottled with lighter brown, or yellowish, especially on middle segments; the dorsal and upper lateral larval tubercles represented by slight elevations, about which the yellowish dots are more dense than elsewhere. Duration of this stage five to seven days, in October.

Camillus was described, Tr. A. E. Soc. 3, 268, 1871, from examples taken by Mr. Mead in northern Colorado, 1870. It is a smaller species than *Tharos*, and closely allied to it, more variegated on upper side, and on that side much like *Pratensis*, Behr. It is dimorphic after the same pattern of markings as *Tharos*, *Phaon* and *Vesta*; probably also *Pratensis*, for I think *Orseis* must be a co-form with that species. Whether the dimorphism of *Camillus* is strictly seasonal, however, cannot yet be determined. Further experiments are necessary to get at the facts; but what I suppose, partly from analogy with *Tharos* and partly from the outcome of the larvæ raised this year, to be the summer form, is the typical *Camillus* as described in Trans. It is light ochre-yellow on under side, with a pale chestnut-brown patch at outer angle of hind wing, a smaller one on middle of disk, and a cloud of same hue on hind margin. In the female these markings are distinct, but in the male they are pale and more or less obsolete. In both sexes the disk is inscribed by reddish lines, as in *Tharos*. The other form is much covered with brown, and across the disk is a conspicuous belt of whitish color, after the manner of form *Marcia*, of *Tharos*. It was this form which was described by me as *Emissa*, in Trans. quoted, p. 269. In the Catalogue, then, the species should be set down thus:

CAMILLUS.

1. dimorphic form CAMILLUS.
2. “ “ EMISSA.

What I take to be a bleached example of *Emissa* was described by me as *Pallida*, Pr. E. Soc. Phil., 2, 505, 1864, the same which Strecker (Lep. pl. 8) has figured as *Mata*, Reak. Mr. Mead, in Rep. Wheeler Exp. v, 764, 1875, says of *Camillus*: “This is the most abundant

Phyciodes in the mountains of Colorado, and is found at all elevations below timber line the whole summer. These butterflies are very fond of flowers, but do not often congregate at wet spots in the road like *Tharos*.' Mr. Mead's remarks, of course, apply to north Colorado.

I received a cluster of about 100 eggs of *Camillus* from Mr. Nash, at Pueblo, altitude 4400 feet, Sept. 3, 1884, laid on August 29th, by a female confined in bag over a species of Aster. This female was also sent, and was form *Emissa*, banded across under hind wings. The larvæ hatched September 5th. I gave them during their stages leaves of half a dozen species of Aster, all which were eaten readily. In habits the larvæ resemble *Tharos*, being exceedingly hardy, and suffering none at all from close confinement. They are very rapid in growth also, like *Tharos*, and unlike *P. Picta*, which I was feeding at same time.* The first moult passed September 9th; the second, 12th; the third, 16th; the fourth, 22d; and the first pupation took place September 28th. The first imago appeared October 5th, so that from laying of egg to imago was but about five weeks. All the emerging butterflies were of the summer form. I had supposed these larvæ would hibernate after third moult, as *Tharos*, at Coalburgh, would have done at this season of the year, and as *Picta* did, but all went to chrysalis. I had disposed of many larvæ in one way or other, but obtained 22 butterflies, 5 ♂ 17 ♀, all of the *Camillus* type, and so unlike the female parent.

Mr. Nash tells me that the species flies in June, at Pueblo, so that the female which laid these eggs August 29th must have been of the second brood of the year. If the dimorphism was strictly seasonal, as in case of *Tharos* and *Marcia*, this female should have been of the form *Camillus*. As it was *Emissa*, the second brood,—supposing the winter brood to be *Emissa*,—may be composed of both forms, as in the mid-summer brood of *Grapta Interrogationis*. If so, it differs from the other dimorphic *Phyciodes* named. In this peculiarity the *Grapta* spoken of differs from the rest of the genus on this continent, so far as known, as in them the dimorphism is strictly seasonal.

—o—

A QUESTION OF PRIORITY.

By E. M. AARON.

During the summer of 1877 the late Mr. Boll, of Texas, collected in that State a considerable number of species of butterflies, sets of which were sent to Mr. Herman Strecker, of Reading, Pa., and Mr. Wm. H. Edwards, Coalburgh, W. Va. These gentlemen, with their usual promptitude in such matters, proceeded at once to a study of these

* I have recently described the preparatory stages of *P. Picta* in Can. Ent. vol. 16, p. 163.

captures and the descriptions of the new species were soon in MS. form. Mr. Edwards at once sent descriptions of some of them to the *Canadian Entomologist*, in which they appeared about November 1st (Can. Ent. IX, p. 189-192, October, 1877), and of others to *Field and Forest* (F. and F. III, pp. 87, 88, 89, 101, 103, and 118, 1877). As the October number of the *Canadian Entomologist* was on the table of the American Entomological Society, at their meeting held Nov. 9, 1877, there can be no doubt that the names given by Mr. Edwards to the species described therein can base their claims to precedence on that date. On the other hand, Mr. Strecker reserved the publication of his descriptions for Part 14 of his *Lepidoptera, Rhopaloceres et Heteroceres*. Now it appears that while these descriptions were written during September, 1877, and were doubtless in type as early as the descriptions of Mr. Edwards, still the part in which they appeared was delayed, by various causes, until the latter part of the following March. After very careful and far-reaching inquiry I find that March 25, 1878, is as early a date of circulation as this part can be credited with. It was not on the table of the American Entomological Society, nor was it received by the Academy of Natural Sciences of Philadelphia, before that date, and inquiry of subscribers in Philadelphia and elsewhere, fails to indicate that any one received it before the last week in March.

My attention was called to this matter by the receipt of a portion of Godman and Salvin's superb work on the fauna of Central America, at the rooms of the American Entomological Society. In this part (Godman and Salvin, Biol. Cent. Amer. Rhopal. vol. i, p. 1, pl. 1) they give Mr. Strecker's names the precedence in each case where the question arises. Just prior to the receipt of this work by the Society, my brother, S. F. Aaron, had returned with a very complete collection of butterflies made in the region of Corpus Christi, Texas. This collection contained most of the species which Mr. Boll had taken at San Antonio. As we wished to send some of these to collectors correctly determined, and also to contribute to the pages of *PAPILIO* for November a notice of these captures, it became necessary to settle to our own satisfaction this question of priority.* To enable us to judge conclusively both Mr. Strecker and Mr. Edwards were written to; from their replies I extract the following:

COALBURGH, W. VA., Nov. 18, 1884.

MR. E. M. AARON, Dear Sir:—

Yours of 17th is received. I reply to your inquiry about *Melitæa Ulrica* versus *M. Imitata*. If Godman and Salvin have given Mr. Strecker's names the priority, as you tell me, it is because they have overlooked the facts.

* It is probable that a few of these species will be found to belong to Hewitson and other European describers.

In September, 1877, I received several butterflies from Mr. Boll, all taken that season in Texas, and at once described them in *Can. Ent.* IX, October, 1877, and in *Field and Forest*, III, November, 1877. These species were *Mel. Ulrica*, *Mel. Dymas*, *Charis Australis*, *Amblyscirtes Nysa*, *Pholisora Nessus*. In March, 1878, appeared Strecker's Part 14, but bearing on the cover the date 1877! I received my copy March 28, 1878, and wrote the date on the cover. In this Part appeared duplicate names for all the species spoken of, described by me October-November, 1877; also Scudder's *Satyrus Dionysius*, 1877, was re-described as *Ashtaroth*, Str. In *Can. Ent.* X, p. 79, April, 1878, appeared a review of Strecker's Part 14 by Mr. Saunders, the editor. He says the Part reached him March 28th, and on inquiry he finds other subscribers received it within a day or two of that date, and proceeds: "We desire to call particular attention to this fact, as this Part of the work, in which a number of species are described as new, bears the date of 1877. In Dr. Hayden's last Report, Mr. Scudder described a *Satyrus* larger than *Ridingsii*, and like it, from Utah, as *Dionysius*, which seems to be identical with Mr. Strecker's *Ashtaroth*. Mr. Strecker's *M. Imitata* is also doubtless a synonym of *M. Ulrica* Edw., *Can. Ent.* IX, p. 189; his *M. Larunda* the same as *M. Dymas*, Edw., l. c. p. 190; his *Pamphila Similis*, Edwards' *Amblyscirtes Nysa*, l. c. p. 191; his *Charis Guadaloupe* identical with *C. Australis*, Edw., *Field and Forest*, November, 1877." And Mr. Saunders reprobates severely this practice of antedating, as will be seen on reference to the paper. I add further that Mr. Strecker's *S. Notabilis* is identical with *P. Nessus* (*Pyrgus Nessus*, as Dr. Speyer gives it).

To the criticisms of Mr. Saunders the other replied by entering all his names spoken of in his Catalogue of Butterflies and Moths, issued 1878, as rightful, with the particular date to each of "September, 1877," followed by the name given by me as "October, 1877." In the case of *Dionysius*, Scud., it reads "*Ashtaroth* Str., September, 1877; *Dionysius*, Scud., February, 1878."

Only the younger lepidopterists need to be reminded that printing is not publishing, and that the Rules of Zoological Nomenclature are explicit in demanding publication in order to insure recognition of the name given to any species. Part 14 spoken of was published late in March, 1878, but bore on its cover the date 1877, and that settles the matter as to the priority of these names. The date in the Catalogue of "September, 1877," does not better the claim made by Mr. Strecker.

Not only was Part 14 antedated many months, but Part 15 also bears the date of 1877, and was delivered to subscribers late in July, 1878. This contains but one description of butterfly, *Mel. Alma*, and in Strecker's Catalogue the species is put down as of 1877. It happens in this case that there is no synonym, and the question of antedating

will not come up. But the Part contains several descriptions of *Sphinges* and Moths, to which, or some of them, it is not unlikely there are other names rightfully claiming priority.

W. H. EDWARDS.

READING, NOV. 17, 1884.

MY DEAR MR. AARON:—

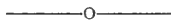
By referring to page 130 of my *Lep. Rhop. et Het.* you will see the description of *Melitæa Imitata*, also the allied *M. Larunda*, as well as of other species. At the end of the article, p. 132, you will see the date SEPTEMBER, 1877.

Then turn to *Canadian Entomologist* vol. ix (No. 10), p. 189, and you will find the same insects redescribed by W. H. Edwards as *Ulrica* and *Dymas*. By looking at p. 181, the heading of the number, you will see this was published OCTOBER, 1877, one month later. So it is not difficult to see how they stand; plain enough I should think.

Yours truly,

HERMAN STRECKER.

It will be seen by the above letters that the whole question hinges on what is required of an author before he can lay claim to a species. Both the British and American Associations have for years agreed that publishing was necessary, and that a work was not published until it was accessible (in circulation) to students. As Mr. Strecker's descriptions were not before students until March 1878, and Mr. Edwards' were accessible during November, 1877, it seems that there can no longer be any doubt as to the right of the latter gentleman to these species. I have dwelt upon this matter at this length as it seems likely that several of these species will hereafter be common in collections, and it is desirable that the matter be set at rest.



THE BROOKLYN ENTOMOLOGICAL SOCIETY at their next business meeting will consider the advisability of assuming control of PAPILIO, and publishing it in connection with their Bulletin. Unless such an arrangement can be made PAPILIO will be discontinued after the publication of the number for December, 1884. Of the 250 subscribers who have regularly received it without protest, less than 100 have paid for it. The latter, together with certain Entomologists to whom the Editor is glad to be able to send it as a token of esteem, are the only ones who will receive this number. The loss of many hours of precious time, and about \$200 as well, is not incurred for the benefit of the majority who are delinquents.

ON SOME RIO GRANDE LEPIDOPTERA.

BY J. A. LINTNER.

During the spring of 1877 an expedition mainly for the collection and study of birds was made by Mr. George B. Sennett, of Erie, Pa., to the Texas border of the Rio Grande. The successful and valuable results of these studies have been given to the public in a paper by Mr. Sennett, entitled "Notes on the Ornithology of the Lower Rio Grande of Texas, from Observations made during the Season of 1877," and published in the *Bulletin of the U. S. Geological and Geographical Survey for 1878*, vol. iv, pp. 1-66. Mr. F. S. Webster,—then of Troy, N. Y., now of Washington, D. C.,—Taxidermist, was associated with him. In addition to some five hundred birds, collections were also made of mammals, reptiles and insects. The latter, which, with a few exceptions, were LEPIDOPTERA, were placed in my hands by Mr. Webster for study and determination. No notes accompanied them, and the only information received in regard to them (with some trifling exceptions) was that they were collected at two localities, viz.: at Brownsville, Texas, from April 1st to April 10th, and at Hidalgo, from April 17th to May 10th.

In the spring of 1878, a second expedition was made by Mr. Sennett to the same region during which, in addition to the Ornithological material reported upon in a second paper in the *Bulletin of the U. S. Geological and Geographical Survey for 1879-80*, vol. v, pp. 371-440, a number of LEPIDOPTERA were collected by him at Lomita Ranch,* Texas, during a sojourn there from April 14th to May 20th. These also were placed in my hands by Mr. Sennett for study and for report.

The collection, although not a large one, was quite an interesting one, as coming from a locality upon the extreme southern limits of our border. It contained some forms of peculiar interest and a few species which proved to be undescribed. Several of the rarer *Pierinæ* were submitted to Mr. A. G. Butler for comparison with the British Museum collections, and upon his report the identifications were made, and the new species are designated as such.

I greatly regret that my studies of this collection have not, even up to the present, been completed. Several causes have contributed to this delay, chief among which may be mentioned a number of obscure forms of *Noctuidæ* which have not been satisfactorily worked out. I humbly beg the forbearance of the gentlemen who so kindly placed all their material in my hands without urging return.

* Seven miles above Hidalgo and sixty-five from Brownsville.

A request for information upon the species of *Kricogonia* to which MS. names had been given by me, made by the editor of PAPILO, as an aid to determinations in an extensive collection of insects recently made by Mr. S. F. Aaron in southeastern Texas, has led me to offer for publication at the present time that portion of my paper which I had prepared in 1880, containing the *Rhopalocera*, the *Sphingidæ*, *Ægeridæ* and *Bombycidæ* of the Sennett collections.

RHOPALOCERA.

PAPILIONIDÆ.

1. **Papilio Philenor** Linn.

Hab.—Throughout the United States.

Three examples, in the Sennett collection of 1878.

2. **Papilio Asterias** Fabr.

Hab.—Quebec to Gulf of Mexico; Atlantic to Pacific; abundant in Kansas (Snow); rare in New Mexico, Colorado and California in June and July (Mead).

Three examples, Sennett coll. of 1878.

3. **Papilio Cresphontes** Cramer.

Hab.—Ontario to Mexico; Illinois (Worthington); occasional in Wisconsin and Michigan (W. H. Edwards); occasionally common in Kansas (Snow); rare in New York until in 1882 and '83.

Two examples, Sennett and Webster in 1877; five, Sennett coll. in 1878.

4. **Pieris Protodice** Boisd.-Lec.

Hab.—Atlantic to Pacific; Quebec (Barnston); Kansas common (Snow); Colorado common (Scudder); California common (H. Edwards); rare in New York.

Twenty-three examples: eleven in coll. of 1877, ten in coll. of 1878.

5. **Pieris Amaryllis** Fabr. Ent. Syst., III, I, 189, No. 586.

“P. A. alis rotundatis, integerrimis concoloribus obscure albidis; anticis lunula media nigra.

Habitat in India. Mus. Dr. Hunter.

Statura et magnitudo *P. Monuste*. Alæ omnes obscure albæ vel potius cineræ immaculatæ, lunula sola, nigra, utrinque in medio alæ anticæ.”

A single example (♀) of this species was taken by Mr. Webster in the 1877 coll. The wings are white, faintly tinged with yellow. Primaries broad, costa quite rounded; outer margin almost straight—very slightly drawn in; hinder angle rounded; an oval black spot, a line in length, rests on the discal cross-vein. Secondaries immaculate, rounded at both the costa and inner margin.

Beneath, discal spot as above. Secondaries more tinged with yellow costally. Exp. of wings three inches.

6. **Nathalis Iole** Boisd.

Hab.—Illinois (Worthington); Missouri to California, New Mexico, Arizona (W. H. Edwards); abundant in Kansas (Snow).

The single example of this species, captured in very poor condition, shows such an unusual coloration in its bright red suffusion that it was at first thought to be a distinct species. It may have been changed by remaining long in the cyanide bottle in which it was taken.

7. **Phœbis Agarithe** (Boisd.). Sp. Gen., I, 623. *Phæbis Agarithe*, Butler, Lep. Exot., p. 121, pl. 45.

Hab.—Butler cites this species from Texas, Yucatan, Venezuela, Nicaragua, Panama, Santa Martha, Caraccas, Brazil and Hayti.

Mr. Scudder records a pair brought from Key West by Dr. Palmer.

This beautiful species is represented by three male examples, in fair condition, taken by Mr. Sennett. The peculiar borders of its wings, consisting apparently of less closely appressed scales which are unicolorous with those of the rest of the wing, entirely disappear when viewed at a certain angle. The border is well defined on the primaries, of nearly uniform width across the outer margin (with the exception of its inward curving at the nervules) until to cell 7, which it more than half fills: cells 8, 9 and 10 are nearly filled by it. It is continued around the inner margin to nearly its middle. On the secondaries it is narrower, quite uniform in width (very slightly curving in at the nervules), arrested at vein 3, and preceded in cell 3 by a round spot of less diameter than the border lying above the fold.

Two of the examples (the smaller) are marked by a linear spot on the cross-vein of the primaries above and beneath; an obscure band of scattered brown scales crossing in a direct line the nervules of the primaries beneath, and continued irregularly over those of the secondaries; on the discal cross-vein of the latter a small circle of reddish scales resting on the fold of cell 5, and a similar one above it in cell 6. The third example shows none of these discal marks on either surface, but only the obscure band of the primaries beneath.

Butler gives the following characters and comparisons of this species: "♂. Above very similar to *P. Argante*, but paler; the front wings more produced at apex; below differs from *P. Argante* in the oblique band of forewings, which is continuous and not angulated as in *P. Argante*.

"♀. Above generally golden-orange, sometimes pinky-white; forewings with diffused orange patch on end of cell; a brown spot at end of cell."

8. **Kricogonia Lyside** (Godt.). Encyc. Method., ix, p. 98 (as *Colias L.*)

Hab.—Texas; Costa Rica (Reakirt.; South Florida (Strecker's Catalogue); Antilles, Mexico, Guatemala (Boisduval).

Eight examples—one in 1877 coll., seven in 1878 coll.,—all ♀ ♀ but one.

9. **Kricogonia Fantasia** Butler. Trans. Ent. Soc. Lond. for 1871, p. 170, pl. 7, fig. 6.

The following is the description:

♀. Wings above greenish white; front wings with the basal costa dusky sulphur-yellow; a pale brown marginal band beginning broad on costa and tapering to near the anal angle; hind wings tinted with pale sulphur; front wings below with the greater part of the discoidal cell and basal half of the costal area bright sulphur-yellow; apical half of the costal area and apex tapering to near the anal angle tinted with pale sulphur; hind wings as above, but brighter toward the base; body cream-white; anus brownish.

Exp. of wings two inches four lines to one inch four lines.

Hab.—Nicaragua. (coll. Boisduval.)

Most nearly allied to *K. Lyside* (*Castalia* Butler, nec. Fabr.), but at once distinguishable by the marginal band and differently colored bases of the wings (Butler).

Four examples, all ♀ ♀; three in 1877 coll.

10. **Kricogonia Terissa** Lucas.

Hab.—Mexico and Guatemala (Boisduval).

Two examples, coll. of 1877 and of 1878, ♂ ♂

Boisduval states of this species: "In our '*Species*' we have described as a variety of *Lyside*, some individuals from Mexico which differ sensibly from the type of the Antilles in that they are smaller, and that the males show upon the costal border of the secondaries a short black band. We believe to-day that this variety figured by Hübner-Geyer, Nos. 843 and 844, under the name of *Lyside*, well deserves to be regarded as a species pertaining to Central America. It is more common in Mexico than in Guatemala ('*Considérations sur des Lépidoptères Envoyés du Guatemala à M. de l'Orza*, p. 10, 1870.')

11. **Kricogonia Lanice** n. sp.

♂. Primaries white; basilar region bright yellow, extending one-third across the wing, or to the first median nervule; costa slightly, and apex more conspicuously shaded with pale yellow; internal margin bordered with black for one-fourth its length from the base. Secondaries slightly tinged with yellow; bright yellow at the base, with a few black scales; outer margin narrowly bordered with pale yellow; no discal spot on either wing.

Beneath, the yellow of the basilar region of the primaries is less bright than above, while that of the costal and apical regions is deeper

and more extended. Secondaries yellow, somewhat deeper basally, with an indistinct band of intranervular dusky spots extending across the outer third of the wing, and a faint discal spot.

♀. Wings yellow; primaries brighter at the base and apex, but less bright basally than in the ♂; inner margin black only at the base; some dusky scales at the base, upon the inner fourth of the costal region, at the apex, and extending two-thirds the extent of the outer margin. Secondaries deeper yellow along the outer and inner margins. Cilia of both wings pale pink.

Beneath, bright yellow only on the base of the primaries, extending over the cell—the remainder of the wing pale. Secondaries quite pale, barely tinged with yellow, with a transverse band and discal spot as in the ♂.

Thorax and abdomen of the examples too much denuded for description.

Exp. of wings 1.6 inch.

Two examples—one ♀ in 1877, one ♂ in 1878.

12. **Colias Cæsonia** (Stoll).

Hab.—Southern and Western States; San Diego, Cal., rare (Behrens); Kansas common (Snow); Texas, Arizona, Colorado, Mexico, Cuba, Jamaica, St. Domingo.

One example in coll. of 1877, and one in 1878.

13. **Colias Eurytheme** (Boisd.).

Hab.—British America (Scudder); Quebec to Mexico; Atl. to Pac. Seven examples in coll. of 1877.

14. **Terias Nicippe** (Cramer).

Hab.—Occasional on Long Island, N. Y. (Tepper); Pennsylvania to Florida; Illinois (Worthington); Kansas common (Snow); Colorado (Nash), California, Arizona, Mexico, Central America, West Indies.

A single example only in coll. of 1878.

15. **Terias Lisa** (Boisd.).

Hab.—This species occurs along the Atlantic coast from New Hampshire to Cuba; it is excessively rare north of Cape Cod, common from New Jersey to Cape Hatteras, and extremely abundant further south (Scudder). In the State of New York it is frequent on Long Island, and is not rare at Yonkers, in Westchester County. It has not been seen in the vicinity of Albany. An interesting account of its appearance in large numbers in the Bermudas in October, 1874, and on an earlier occasion (in 1847) is given in *Psyche*, vol. i, p. 121. It occurs also in the Western States, Illinois, Kansas, etc., and in Mexico.

Four examples in coll. of 1877; two in coll. of 1878.

NYMPHALIDÆ.

HELICONINÆ.

16. **Heliconia Charitonia** (Linn.).
 Hab.—South Carolina, Georgia, Florida, West Indies. Very common in all Central America and in the Antilles (Boisduval). One example in coll. of 1878.
17. **Dircenna Klugii** (Hübner).
 Hab.—Common in Mexico and Honduras.
 A single example of this species, new, we believe, to the United States fauna, occurred in the coll. of 1877.

DANAINÆ.

18. **Danais Archippus** (Fabr.).
 Hab.—Southern parts of British America (Scudder); Patagonia (Berg.); Nova Scotia, United States, Atlantic to Pacific, Mexico, Central America, West Indies, Bermudas, Sandwich Islands, Australia.
 A single example only, in 1877.
19. **Danais Berenice** (Cramer).
 Hab.—Southern United States to New Mexico (Scudder); Utah, Colorado, Arizona, Mexico, West Indies.
 Four examples in coll. of 1878.

NYMPHALINÆ.

20. **Agraulis Vanillæ** (Linn.).
 Hab.—Southern third of U. S. east of Rocky Mountains (Scudder); Illinois (Worthington); from Virginia southward, and from the Atlantic to the Pacific, Antilles, Mexico, Central America, New Grenada, Venezuela, Guinea, Brazil, Bolivia (Strecker's Cat.).
 Ten examples in coll. of 1878.
21. **Euptoieta Claudia** (Cramer).
 Hab.—Ontario; Massachusetts, rare (Scudder); New York to the Gulf of Mexico, Mississippi Valley, Colorado, Arizona, California (Edwards' Cat.); Arizona and Colorado in May (Mead); Kansas, common (Snow); New Mexico, southward to Honduras and Guatemala?, Cuba (Scudder).
 Two examples in coll. of 1877, and five in 1878. One of the former is much the smallest that has ever come under my observation, its expanse being but 1.80 inch, while others in my collection measure 2.50 inches, and, according to Boisduval, it expands to 3 inches.

22. **Phyciodes Phaon**, Edwards.
Hab.—Gulf States (Edwards); Kansas, rare (Snow).
Seventeen examples in 1877, eight in 1878.
23. **Eresia Texana**, Edwards. Proc. Ent. Soc. Phil., ii, 1863, p. 81.
Hab.—Texas and Florida (Edwards).
One example in 1877.
24. **Synchloe Adjutrix** (Scudder). Bull. Buff. Soc. Nat. Sci. ii, 1875, p. 269.
Hab.—Texas.
Thirteen examples in 1877, twelve in 1878.
25. **Pyrameis Atalanta** (Drury).
Hab.—Newfoundland; Nova Scotia; Southern Canada; and Southward over the United States from Atlantic to Pacific; Cuba, Mexico, Europe and Mediterranean district (Scudder); British America and Anticosti (Edwards).
Thirteen examples in 1877, four in 1878.
26. **Pyrameis Huntera** (Drury).
Hab.—Nova Scotia, Southern Canada, and United States south of British possessions, from Atlantic to Pacific, Cuba, Mexico, Guatemala (Scudder); South Labrador (Edwards); Patagonia (Berg.).
One example in 1877.
27. **Junonia Lavinia** (Cramer).
Hab.—Ontario, New York and Massachusetts, occasional; Middle and Southern States, Kansas, common; Colorado, Iowa, California, Bermudas and Cuba (Scudder); Northern Illinois (Worthington).
Two examples in 1878.
28. **Apatura Celtis**, Boisduval.
Hab.—Virginia to Gulf of Mexico, Mississippi Valley, Kansas, Texas (Edwards); Iowa (Scudder).
One ♀ example in 1877.
29. **Apatura Antonia**, Edwards. Field and Forest, iii, 1878, p. 103.
Hab.—Arizona and Texas.
Six ♂'s and twelve ♀'s in coll. of 1877.
30. **Apatura Cocles**, n. sp.
♀. Approaches *A. Celtis* in ornamentation, form and size. Primaries quite pointed, more than in any other known species of the genus; outer margin quite excavated; inner margin short as compared with costal margin. Secondaries with the outer margin less curved than in

the other species, having the anal angle quite prolonged; in the angulations of the wings it approaches *A. Celtis* ♂. Of the two black spots between the submedian nervules (in cells 3 and 4) the lower (in cell 3) is slightly the larger; the upper bears a few bluish scales. In cell 6, a black spot bearing centrally a few bluish scales; in *A. Celtis* the corresponding spot is white, and in *A. Antonia* black with a white centre. Discoidal cell double barred, the bars black-bordered and ochraceous within; *A. Celtis*, *A. Alicia* and *A. Antonia*, have a single bar outwardly, and toward the base two separate spots—more contiguous in the latter species.

Secondaries: spots larger than in *A. Celtis* and *A. Alicia*; band outside of the row of spots, more dentate than in *A. Antonia*, and less than in *A. Celtis*; marginal band slightly curving in the interspaces cellular spots obsolete.

Below: primaries with the veins and lower half of wing reddish. The three spots in cells 3, 4, 6, black, dotted with blue scales, and bordered broadly with yellow. Secondaries: spots large, oval, bearing their interior blue scales toward their outer portion; marginal band narrow, very slightly curving in the interspaces.

Hab.—Texas.

Two examples in 1877.

It is worthy of note that while so many *Apaturas* were taken in the first expedition, of 1877, not a single example occurred the following year, although made during the months of April and May, and in a locality but seven miles distant from the first collecting field.

SATYRINÆ.

31. *Neonympha Sosybius* (Fabr.).

Hab.—Middle and Southern States and Mississippi Valley (Edwards).

Ten examples in 1877.

32. *Neonympha Areolatus* (Sm.-Abb.).

Hab.—Gulf States; New Jersey, occasionally.

One example in 1877.

33. *Neonympha Gemma*, Hübner.

Hab.—West Virginia to Gulf States.

Two examples in 1877; one example in 1878.

LIBYTHEINÆ.

34. *Libythea Carinenta* (Cramer).

Hab.—New Mexico, Arizona; Texas, south to Brazil (Mead).

ERYCINIDÆ.

35. **Charis Cænius** (Linn.).
 Hab.—Southern States.
 One example in 1878.

LYCÆNIDÆ.

THECLINÆ.

36. **Thecla Humuli**, Harris.
 Hab.—Middle and Southern States and Mississippi Valley (Edwards).
 One example in 1878.
37. **Thecla Poeas**, Hübner.
 Hab.—West Virginia, Kentucky, Southern States (Edwards);
 Illinois (Worthington).
 Five examples in 1877; three in 1878.

LYCÆNINÆ.

38. **Lycæna Alce**, Edwards. Trans. Amer. Ent. Soc. iii, 1871, p. 272.
 Hab.—Kansas, Colorado, Arizona, Texas (Edwards).
 One example in 1878.
39. **Lycæna Gyas**, Edwards. Trans. Amer. Ent. Soc. iii, 1871, p. 210.
 Hab.—Arizona, Texas.
 One example each in 1877 and in 1878.
40. **Lycæna Exilis**, Boisduval. Ann. Soc. Ent. France, ii, 10, p. 294.
 Hab.—Utah, California, Arizona, Texas.
 One example in 1878.

HESPERIDÆ.

41. **Copæodes Procris** var. **Waco**, Edwards. Trans. Amer. Ent. Soc. ii, 1868, p. 122.
 Hab.—Texas.
 One example in 1877.
42. **Pamphila Huron**, Edwards. Proc. Ent. Soc. Phil. ii, 1863, p. 16, pl. 1, figs. 1, 2.
 Hab.—New York to Texas; Illinois (Worthington); Kansas, abundant (Snow); Arizona, California.
 One ♀ example in 1877.

43. **Pamphila Phylæus** (Drury).
 Hab.—New York; Middle and Gulf States (Edwards); Kansas rare (Snow); Illinois (Worthington).
 Two examples in 1878.
44. **Pamphila Brettus**, Boisd.-Lec.
 Hab.—West Virginia and Gulf States (Edwards); Southern New England, rare (Scudder).
 Four ♂ examples in 1877.
45. **Pamphila Otho** (Sm.-Abb.).
 Hab.—(var. *Egeremet*) Canada, New York, Atlantic States; rare in New England (Scudder); (*Otho* form) Florida, Mississippi Valley (Edwards); Texas.
 One ♀ example in 1877.
46. **Amblyscirtes Eos**, Edwards. Trans. Amer. Ent. Soc. iii, 1871, p. 276.
 Hab.—Georgia, Texas.
 One example in 1877.
47. **Pyrgus Tessellata** (Scudder).
 Hab.—Pennsylvania to Gulf of Mexico, Atlantic to Pacific, Arizona, Texas (Edwards); common in Kansas (Snow).
 Eleven examples in 1877; five in 1878.
48. **Nisoniades Funeralis**, Scudd.-Burg.
 Hab.—This is believed to be the species of which the genitalia are described and figured by Messrs. Scudder and Burgess (*Proc. Bost. Soc. Nat. Hist.* xiii, 1870, p. 293) and credited to Texas. A number of fine examples of it have been received from Mr. Heiligbrodt, of Bastrop, Texas, from a pair of which the description of the butterfly given in my Entomological Contributions No. iv, p. 61, was drawn. I have also seen examples in the collection of Mr. W. H. Edwards, collected in San Diego, Cal. It should be found in New Mexico and Arizona.
 One example each in 1877 and in 1878.
49. **Systasea Zampa** (Edwards).
Hesperia Zampa, Edw., Trans. Amer. Ent. Soc. v, 1876, p. 207.
Lintneria Zampa, Edw., Catalog. Lepidop. Amer. 1877, p. 57.
Systasea Zampa, Butler, Canad. Entomol. ix, 1877, p. 120.
 Hab.—Described by Mr. W. H. Edwards from a single specimen taken at South Apache, Arizona, in 1874. It is a very rare species in our collections, it being but the second one that I have seen. It is a tropical form, rarely extending into the United States, its present congeners of six species (formerly grouped with *Thanaos*) occurring, according to Butler, in Natal, India, Ceylon, Angola, Abyssinia and St. Domingo.
 One example in coll. of 1878.

50. **Pholisora Hayhurstii** (Edwards).
 Hab.—West Virginia to Kansas, Texas, New Mexico (Edwards).
 Two examples in coll. of 1878.
51. **Pholisora Catullus** (Cramer).
 Hab.—Atlantic, Southern and Western States, into Kansas, Utah,
 Colorado, New Mexico and Texas. It has, within a few years,
 appeared in the vicinity of Albany, N. Y.
 One example in 1877.
52. **Achlyodes Thraso**, Hübner.
 Hab.—Texas.
 One example in 1877; two in 1878.

HETEROCERA.

SPHINGIDÆ.

1. **Deilephila Lineata** (Fabr.).
 Hab.—Atlantic, Western, Central and Tropical Insular Districts
 (Gr.-Rob.).
 Two examples in 1877.
2. **Philampelus Linnei**, Grote and Robinson. Proc. Ent. Soc.
 Phil. v, 1865, pp. 157, 179, 182, pl. 3, fig. 3.
 Hab.—Atlantic and Tropical Insular Districts (Gr.-Rob.).
 One example, attracted to light, May 12, 1878, in Mr. Bourbois'
 house.
 This species had long been confounded with *Sphinx vitis*, Linn., by
 many authors, previous to its separation therefrom by Messrs. Grote
 and Robinson, as above cited.
3. **Sphinx Quinquemaculata**, Haworth.
 Hab.—Throughout the United States.
 One example in coll. of 1878.
4. **Sphinx Insolita**, n. sp.
 Head, prothorax, thorax and tegulæ gray, as in *Sphinx Plebeia*; pro-
 thorax crossed by two black lines, nearly continued on the black bor-
 dering of the tegulæ, which also bear an indistinct black median streak.
 Abdomen dark gray above, with a narrow black dorsal line which is
 not so broad as in *S. Eremitus*; beneath paler, with a black mark
 mesially on each segment, broader on the anterior portion, forming an
 elongated triangular spot acute posteriorly; laterally, a broad black
 band bearing five transversely elongated patches (bands) of clear white
 scales extending over nearly half of each of the segments on its anterior
 half.

Primaries narrow, acute, slightly rounded costo-apically; hind margin nearly straight; inner margin but slightly excavated. General color near to *S. Cinerea*; crossed by three brown bands, of which the inner one arises at or near (not fully defined in the specimen) some internobasilar lines and black basilar patch, and runs obliquely toward the cell, in which it is apparently sharply deflected toward the centre; the following two bands run from the internal margin at its middle; the median one runs with an inward curve to opposite the cell, whence it is directed toward the costa at its outer third at nearly a right angle to the costa; the outer and narrower band is angulated on the submedian fold, and thence approaching the outer margin to opposite the cell (its course beyond not traceable in the specimen); following the band is a narrow black line parallel to it, which is outwardly bordered with a whitish shade; cilia white, marked with black opposite the nervules.

The veins and the submedian fold have apparently been clothed with black scales; cells 3-8 bear distinct black streaks, the last two of which form a nearly direct line, disconnected only by vein 7. There is an indication of a small white discal spot.

Secondaries narrow, acute, with a broad black border widening toward the costa; a nearly straight central black band, separated from the preceding by a narrower gray band, and by a still narrower one from the black basilar space; cilia absent. Beneath, a median band, which is the continuation of a similar one on the primaries.

Expanse of wings 2.6 inches, or about that of *S. Hylæus*; length of abdomen 1.2 inches.

One ♂ example in coll. of 1878.

ÆGERIDÆ.

5. **Ctenucha Venosa** (Walker).

Hab.—Texas, Mexico, Honduras.

Two examples in coll. of 1877.

6. **Alypia Octomaculata** (Fabr.).

Hab.—Maine, rare (Mrs. Fernald); Northern States, California.

One example in coll. of 1878.

BOMBYCIDÆ.

7. **Ameria Unicolor**, Robinson.

Hab.—Texas.

One example in coll. of 1877.

8. **Apatalodes Angelica** (Grote). Proc. Ent. Soc. Phil. iii, 1864, p. 322, pl. 4, fig. 1.

Hab.—Massachusetts (Packard), Middle States (Grote).

One ♀ example in coll. of 1878.

9. *Ecpantheria Sennettii*, n. sp.

Female: wings white with brown markings, of which four suboval ones rest on the costa—the first three being white interiorly; four oval yellow-brown rings behind the internal vein; two double rows of four each in the median interspace, preceded by a large basilar spot; three in the following space—cell 3, and two each in cells 4 to 7; hind wings with a few dusky spots upon their outer margin.

Head: lower portion of front white, with two confluent brown spots above it below the antennal bases; collar with two broadly oval rings in yellow-brown; thorax white, superiorly with two markings in somewhat of an hour-glass form, not four as usually in *Scribonia*; posteriorly with two round rings; shoulder-covers each with a marking like the sole of a shoe—all of these in a yellow-brown.

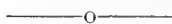
Abdomen orange above, brown beneath, with a black lateral band, two subdorsal rows of subtriangular white spots anteriorly bordered with black, resting on the posterior margin of the segment and nearly reaching to the anterior; segments fringed with white scales behind these spots and intermediate to them. The long hairs at the basal segment are white laterally and pale brown centrally. Legs white; anterior pair with femora brown on their anterior lower half, tibiae lined with brown interiorly, with a purplish reflection, broadly widening toward the tarsi (broken from the specimen); middle pair with a brown triangular spot on the lower part of the tibia, tarsi brown; hind pair with the upper part of each tarsus above marked with brown.

Expanse of wings 2.20 inches.

One example in coll. of 1878.

Named in recognition of the scientific labors of Mr. Geo. B. Sennett.

Although with but a single specimen, and that in poor condition, I do not hesitate to separate it from any species known to me, in consideration of the yellow-brown markings of the wings and thorax, and the yellow abdomen without the dorsal blue-black spots so conspicuous in *Scribonia*.



THE CATALOGUE OF DIURNAL LEPIDOPTERA by Wm. H. Edwards, of Coalburgh, W. Va., is now ready for distribution. It is in many ways a superior work to the same author's Catalogue of 1877. Those wishing to procure the work (no Lepidopterist can afford to do without it) will do well to send their orders *at once* to Mr. E. T. Cresson, Box 1577, Philadelphia, Pa. Comparatively few separates have been printed; when they are sold the Catalogue can only be obtained by purchasing the entire volume of the Transactions.

PREPARATORY STAGES OF DRASTERIA ERICHTEA, Cramer.

By G. H. FRENCH, Carbondale, Ill.

EGG.—Diameter .035 inch; globular, only slightly flattened on the base; longitudinally striated, the ridges shallow, some long and some short, about 15 reaching the apex; the apex rather coarsely but shallowly punctured; color green. Deposited singly and in clusters on the stem and leaves of clover. Duration of this period five days.

YOUNG LARVA.—Length .15 inch, very slender, head about one-fourth larger than body, legs twelve, looping like a *Catocala* larva when walking. Color of head and first and last joints of the body pale reddish, the rest of body green with brown piliferous spots. Duration of this period three days.

After first Moulting: length .30 inch; color green with three reddish brown stripes on each side, the centre of the back clear green. Head, and joints 2 and 13 nankeen color, the red stripes extending over all but the head. Piliferous spots inconspicuous, the hairs gray. Duration of this period three days.

After second Moulting: length .40 inch; color an alternate arrangement of pale green or yellowish green stripes and single or double reddish brown stripes. Dorsal, sub-dorsal, and sub-stigmatal yellowish green, the first and last a little the widest; the stripe in the dorsal space or outside the dorsal line, and the stigmatal double, or with a more or less continuous central field of the green a little brown tinted; below the sub-stigmatal there are five reddish brown lines, the first and second on each side more or less double; the upper stripes are continued on to the head, jaws brown, thoracic feet brownish, the abdominal striped parallel to the body. Duration of this period three days.

After third Moulting: length .65 inch; colors as before; a series of stripes. Dorsal stripe composed of a central brownish gray line bordered each side by a pale yellow one; next to this a stripe with the same centre but a brownish purple line each side; outside this the sub-dorsal pale yellowish line; below this a stripe like the dorsal, then a pale yellow line below which is a stripe composed of a brownish gray centre with a brownish purple line each side; below this a broader yellow sub-stigmatal line, darker yellow than the sub-dorsal; below the sub-stigmatal are nine brownish purple lines alternating with yellow ones, the central line the broadest. Duration of this period six days.

After fourth Moulting: length .95 inch; striped as before in regard to position and number but differing a little in color. Dorsal caraneous with a gray centre with yellow border; outside this a purplish brown

stripe with two gray lines; next five yellow lines alternating with four others, the two outer carneous, the other two purplish red, the upper yellow line the sub-dorsal; below these a stigmatal purplish brown stripe with the centre a little pale, sub-stigmatal stripe carneous with a narrow yellow line above. The center of the venter is a dark brown stripe having on each side two dull reddish stripes and two dull purplish brown stripes, a little pale in the centre; as before the upper stripes pass over the head, the yellow being a little paler on the head and on joint 2; prolegs striped with the color of the body as before.

MATURE LARVA.—Cylindrical; length 1.50 inches; width of head .10 inch, of middle of body .12 inch. The general color much the same as at the first of the period; in some the dark color is faint and the light color of an orange cast, this predominating so as to give the larva that color as a general color; in others both the light and the dark have a gray shade, in others again the dark stripes are bright and distinct and the light color orange. In all of them the lens shows the stripes divisible into narrow lines. Legs twelve, with no rudiments of any more. Duration of this period from seven to thirteen days.

CHRYsalis.—Length .70 inch, length of wing cases .45 inch, these reaching to the posterior part of joint 5 of the abdomen; leg and antennæ cases the same. Form cylindrical, tapering from abdominal joint 5 back. Depth of thorax .20 inch, joint 1 the same; of joints 2 to 4 .22 inch. Anterior part rounded from the head back both dorsally and laterally. Head and thoracic parts a little roughened but not punctured; the abdominal joints punctured on the anterior two-thirds; the last joint striated dorsally and tipped with 8 hooked bristles borne on a tubercle; the joint, aside from the cremaster, rather blunt. Color rather pale brown, more or less glaucous, a little darker brown dorsally, the dorsum of the anal joint, humerus and stigmata dark brown. Duration of this period from fourteen to thirty-three days.

As is well known this species feeds on clover. When about to pupate it fastens several leaves together, lines the puparium thus formed with a thin coating of silk, and then changes to a chrysalis, fastening the cremaster hooks into the silky lining.

The data given above would give this species from 41 to 66 days from the egg to the imago, the majority going from 48 to 53 days, or a little over a month and a half. This would, allowing a few days after the appearance of the imago for maturity of the eggs, give us at least three broods in a season, and the difference of time in the pupa state would account for their being seen all through the season. How they pass the winter is not determined by these observations, but as they are quite variable in the spring it may be inferred they hibernate as chrysalids. These observations were made in 1882, the eggs being deposited August 13th and the last moth emerging from the chrysalis October 18th.

NOTES AND QUERIES.

EUGENE M. AARON, Editor of PAPHIO,

Dear Sir:—On my return to the city a few days since, I received No. 5 of the 4th vol. of PAPHIO which you were so kind in sending to my address.

On page 103, I am pleased to see a notice of my early efforts to make known some things about the LEPIDOPTERA of North America, which had I received sufficient patronage I intended to extend to the adjacent South; and made collections and a few drawings with that view supposing that the splendor of the Southern species would meet the public taste; but was disappointed. This occurred more than half a century since.

The question about priority in nomenclature is comparatively of modern invention. What constitutes publication it seems is still in doubt.

The doubted plates were printed and colored, were distributed amongst scientific friends, some colored and others uncolored were deposited in Scientific Libraries. I gave a set to Mr. Doubleday of the British Museum personally on his visit to this country about the year 1836,—probably this is the same now noticed, the descriptions are still in MS.

I made a rich collection on the Magdalena River, S. A., in 1830-31, of new and beautiful species, but considering it essential that *new* species particularly should have colored illustrations I have deferred publication, preferring to lose a name, for my pets, rather than give imperfect work to the public by multiplying synonyms and disgusting students of Nature.

The work alluded to in PAPHIO by Mr. W. F. Kirby, has been continued from 1833 down to the present day, and has been illustrated by 109 finished drawings, with material on hand for 30 more unfinished drawings, of diurnal species alone; of the *Noctua*, I have raised great numbers illustrating the history of each species separately; of *Sphingidæ* I have complete illustrations of twenty species in various transformations with their food, etc. This is not the labor of a day, but that of a life, without hope of publication of a book, or books; from publishers I receive no encouragement; but it is a "labor of love," and don't furnish much nourishment for the body.

I thank you for the notice in the publication of Mr. Kirby's paper.

ACAD. NAT. SCI. PHILADELPHIA, Oct. 1, 1884.

Respectfully, T. R. PEALE.

PAMPHILA BARACOA, LUC., IN FLORIDA.—One of the most interesting captures made in Central Florida this year by Mr. H. K. Morrison, was a fine series of *Pamphila Baracoa*. This little Hesperid, closely allied to *P. Cernes*, has always been common in collections from the West Indies, but has never, so far as I can ascertain, been credited to our fauna. That it should be taken in quantities is remarkable, unless, indeed, it has heretofore been mistaken for either *Cernes* or *Manataaqua*. It is rather more deeply colored; the costal dash is a deeper orange; the markings are usually more pronounced; and the band of spots on the secondaries, beneath, is generally very prominent, though at times almost obsolete. I am inclined, after a hasty examination, to place it with *Manataaqua* as a co-form of *Cernes*. A careful study of a large series of all three forms (which I fortunately possess) will probably justify that conclusion. I should be glad to receive from students of the DIURNAL LEPIDOPTERA any information in their possession relative to the geographical distribution of *Baracoa*.

E. M. AARON.

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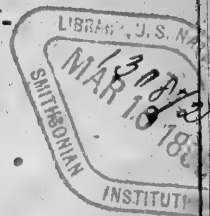
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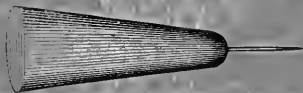
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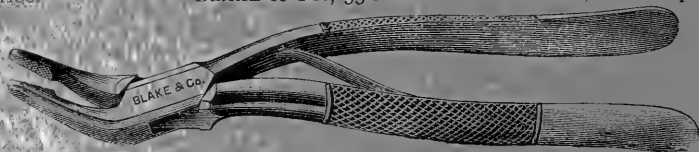
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Philadelphia, November, 1884.

{ VOL. 4.
Nos. 9, 10.

THE TYPES OF TINEINA IN THE COLLECTION OF THE MUSEUM IN CAMBRIDGE, MASS.

BY DR. H. A. HAGEN.

No. II.*

(Not Chambers signifies that the species is not present among Chambers' types.)

LITHOCOLLETIS, Zell.

- aceriella*, Clem. 2 Ky. (a good spec.)
ænigmatella, Frey. (Chb.) 3 Cambridge, Mass.
æriferella, Chb. 2 Ky. (bad condition; new to me.)
albanotella, Chb. 1 Middle States (bad condition.)
alternatella, Zell. 1 Texas. (not Chambers.)
ambrosiæella, Chb. 2 Ky.
amorphæella, Chb. 1 Col. (bad condition.)
amphicarpæella, Chb. 5 Col. (probably a good species, but the specimens are not sufficient to separate the related species.)
argentifimbriella, Chb. 1 Ky. (very bad condition; perhaps? *longestriata*, Frey.)
argentinatella, Clem.-Chb. 7 Ky. Frey. 8 Cambridge, Mass.
atomariella, Zell. 2 Texas. (perhaps *hamadryella* Clem., but this is still doubtful.)
The same spec. 4 Cambridge in underside mine of *Populus tremuloides*; 4 Cambridge underside mine of *Pop. grandidentata*; 3 Cambridge on *Salix*; all coll. by J. Boll and determined by H. Frey; he adds, "not" *atomariella*, Chambers.
auronitens, Frey. Cambridge. (not Chambers.)
australisella, Chb. 1 Texas. (not recognizable.)
basistrigella, Clem.-Chb. 4 Ky. (new to me.)
Bethunella, Chb. 3 Ky. (scarcely recognizable.)
bifasciella, Chb. 1 Ky. (a beautiful spec, entirely different from all European ones.)
caryæalbella, Chb. 1 Ky. (unfit for determination.)

* See pages 96-98 of this volume for an explanation of the abbreviations used, and a statement of the condition of these collections.—*Editor*.

- caryæfoliella*, Clem.-Chb. 4 Ky.
castaneæella, Chb. 1 Ky. (new to me.)
celtisella, Chb. 15 Ky. (new to me.)
Cincinnatiella, Chb. 14 Ky. (new to me.)
Clemensiella, Chb. 9 Ky. (unfit for determination.)
conglomeratella, Zell. 4 Texas. (not Chambers; wanting among his spec.)
consimilella, Frey. 1 Cambridge. (not Chambers.)
coryliella, Chb. 1 Ky. (unfit for determination.) var. *ostryæella*, Chb.
corylisella, Chb. 1 Ky. (unfit for determination.) from the hazel, Chb.
cratægella, Clem.-Chb. 7 Ky. from quince and wild cherry (new to me.)
deceptisella, Chb. 1 Ky. (not recognizable.)
Fitchella, Clem.-Chb. 2 Ky. Zell. 2 Texas (is *quercetorum*, Frey; Clemens' name to be retained.)
fuscocostella, Chb. 3 Ky. (new to me.)
gemnea, Frey. 2 Cambridge. (not Chambers; the specimens are of very light color.)
guttifinitella, Chb. 8 Ky. (new to me.)
Hagenii, Frey. 4 Cambridge. (is *uccopinusella*, Chambers.)
hamadryadella, Clem.-Chb. 6 Ky. (a good spec. new to me.)
helianthivorella, Chb. 1 Ky. (unfit for determination.)
intermedia, Frey. 4 Cambridge. (not Chambers.)
longestriata, Frey 1 Cambridge. (not Chambers.)
lucetiella, Clem.-Chb. 2 Ky. (not recognizable.)
lucidicostella, Clem.-Chb. 5 Ky. (a good spec. new to me.)
necopinusella, Chb. 1 Ky. (is *Hagenii*, Frey.)
obscuricostella, Clem.-Chb. 1 Ky. (not recognizable.)
ornatella, Chb. 6 Ky.; 5 Cambridge. (Frey's spec. is the same, as far as Chambers' specimens allow to judge.)
ostryæfoliella, Clem.-Chb. 2 Ky. (not recognizable.)
populiella, Chb. 1 Ky. (not recognizable.)
quercella, Chb. 1 Col. (new to me.)
(quercetorum, Chb. 1 Mo. is *Fitchella*, Clem.)
quercivorella, Chb. 1 Ky.
quinquenotella, Chb. 2 Texas. (new to me.)
Rileyella, Chb. 1 Mo. (a good specimen; new to me.)
Robiniella, Clem.-Chb. 3 Ky.; Frey. 9 Cambridge. (right.)
salicifoliella, Clem.-Chb. 7 Ky. (Chambers' species is new to me, and therefore has not been described by me; it is very different from *Scudderella*, though I had agreed formerly with Chambers about the identity, as I see now erroneously; *salicifoliella*, is a most beautiful species; the American fauna is apparently very rich for *Lithocolletis*.)
Scudderella, Frey. 6 Cambridge. (not Chambers.)
Solidaginisella, Chb. 1 Ky. (not recognizable.)
Tilicella, Chb. 4 Ky. (a good spec. new to me.)
Texanella, Zell. 2 Texas.
Tritæniella, Chb. 4 Ky. (not recognizable.)
Tubiferella, Chb. 2 Ky. (a good specimen.)
Ulmella, Chb. 12 Ky. (a good spec. very nearly related to *intermedia*, Frey.)
unifasciella, Chb. 1 Ky. (new to me.)

Of the *Lithocolletidæ* recorded in Chambers' Index, 58 are in the collection; there are wanting 10 types of Chambers' species, 5 of Frey's

and 3 of Packard's. Prof. Frey says: "this about the most important part of the collection. Chambers did not know the larger part of my species."

ELACHISTIDÆ.

TISCHERIA.

- ænca*, Frey. 4 Cambridge; Chb. 2 Ky.
badiella, Chb. 4 Ky. (new to me.)
Clemensella, Chb. 1 Ky. (unfit for determination.) This species inadvertently omitted in the Index.
concolor, Zell. 1 Texas.
fuscomarginella, Chb. 1 Ky. (new to me.)
heliopsisella, Chb. 2 Ky. (new to me; if at all belonging to *Tischeria*.)
latipennella, Chb. 1 Texas. (unfit for determination.)
malifoliella, Clem.-Chb. 3 Ky.; Frey. 18 Cambridge.
pulvella, Chb. 1 Texas. (new to me.)
pruinosa, Chb. 1 Texas. (unfit for determination.)
quercitella, Clem.-Zeller. 2 Texas, Frey. 3 Cambridge.
quercivorella, Chb. 5 Ky. (new to me.)
roseticola, Frey. Cambridge.
tinctoriella, Chb. 2 Ky.
Zelleriella, Clem.-Chb. 4 Ky.

There are wanting 4 species of the Index.

ELACHISTA.

- bicristatella*, Chb. 1 Texas. (surely no *Elachista*; genus unknown to me.)
concolorella, Chb. 1 Texas. (no *Elachista*; genus unknown; unfit for determination.)
parvipulvella, Chb. 4 Texas. no *Elachista*; genus unknown.)
præmaturella, Clem.-Chb. 6 Ky. (3 spec. not recognizable; one not belonging to this species.)
spectrella, Frey mss. 1 Texas.
Staintonella, Clem.-Chb. 1 Ky. (is an *Elachista*.)
Texanella, Chb. 3 Texas. (belongs perhaps not to *Tischeria*.)

There are wanting 8 species of the Index.

ANTISPILA. (not seen by Prof. Frey.)

- ampelopsiella*, Chb. 3 Ky.
cornifoliella, Clem.-Chb. 1 Ky.
hydrangiella, Chb. 1 Ky.
isabella, Chb. 1 Ky.
viticordifoliella, Chb. 2 Ky.

All specimens in bad condition; one specimen of the Index wanting.

LAVERNA.

- (*albocapitella*, Chb. 1 Texas; is *Murtfeldtella*, of Index.)
cephalanthella, Chb. 6 Ky.
circumscriptella, Zell.-Chb. 2 Mo.; Zell. 5 Texas.
coloradoella, Chb. 1 Col. (belongs to another genus.)
definitella, Zell. 1 Texas.
erransella, Chb. 3 Ky.; formerly *Perimede erransella* of Index (unfit for determination.)
gleditschiella, Chb. 2 Ky. (belongs not to *Laverna*.)
(*griseella*, Chb. 2 Ky.; is *Murtfeldtella* of Index) (unfit for determination.)
ignobiliella, Chb. 1 Ky. (unfit for determination.)
magnatella, Zell.-Chb. 2 locality? It is different from *ænotheriella*.
miscocolorella, Chb. 8 Texas. (a good spec.)
Murtfeldtella, Chb. 6 Ky. (a good spec.)
obscurusella, Chb. 2 Texas.
ænotheræseminella, Chb. 2 Mo.
ænotherella, Chb. 3 Texas. (all 3 are different species.)
unifasciella, Chb. 1 Col.

Wanting 9 species of Index.

BEDELLIA.

- somnulentella*, Zell. 3 Ky. (the European species.)

COSMOPTERYX.

- montisella*, Chb. 1 Ky.
gemmiferella? Zeller. 1 Texas.
quadrilinella, Chb. 2 Texas.

BATRACHEDRA.

- (*Clemensella*, Chb.; after a ms. note by Chambers it is *striolata*, Zell.)
præangusta, Chb. 4 Col. (unfit for determination.) Chambers believes his *salicipomonella* to be the same species.
striolata, Zell. 9 Texas.

Æ.Æ.A.

- ostryæella*, Chb. 1 Ky.
purpuriella, Chb. 4 Ky.; formerly *Chrysopelia purpuriella*, Chambers.
quadricristatella, Chb. 1 Texas.

AETOLA.

- bella*, Chb. 1 Texas (a most wonderful species; there exists not anything alike or even related in Europe.)

ASYCHNA.

- putzella*, Chb. 4 Ky.

With the only exception of *Bedellia somnulentella* there is no European species among all here recorded.

FOOD-PLANTS OF LEPIDOPTERA.

BY WM. BEUTTENMÜLLER.

(NO. I. HYPERCHIRIA. IO.)

I offer the following paper as one of a series on the food-plants of LEPIDOPTERA, which though perhaps by no means perfect, may be relied upon as having been the result of my own personal observations, and which will, I trust, derive value in the eyes of entomologists from the care and accuracy with which those observations have been made. The imported plants mentioned in the list are all to be found in cultivation in Central Park, New York.

MALVACEÆ.

Gossypeum herbaceum. Common Cotton.

TILIACEÆ.

Tilia Americana, L. Basswood.
 “ *pubescens*, Ait. Hairy-leaved Linden.
 “ *heterophylla*, Vent. Cut-leaved Linden.
 “ *Europeæ*, L. European Linden.
 “ *alba*, Waldst and Kit. White European Lime Tree.

SAPINDACEÆ.

Acer spicatum, Lam. Mountain Maple.
 “ *saccharinum*, Wang. Sugar or Rock Maple.
 “ *dasycarpum*, Ehrhart. White or Silver Maple.
 “ *rubrum*, L. Red or Swamp Maple.
 “ *Pseudo-platanus*, L. Mock Plane Tree or Great Maple.
 “ *platanoides*, L. Platanus-like or Norway Maple.
 “ *circinatum*, Pursh. Round-leaved Maple.

LEGUMINOSÆ.

Trifolium pratense, L. Red Clover.
Melilotus alba, Lam. White Melilot.
Amorpha fruticosa, L. False Indigo.
Robinia pseudacacia, L. Common Locust or False Acacia.
 “ *viscosa*, Vent. Clammy Locust.
 “ *hispida*, L. Bristle or Rose Acacia.
Wistaria Sinensis, Dec. Chinese Wistaria.
Lespedeza hirta, Ell. Bush Clover.
 “ *capitata*, Michx. Bush Clover.

- Baptisia tinctoria, R. Br. Wild Indigo.
 Gleditschia triacanthos, L. Three-thorned or Honey Locust.

ROSACEÆ.

- Prunus virginiana, L. Choke-cherry.
 " serotina, Ehrhart. Wild Black Cherry.
 Spiræa opulifolia, L. Nine Bark.
 Rubus odoratus, L. Purple-flowering Raspberry.
 " villosus, Ait. Common Blackberry.
 Pyrus malus, Tourn. Apple.

SAXIFRAGACEÆ.

- Ribes rubrum, L. Red Currant.

CORNACEÆ.

- Cornus Florida, L. Florida Dogwood.

CAPRIFOLIACEÆ.

- Symphoricarpus racemosus, Michx. Snowberry.
 Viburnum dentatum, L. Arrow Wood.

OLEACEÆ.

- Fraxinus Americana, L. White Ash.
 " pubescens, Lam. Red Ash.
 " sambucifolia, Lam. Black or Water Ash.

LAURACEÆ.

- Sassafras officinale, Nees. Sassafras.

URTICACEÆ.

- Ulmus fulva, Mich. Slippery or Red Elm.
 " americana, L. American or Wild Elm.
 " alata, Michx. Whahoo or Winged Elm.
 " campestris, L. English or Field Elm.
 " montana, Bauh. Mountain, Scotch or Wych Elm.
 " suberosa, Monch. Cork-barked Elm.
 Humulus Lupulus, L. Common Hop.

CUPULIFERÆ.

- Quercus alba, L. White Oak.
 " obtusiloba, Michx. Post Oak.
 " macrocarpa, Michx. Bur Oak.
 " coccinea, Wang. Scarlet Oak.

- Quercus tinctoria*, Bart. Quercitron, Yellow or Black Oak.
 “ *rubra*, L. Red Oak.
 “ *palustris*, Du Roi. Swamp, Spanish or Pin Oak.
 “ *Cerris*, L. Mossy-cupped or Turkey Oak.
 “ “ *vulgaris*.
 “ “ *austriaca*, Willd.
 “ “ *dentata*, Wats.
Fagus ferruginea, Ait. American Beech.
 “ *sylvatica*, L. Wood or Common Beech.
 “ var. *purpurea*, Ait. Purple Beech.
 “ var. *Cuprea*, Lodd. Copper-colored Beech.
 “ *heterophylla*. Cut-leaved Beech.
 “ *Americana*.
Corylus Americana, Walt. Wild Hazel-nut.
 “ *rostrata*, Ait. Beaked Hazel-nut.
 “ *avellana*. European Hazel or Filbert.
Ostrya virginica, Willd. Hop Hornbeam.
Carpinus Americana, Michx. American Hornbeam.

MYRICACEÆ.

- Myrica cerifera*, L. Bayberry, Wax Myrtle.
Comptonia asplenifolia, Ait. Sweet Fern.

BETULACEÆ.

- Betula alba*, L. American White Birch.
 “ var. *populifolia*, Spact.
 “ *papyracea*, Ait. Paper or Canoe Birch.
 “ *laciniata*. Cut-leaved Birch.

SALICACEÆ.

- Salix cordata*, Muhl. Heart-leaved Willow.
 “ *lucida*, Muhl. Shining Willow.
 “ *nigra*, Marsh. Black Willow.
 “ *fragilis*, L. Brittle Willow.
 “ *alba*, L. White Willow.
 “ *Babylonica*, Tourn. Weeping Willow.
Populus tremuloides, Michx. American Aspen.
 “ *grandidentata*, Michx. Large-toothed Aspen.
 “ *angulata*, Ait. Angled Cottonwood.
 “ *balsamifera*, L. Balsam Poplar.
 “ *monilifera*, Ait. Cottonwood or Necklace Poplar.

GRAMINEÆ.

- Zea mays*. Common Corn.

ARCTIA GENEURA, Strecker.—Female.

By G. H. FRENCH, Carbondale, Ill.

I have recently received from my correspondent in Colorado a fine female specimen of this species taken at the same place where I found the male in 1874. As it is the first time I have known of a female being taken a description may be in order.

Expanse 1.65 inches. Head flesh colored between the eyes, orange tinted above, otherwise as in the male. Abdomen the same as the male, but the lateral spots much enlarged, and the anterior edge of joints between these spots flesh color instead of scarlet; the underside of abdomen black, continuous with the lateral black spots, the flesh color on the anterior edge of the joints not reaching the centre. Upper surface of primaries black, this being the prevailing color, marked with flesh color as in the male, but the lines much contracted; the basal half line represented by a dot on the costa and an upward angle on the longitudinal line; the second, third and fourth lines present, but not more than one-half as wide as in the male, the fourth becoming obsolete before reaching the hind margin; the lines forming the terminal M also narrow; costal margin black, except where flesh colored by the expanded ends of the lines; fringes black; hind margin flesh colored to the end of second line, the end of the third a little expanded, the rest of the margin black. Secondaries scarlet as in the male, with the same black markings, but these marks are heavier; edge of the wing and the fringe black; the anal spot united with the black edge, the marginal border sending two low teeth between the three large submarginal spots, the elongate costal spot in line with these three united with the narrow black costal border but not, as in the male, with the spot adjoining; the two spots within this row, one on costa and one at the end of cell, are not united as they are in the male; the median row of three spots have the same position as in the male but are a little larger.

Underside of primaries the same as above, the marks more of a nankeen than flesh color, the black a little yellow tinted, the basal third of costal vein yellow. Secondaries as above, the red a little paler, yellow tinted along costa.

Mr. Strecker in describing the male says the fringe is pale yellowish. The fringes of the specimen are distinctly black; all the other marks are the same as the male, only in degree, for which reason I doubt not this is the female of *Geneura*, notwithstanding the black fringe. I have another species of *Arctia* from Colorado in which the males have fringe nearly clear white and the female black. A male *Utethesia Bella* has the fringe white, a female blackish on the hind wings. This shows that the color of the fringes cannot be relied on as a specific character in this group.

COLLECTING ON THE GULF COAST OF SOUTHERN TEXAS.

BY S. FRANK AARON.

It is the general opinion of collectors in entomology, who have not visited our semi-tropical localities, that the farther South one goes the more rapidly he can wield his net, and fill his collecting boxes. And this is mainly true. There are, however, some exceptions to this; localities where the peculiar climate and vegetation combine to produce rather rare and interesting things, but few in numbers and short-lived at that. Such a locality is Southwestern Texas, between Laredo, 160 miles inland, on the Rio Grande, and Corpus Christi on the Gulf Coast.

Along the Rio Grande, on both the Texas and Mexican sides, is a broad belt of partly sterile land, where little if any grass grows, but instead, great quantities of the common cactus or prickly pear, *mesquite* (a kind of locust), black chaparral, some so-called ebony and yellow-berry bushes, and other scrub vegetation suited to the sandy dry soil. Over this area there is found very little insect life, and it has occurred to me that insects, especially butterflies, dread to cross it, as they would a broad expanse of water. In some places this dead-land belt continues for over a hundred miles from the river on the Texas side. Near the coast it becomes fresher and a little grassy. North of this belt the broad grass pastures begin and there is less chaparral and cactus, till they disappear entirely as one travels up the coast. During the past summer I made my headquarters at Corpus Christi and collected for the most part within a radius of fifty miles to the north and west. Corpus Christi is situated just a little north of the dead-land belt, and being on the coast is surrounded by many broad pastures, but retains much of the dead-land vegetation. Here it is that the collecting may be said to commence, but much depends on whether the seasons are wet or dry. From the middle of March (the time I commenced collecting) to the middle of May it rained a greater part of the time, generally copious showers in the morning and afternoon, with sunshine between. This, with June, was the season for the wild flowers, and we in the Northern States cannot imagine their beauty and variety. However, I would visit large patches and fields full of the most honeyed of them, but few insects could be taken at this season. I can think only of this explanation: before these rains set in there had been a long dry spell, and this had most probably interfered with the preparatory stages; in June the rains ceased, leaving for a time the flowers and blossoms, and plenty of the purest blue sky and sunshine; then came the insects, and through this month and the first two weeks in July my net was kept going vigorously. Then as no later showers had come to keep up the needed moisture, and Old Sol had shone down with all

his semi-tropical fury unabated, the blossoms dropped off, the flowers drooped and died, even some leaves of the *mesquite* turned yellow, and the grass literally dried up.

The inland radiation of heat caused a strong wind from the coast, every day from 10 A. M. till midnight, and collecting ceased by reason of the wind on the prairie and of the dried-up vegetation in the sheltered places. There was no marked change of species during the spring and summer; immediate localities had more to do with producing different things. Down the bay coast below Corpus Christi are low bluffs, twenty or thirty feet high, and in many places they have suffered washouts, causing great arroyas, or gullies, extending often several hundred yards back from the beach. These afforded absolute shelter from the strong winds, and were filled with blossoms and flowers in the early half of the season, during which they were excellent collecting grounds. One day in March, in a single one of these gullies, I took species of *Anthocharis*, *Colias*, *Terias*, *Melitæa*, *Phyciodes*, *Synchloe*, *Junonia*, *Neonympha*, *Thecla*, *Lycæna*, *Copæodes*, *Pamphila*, *Amblyscirtes*, *Spilothyrus*, *Pyrgus*, *Thanaos*, *Systasia* and *Eudamus*; about twenty species or more. Afterwards in April, and through the season, *Papilio*, *Pieris*, *Callidryas*, *Kricogonia*, *Danais*, *Agraulis*, *Euptoicta*, *Ercisia*, *Charis* and *Pholisora*.

The Nueces River has its mouth within a few miles of Corpus Christi, and by a ride of twenty-five miles in wagon we reached its heavy bottom-land, the first real woods I had seen in this part of Texas. These remind one much of Florida scenery. Along its wild bayous, under its moss-hung trees, and through its acres of palmetto, in the early part of July, I had my best collecting. A short creeping plant, bearing a small white flower, was the principal attraction for the butterflies. On this I took nearly all the genera that I found down the beach, with the exception of *Anthocharis*, *Neonympha*, *Spilothyrus*, *Systasia* and *Eudamus*, but in addition *Nathalis*, *Pyrameis*, *Libythea* and *Achlyodes* and different species of *Synchloe*, *Thecla*, *Pamphila* and *Thanaos*. Also among the timber I found *Grapta* and *Apatura*. On the prairie, during the season of little wind, I found nearly all the fore-going genera, with still different species of *Melitæa*, *Apatura* and *Pholisora*, and within the shade of the motts (small groves) that are here and there over the prairies, I found an occasional *Neonympha*. Along the salt-water inlets of the bay and on the coast-skirting islands, over a kind of flowering salt weed, I caught different species of *Pieris*, *Lycæna* and *Pamphila*, as well as *Charis* and *Agraulis*. Among the moths I took some *Noctuidæ*, *Geometridæ* and many of the smaller forms by sweeping on the prairie, and by lantern at night when it was not moonlight. The very few *Bombycidæ* that I came across were taken singly with the net, most of them on the prairie. No moths responded very well to the most vigorous sugaring.

We took one long trip in a wagon during the last half of June north, along the coast, to the Colorado River (in Texas), and over a hundred miles from Corpus Christi. Here we found broader pastures, more grass and flowers, heavier bottom-lands on the rivers, an increase of live-oak, but little cacti and no chaparral. The fauna was also in a measure changed. On the San Antonio River I found *Neonympha Sosybius* very common. The southern limit of certain species of *Catocala* appeared to be a broad strip of timber a little north of the Mission Creek, south of which I failed to find any of them, though they were moderately common there but rarely perfect. I did not take *Kricogonia Lyside* or *Fantasia* farther north than the Aransas River, and *Synchlœ Janais* was found only at Corpus Christi. *Eresia Texana* and *Punctata* were not seen north of the Guadalupe River, and were most abundant on the Nueces River.

The larger *Hesperids*, such as *Thanaos*, *Eudamus*, etc., were most plentiful north of the Guadalupe. The rapid changes in the broods of butterflies were worth noting. Some species of *Phyciodes*, *Eresia*, *Thecla*, *Lycæna*, *Pamphila*, *Pyrgus* and *Copæodes* were out all the time, and I did not know how to estimate the number of the broods; fresh specimens always being obtainable during the collecting season. There seemed to be about four broods of *Colias*, *Callidyras*, *Kricogonia*, *Apatura*, etc. Migration, if it may be so called, also claims notice. Twice I observed great numbers of *Kricogonia*, *Colias* and a few *Callidyras* flying northward over a large extent of country; in both cases on the following day I visited the same ground, but only a few stragglers of these species could be found. Where had they gone? In the early season I often noticed that the general direction in which field butterflies were flying was towards the North. In latter August and September the few field butterflies remaining flew in no particular direction. I was informed that in early winter they began to fly southward.

I had the good fortune to become acquainted with a professional hunter, Mr. John Priour, of Corpus Christi, a collector in other branches of Natural History, and with his guidance and pleasant companionship all my collecting trips were made.



DESCRIPTION OF THE PREPARATORY STAGES OF PAPILIO ZOLICAON, Boisd.

By W. H. EDWARDS.

EGG.—Spherical; smooth; color yellow-green. Duration of this stage about ten days.

YOUNG LARVA.—Length .1 inch; cylindrical, the anterior segments somewhat thickened, the back and sides tapering to 13; when at rest the dorsum is hunched, the head bent down; color black; on 7 and 8 a gray-white dorsal patch, sometimes mottled with black; this patch is irregular, but does not descend below the middle row of tubercles; some larvæ have a little mottling with white on dorsum of 11 to 13, or perhaps one or two segments only, and some have one or two white dots on 2 and 3 in line with the upper row of tubercles; the tubercles form three longitudinal rows: one sub-dorsal, one on mid-side, one infra-stigmatal; these run from 2 to 13, on 2 the tubercles of lower two rows being below the lines; the sub-dorsals are large, slender, tapering, those on 3 to 5 and 11 to 13 larger than the rest and of about equal size; from the apex of each rises a long straight black hair knobbed at extremity, and five or six shorter hairs are irregularly placed about the sides on the upper half; the next two rows are of rounded knobs; on the middle one the knobs on the anterior segments give out four hairs each, but after 3, three hairs; on 2 and 3 the hairs are turned forward, but on the remainder are erect; the knobs of lower row are smallest of all, except on 2 and 3, where they equal in size those of the middle row; the hairs as in that row, but after 3 all are turned down; on the anterior side of each knob, and a little above it, are two hairs to each segment; along base of body a tuft of hairs on each segment from 3 to 12; between the sub-dorsals are two rows of tiny points, from 3 to 12, each with one short hair, but on 11 and 12 the hairs are wanting; feet black; pro-legs greenish brown; head rounded, somewhat flattened frontally, bilobed, the vertices well rounded; color shining black; beset with many black hairs from fine points; the scent organs or tubercles from 2 are stout at base, slender, tapering to a point and bent like an ox-horn; color pale yellow. Duration of this stage four days.

After first Moulting: length .16 inch; similar shape; color black-brown; on 8 the dorsum and side are white; on 7 partly mingled with black, but sometimes 7 is white also; on the side of 11 and 12 are usually two or three small white patches, but sometimes there is but one on 10 and

11 each, none on 12; on dorsum of 3 one, two, or three similar patches, but sometimes none; the rows of tubercles as before, but all are conical, with hairs from apex and sides; the sub-dorsals on 3, 4, 5, 11, 12, orange at base; the middle row black to base; the lower row orange from apex to base; the double dorsal row of small spines as before, but those on 3, 4, 5 are larger in proportion, the rest minute; on 2 is a black chitinous collar and a compressed ridge in front; this ridge is whitish, in the middle black, and at each end is a large spine in line with the middle row; back of and between these on same segment a smaller pair (in sub-dorsal row); head rounded, bilobed, black, shining, in front face a whitish chevron; surface beset with short black hairs. Duration of this stage three days.

After second Moulting: length .3 inch, same shape; color black; the white patch on 7 and 8 as before, variable in same way; so the spots on 10, 11 and 3; the tubercles as before, the orange at base reddish; some larvæ have the middle row orange, but usually it is black; the anterior spines of the two mid-dorsal rows now conspicuous, largest on 4; the other rows either minute or on last segments almost suppressed; head shaped and colored as before, with similar mark in front face. Duration of this stage about three days.

After third Moulting: length .54 inch; same shape; color deep brown-black; the patch on 7 and 8 much broken up, and usually restricted to upper part of sides; on 7 sometimes a bar covering last ridge on dorsum; on 8 dorsum mottled black and white; on 11 and 12 each a small round spot in front of and just below the tubercle of middle row; sometimes an additional spot in line with these back of the tubercle; a small patch on 3, sometimes bisected by the medio-dorsal line, and a small spot on side of 2; over shield on 13 a white cross-bar; over feet and legs each a white patch, and a smaller one on each intervening segment; some examples have two small spots on dorsum and one on side of 6; but others have no white spots on either anterior or posterior segments, very little white on 7 and 8, and no white along base (one had white over legs on 7 and 8 only); the ridge of 2 either whitish or yellow; the sub-dorsal tubercles yolk-red at base except behind, where the color is black, but on 7 and 8 the bases are yellow; the tubercles of middle row are large on anterior segments, the rest small, and all have red at base on dorsal side only; those of lower row are minute except the anterior ones, and all are red to base; the tubercles of the dorsal rows are mere points except on 3, 4, 5, and those on 4 are twice the size of the others; head as before with whitish mark in front and a white patch on side cheek.

At 24 hours later: length .6 to .64 inch; the bases of upper two tubercles on 7 and 8 light yellow; the chevron on face yellow, though the cheek mark is white; before end of the stage the length was .7 at rest. To next moult four days.

After fourth Moulting: length .8 (all the foregoing measurements are taken at twelve hours from the beginning of the stage, the larva at rest); banded black and pale blue-green, the band in middle of each segment velvety-black, at the junctions dull lustreless black; the spots clear yellow. As the stage proceeds the green has less blue, more yellow, and this shade spreads over the white along base and under surface. In from three to four days the larvæ were fully grown.

MATURE LARVA.—Length at rest 1.5 to 1.8 inch; greatest breadth .28 inch; cylindrical, stout, somewhat thickened on 3 and 4; color green, banded with black; on the middle of each segment a broad transverse velvet-black band, generally reaching to base, variable in width and often irregular, sometimes broken on mid-side in two or three of the middle segments; the extreme ends of each segment bordered by a velvet-black line or narrow stripe; the junctions dull black; the anterior part of nearly all segments yellow-green, the posterior blue-green; the light parts of base whitish blue-green; on under side a broad ventral black band, and the segments 5, 6, 11, 12 are almost wholly black; 2 has near front a compressed square ridge, the top arcuate, the corners elevated into low rounded knobs, the top yellow, the knobs and sides orange; before this is the black ridge in front of the scent-organs which shows two yellow cross-bars on summit; 3 has two rounded ridges, between which is the black band; the front ridge yellow, the other divided by the narrow green band; on the remaining segments to 12 there is but a single broad rounded ridge to each; 13 has a broken black bar on dorsum, over the shield, and one bar on the side; over the pro-legs on 7 to 10 are two large rounded black spots to each; on 5, 6, 11, 12 one large, one small; on the sides of each pro-leg, as also on that of 13 a black spot; feet black, the ground over them black; in the first part of this stage the sub-dorsal and part of the lateral tuberculations are distinctly seen, but at maturity there is merely a slight rounded sub-dorsal elevation on either side of 3, 4, 5, and on 11 and 12; also on 3 and 4 in each of the two lower rows; on either side are three rows of yolk-red spots, the upper one running from 4 or 5 to 12, the middle row from 2 to 11, in 2 covering the knob on cross ridge; the lower row from 2 to 12; these are placed on the front of the black middle band on each segment, or if the band be broad, near the middle of it; in this last case, they are rounded; but where the band is narrow, a sinus of same color from the front leads to the spot; the spots of sub-dorsal and middle row on 3 and 4 are minute, the first named often wanting on 4 and usually on 3; surface covered with fine short black hairs; head rounded, bilobed, the vertices rounded; yellow in front, yellowish on sides; from the suture at top two black bars pass down, one on front face ending at mandibles, the other down the cheek behind the ocelli; ocelli black on a black patch.

BLACK VARIETY.—Extreme: The middle black bands on all segments so broad as to extinguish the white bands more or less completely; what remains of these bands is also broken into short bits over dorsum; a white patch on each segment along base, large over pro-legs. Examples also appear in which the black is less extended, but nearly all the larvæ observed were of the green type in last stage.

CHRYSALIS.—Length 1.2 inch; greatest breadth, across mesonotum, .48 inch; greatest depth .3 inch; cylindrical, thickest in middle segments; the surface rough, granulated and on all ridges corrugated; head-case produced, ending in two sub-triangular processes which are but little divergent, the space between them incised at a right angle, and the slopes made irregular by one small knob or tooth on each; mesonotum prominent, pointed forward, sub-pyramidal, the top blunt and rough, the edges thickened and rough; on abdomen two sub-dorsal rows of low blunt tubercles; on fourth segment a cross row of four small tubercles; on the ventral side six small black tubercles between the antennæ and tongue-cases, three on either side in longitudinal row; color light wood-brown, the ventral side of thorax darker, the wing-cases with black lines indicating the neuration of the wings; a slightly darker band than on rest of abdomen along the side from wing-case to last segment.

Or the color is green, the whole dorsal area from mesonotum down being bright yellow over a green ground, which ground shows most clearly between the rows of tubercles on last three or four segments; the tubercles all yellow, and the granulations of surface yellow, head and wing-cases one shade of green with a light brown tint; the ventral side of abdomen yellow-green; no side stripe. Duration of this stage in the only example which gave imago the same year fourteen days. The others hibernated and gave imagos in following spring.

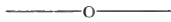
Zolicoon flies at least from Oregon to Arizona and through the Rocky Mountains, being taken occasionally from Colorado to Montana. But it is at home on the Coast. Mr. W. G. Wright, at San Bernardino, is of the opinion that it is a single-brooded species, though now and then an individual is seen as late as July, and it would therefore be of a second brood. But the larger part of the chrysalids hibernate. The flight of the butterfly is in March and April, according to Mr. Wright. I received from Mr. Wright, April 2, 1883, a number of eggs which had been laid seven days before, on carrot, by a female tied over the plant. On the 5th, these began to hatch, and by 7th all had hatched. The young larvæ look like those of *Asterias* at same stage, and behaved in same manner. I noticed one of them in its first day thrust out its scent-organs, on being touched by another larva. (All *Papilio* larvæ, however, have this power from the egg.) By 13th most had passed the second moult; on 15th some were passing the third moult. After this moult varieties were observed, some larvæ

lacking the white spots over feet and legs, and on the anterior and posterior segments; on 19th and 20th four had passed the fourth moult, and came up pale green, as did all the other larvæ of that brood; on 29th the first one fixed itself for pupation, and pupated 30th; making the whole larval period twenty-three days.

On April 14th came a lot of eggs on parsnip. All the larvæ of both lots had been fed at first on fennel; later, on parsley also. On May 3d four of last larvæ passed fourth moult, two coming up green, but two black, one of them very black, the bands almost excluding any white, the other less so, the bands not so broad. The usual green was changed to white or whitish. Part of the chrysalids were wood-brown, part green. One imago only came from chrysalis this year, a female, on May 29th, from pupa formed May 15th, and the rest hibernated, giving imagos in March, 1884. Mr. Wright was surprised at hearing of the rapidity of the stages of my larvæ, inasmuch as some retained by him from the lot received by me April 14th did not pupate till June 9th, or one month later than the last of my larvæ. Why this should be so I do not know, as the climate at San Bernardino is warmer than in Virginia in April and May.

The habits of these larvæ were in all respects like those of *Asterias*. They are sluggish at all stages, remaining long in one place, moving merely to feed.

NOTE.—While this paper was passing through the press, I received from Prof. J. J. Rivers, some notes on *Zolicaon* as it appears at his residence, Berkeley, Cal. He says: "Here at the end of April the first appearance of the butterfly takes place, and again in June come fresh examples; and from that time till the end of August fresh specimens occur frequently."



Steps are now being taken by the American Entomological Society, of Philadelphia, that will doubtless end in the endowment of a permanent Curatorship. This will place the Society in the front rank in this country and entitle it to the first consideration as a worthy beneficiary for Entomological material. As a Section of the Academy of Natural Sciences of Philadelphia the Society has the advantage of a fire-proof building, the benefit of collections and library surpassed by none in America, and, with their own and the Academy's, the most complete Library of Entomological works, as well. These advantages with the endowments left them by the late Dr. Thos. B. Wilson—which enable them to publish their Transactions, and purchase desirable publications,—will place them, so soon as the Curatorship is established, on a firm footing.

ON SOME HISTORICAL ERRORS.

BY W. H. EDWARDS.

In a paper entitled "Contributions from the Trans-Continental Survey. The genus *Colias*," Proc. Bost. Soc. Nat. Hist., vol. 22, December, 1882, it is stated as fact that six of the *Colias* females were "caught in copula;" p. 154. On next page, that "of the six couples collected in copulation, of one the male is *Philodice*, the female *Edwardsii*. Another pair show the male without, the female with, submarginal spots, and a third pair is just the reverse."

On p. 163, under *C. Christina*, we read: "I have two females from Umatilla, Or., and Yakima, W. T., entirely like the figured one" (*i. e.* the one figured in But. N. A., vol. 1). "They were collected among numerous *C. Edwardsii*, and are entirely pale yellow *without a border*. As similar ones with a *faint beginning of a border* WERE TAKEN IN COPULA with *C. Edwardsii*, there can be no doubt that the females *without border* belong also to *C. Edwardsii*. . . . It would certainly need a stronger proof to consider these males" (the males *Christina* as figured) "as a separate species, *the more so since they are associated with an undoubted female of Edwardsii*." Here are more facts, and from them important deductions are made. The author is endeavoring to argue out the species *Christina*, of which he had then never seen an individual specimen. He first asserts that among numerous *Edwardsii* taken was a female *like the one* given on the plate of *Christina* (which has no border to either wing on upper side); then he asserts that *similar* females (that is, two or more) with a faint beginning of a border were *taken in copula* with males *Edwardsii*. These are the facts. The conclusion from the facts is that the female figured as *Christina* is an undoubted female *Edwardsii*, and hence the males figured must also be *Edwardsii*. (Which last does not follow at all, even if the female figured had been an *Edwardsii*.) A species is wiped out, and all because certain *Colias* pairs were taken in copula!* These statements of fact are without qualification, and are made of the author's own knowledge as a member of the expedition.

On the other hand, the author bears hard on me because at one time or other I had allotted certain females to certain males as constituting one species, when all that was known of them was what the dried butterflies showed. He distrusts dried butterflies, and wants facts! On

* It is amusing to read in 1885 this emphatic decision as to *Christina*, inasmuch as by the large collections of Capt. Geddes and others made in '83, '84, the species has become thoroughly well known, and is as sharply characterized as any species of butterfly on the continent.

p. 152: "A careful study of his (Mr. Edwards') statements about *C. Philodice*, apparently justifies the doubt if other species, some described after a few specimens, are (to be) accepted as reliable species, the more so when the females are considered as belonging to males ONLY for the reason that they arrived in the same lot."

On p. 163: "This species (*Christina*) is described after 4 ♂ 1 ♀ taken at the Portage of the Slave River. That the female belongs to the male seems to be assumed MERELY from the fact that both arrived in the same lot."

On p. 168: "Such SPURIOUS SPECIES, based upon one or three or a few more specimens, *even without any reliable proof that the males and females belong together*, must be rejected by science, as long as their validity has not been shown in an incontestable manner by equally careful experiments as those for *Eurytheme*."

Now in view of these assertions and of this criticism it will naturally be interesting to see how a scientific professor works, and if his method be commendable, the juniors in all branches of Entomology will do well to take lesson from it.

Let us look into the history of this Trans-Continental expedition so far as concerns the Entomological Division. The author of the paper quoted from was the leader, himself a veteran Neuropterist, and was accompanied by Mr. Stretch, an experienced Lepidopterist, and Mr. Henshaw, Coleopterist. In the Report on the Butterflies of Wash. Terr., which appeared in PAPHIO, vol. 2, December, 1882, on p. 149, we are told that the collection of butterflies made by Mr. Henshaw and Mr. Stretch is large, etc. On p. 160: "WE collected at Yakima City, on milk-weed, 4 ♂ 4 ♀ of *Rutulus*." All specimens were collected from June 24th to July 26th. On p. 150: "The preparation and spreading of the butterflies has only been commenced" (when the Report, printed in December, was written).

Any one reading these reports or papers would understand from them that their author must have observed more or less the butterflies treated of as they flew, if he did not take part of them with his own hand, and must have been conversant with whatever was going on through his associates; and when he declares that certain males were taken in copulation with certain females, either saw it himself or was so informed that there could be no mistake about the matter. The personal observations of a collector in the field are of great value, especially where the question of the validity of a species arises, and when an experienced entomologist, even though not a Lepidopterist, told that on this trip six females, *Colias*, had been taken in copulation, that in one case the pair was male *Philodice* (supposed to be *Chrysomelas*, as there are no *Philodice* in that region) and female *Edwardsii*; that more than one female *Christina* was taken with males *Edwardsii*, strange as it seemed, I for one had to admit the facts, though of course not the

conclusions, for hybridizing between butterflies is not an unknown thing. But later it occurred to me to ask Mr. Stretch for the inside history of this expedition, and what part his chief had in collecting butterflies, and what he saw in the field, and what he himself knew of these facts about copulating of specified males and females. He replied, June 9, 1884, "I went to Washington Territory with Dr. Hagen. By mutual understanding with Mr. Henshaw, I devoted myself to the LEPIDOPTERA and he to the COLEOPTERA, the result being that I collected fully 95 per cent. of the Diurnals. I do not believe that Dr. Hagen personally collected five butterflies on the trip, and *I am absolutely certain knows nothing about them except seeing the dried specimens* (italicised in the letter), for he never saw them while they were being collected, or labeled at night-time, and I had them in my possession until they were delivered to him *en masse*. He was too worn out with the mere effort of moving from place to place to do anything but sleep when he got to camp. . . . *Nor does it follow that because two insects were in one paper they were in copulation when taken. They were sometimes playing together.*"

This is quite another matter! It is manifest that the author of the paper spoken of knew nothing whatever of these butterflies, alive or dead, until he opened the envelopes containing them, some months after the expedition separated. He did not see the insects in the field, he did not see them after they were taken, and he merely received from Mr. Stretch certain packages of dried butterflies. He knew, therefore, just as much about them, and no more, as I knew when I received *Christina* and *Occidentalis* from Slave Lake twenty odd years ago. But although the describing of these species of *Colias* was among the earliest work I did in that way, I correctly mated the sexes, as later observations of collectors show, not *only* and *merely* because they came in the same lot, as Dr. Hagen reiterates, but because of the correspondence in characters and markings in the two sexes of species. And all lepidopterists determine the sexes of species of butterflies thus, when the dried specimens alone are at hand. There is no other conceivable way to do so. But Dr. Hagen did not even suspect that there was some mistake in the matching of his pairs, though in five out of the six cases he says the markings were strikingly different. The last sentence quoted from Mr. Stretch shows how the Doctor came to assume that certain males and females had been taken in copulation; he found the opposite sexes in six of the papers. That was all. If he had had any acquaintance with butterflies he would have suspected there must be an error at first glance.

The outcome of all this is that the facts are baseless and the deductions are in the air.

While investigating in one direction, I thought it well to try another. On p. 158, Proc. Bost. Soc. N. H. under *C. Astræa*, we are told: "I

have submitted to Mr. H. Edwards a female of *Edwardsii*, from W. T., with similar color" (*i. e.* to *Astræa*, a species or form tinted with orange over whole upper surface, but so slightly as to be rather buff than orange), "and he decided that it was very much like *Astræa*. *Now this color was prepared purposely. When the specimen was taken, it was put in a freshly prepared cyanide bottle, which was still damp inside, so that both hind wings were thoroughly wetted.* The supposed change in the color appeared after the specimen had become dry."*

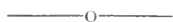
Observe the circumstantiality of this! A fresh bottle of cyanide was prepared, and a yellow butterfly *known to be Edwardsii* was taken and put in it purposely to change the color. The color was changed from yellow to buff, or pale orange. This example was sent to Mr. Edwards to pronounce upon, and he said "it was very like *Astræa*."

I asked Mr. Stretch what he knew about this "purposely prepared" likeness of *Astræa*, so submitted to Mr. Edwards. He replied that he knew nothing of it, but as Mr. Henshaw used a cyanide bottle, and he himself did not, referred me to him. Thereupon I wrote Mr. Henshaw, asking if there was not some error in the statement given by Dr. Hagen, as it reads. He replied June 25, 1884: "In answer to your letter I would say that Mr. Stretch is mistaken in saying that the details given in Dr. Hagen's paper are erroneous. Mr. S. was not present at the time. The bottle was mine, and Dr. Hagen, *on seeing the specimen with the wings wet and soiled*, said *preserve it and we will see if it changes*" (the italics mine). Mr. Henshaw first says the details as given by Dr. Hagen are correct, and then says in effect that they are not correct, inasmuch as the insect was not purposely colored, but accidentally proved to be so. On this, Mr. Stretch again remarks: "Mr. Henshaw broke his bottle and we made a new one, that I know. I did not know the rest. All the same, it was no experiment; we none of us knew positively the names of the *Colias* we were taking; no account was kept of the color of the specimens before they went into the omnivorous bottle, and consequently no one knows the extent of the change which took place. It was a pure accident, and the change of color was purely based on supposition."

It is plain from this that there is not even a certainty that a yellow *Colias* went into that "omnivorous bottle," or that any change was effected at all. All that appears is *that a buff-colored Colias came out of the bottle*. My opinion is that said butterfly came out the same color it went in. The effect of cyanide is not to change the yellow of a *Colias* to buff, but to crimson, blood-red, and no exposure would change all four wings evenly and thoroughly. It would be deeper colored in one place than another, and part would not be colored at

* Dr. Hagen's English is sometimes obscure, but by the "supposed change of color" I understand that the color which it was supposed would appear on treating this butterfly with cyanide did appear. It was a successful experiment.

all. It is not to be supposed that a cyanide bottle would be so full of liquid as to give an insect a bath. Mr. Grote sent me some years ago an example of *Philodice* colored crimson by cyanide, and which he had recently described in the Buffalo Bulletin as *C. Maria*. This was when the poison was beginning to be used in bottles and he did not suspect the artificial coloration. I had a colored figure made of that example before I returned it. The crimson is unequal over the two hind wings, deep on each in spots, but not in same way or to same extent, and streaks and patches of crimson are mixed with yellow, no pair of wings alike. That is the way cyanide stains a yellow *Colias*, as I have since observed in several instances. I am sorry to spoil a good story, nevertheless!



THE MULTIPLICATION OF SYNONYMS.—The past twenty-five years has been a period of unremitting labor on the part of the Entomologists of America. Until the beginning of that period they had been content to let their European brethren describe new species and do what little monographing work was done at that time. Since then, especially in LEPIDOPTERA, the great bulk of the new species described as from America, north of Mexico, have been described by American writers. This change has not been due to the fact that the European students were any less anxious to describe the new material, but simply to the fact that increased enthusiasm on the part of the Americans, combined with naturally better facilities for obtaining American specimens has led the latter to assume to themselves the right to give names to everything found in their territory, presumably new. I say "presumably new," for in very many cases, as all are too well aware, the newness has rested entirely on a presumption, unwarranted by the facts. Without mentioning any specific cases I may venture the remark that any student with but a few months' experience will readily call to mind many cases where nothing but the presumption that a species was undescribed has been the excuse for further burdening our already over-taxed synonymical lists. This is especially true of species collected along our southern confines. With such careful and alert students as Godman and Salvin, Oberthür, Staudinger, Mabille, Butler, and many others, always on the lookout for new material, it is an exceedingly difficult matter at the present time to determine, in the Diurnal Lepidoptera, what has been described. As it may be of interest to students of the *Rhopalocera* to know the methods used by me for the determination of specimens of this sub-order, constantly coming into my own collection, or those of the Am. Ent. Soc., or The Phil. Acad. of Nat. Sci., I will briefly describe them:

1st.—Kirby's Catalogue of described Butterflies, with supplement to May, 1877, is bound interleaved. On these interleaved pages all species described, from time to time in the publications of the world, are entered as fast as such publications come to my knowledge. This work is facilitated by the "Zoological Record;" and is made possible by the very complete libraries of the Society and Academy, into which nearly all Entomological works of permanent value find their way in time. Opposite these insertions, which now number over 900, and opposite all species previously described, references thereto, published since 1877, are carefully entered. The entries referring to North and Central America alone number considerably over two thousand.

2nd.—A carefully prepared list of all figures, colored or uncolored, in these two libraries, is arranged under generic heads.

3rd.—Tabular statements of many groups, difficult to separate specifically, are prepared as needed from time to time.

Thus after much patient toil, in which I have been greatly assisted by my brother, S. F. Aaron, I feel that I am now in a position to offer aid to all who possess undetermined species from any part of the Americas. This aid I freely offer. While not anxious to describe new species myself, I am anxious to amalgamate those already carelessly described, or to prevent, as far as possible, the further manufacture of synonyms.

E. M. AARON.

LIST OF A COLLECTION OF DIURNAL LEPIDOPTERA FROM SOUTHERN TEXAS.*

By E. M. and S. F. AARON.

This collection, made by S. F. Aaron, from March 15th to September 10th, in the Gulf region near Corpus Christi, is rich in species, some of which are scarcely known in collections, a few heretofore undescribed, and in many cases the series of intergrades have proved to be very complete. We have felt that notes thereon would prove of much interest to students of the North American fauna.

—o—

Papilio Philenor, L. Moderately common.

Papilio Asterias, Fab. Occasional.

Papilio Palamedes, Dru. Occasional on the Guadeloupe River, not seen south thereof.

Papilio Thoas, L.

var.—**CRESFONTES**, Cram. Common. The typical form *Thoas*, though occasionally found in Texas, was not taken. *Cresfontes*, the common form in the U. S., may be readily told by the macular central band on the primaries; this band is a connected bar in typical *Thoas*. Careful comparison of all illustrations of these forms, and of a series of both, assures us that they can not be separated specifically.

Pieris Monuste, L. Common.

Pieris Protodice, Bd.-Lec. Common.

Nathalis Iole, Boisd. Very common.

The variety *Irene* (which Fitch separated on account of the presence of the black band on internal edge of primaries beneath, the absence of the central dot on same surface, and the broader shade of orange towards base,) was taken in considerable numbers. With these and the typical form many intermediate grades were taken, in fact the intergrades contained by far the greater number of specimens.

Anthocharis Genutia, Fab. Common on the prairies during the first week in April.

Callidryas Eubule, L. Occasional.

These specimens from Texas, like those brought from Mt. Graham, Arizona, by Mr. Morrison, would admirably fill the position of connecting links between *Eubule* and *Sennæ* if such were needed between forms separated on inconstant characters. Mr. Butler in his *Exotic Lepidoptera* has undertaken to separate these species on what seems to us very insufficient grounds.

* See article on page 159.

To clearly illustrate this we give here a tabular statement of the two species, *in his own words*.

	SENNAE.	EUBULE
♂.	Size: Generally smaller than <i>Eubule</i> ;	
Markings, above:		Unspotted above; narrow, mealy, marginal band;
" below:	The color of under surface deeper; markings much better defined.	below same color as above; a squamose series of spots on secondaries, sometimes wanting; otherwise about as ♀.
♀.	color: Deep golden-yellow to orange or dirty white; abdominal and basal areas of secondaries pale rosy.	Sulphur-yellow.
Above, Margins, primaries:	Front wing internally dentate; well defined margin, dark brown, beginning at second third of costa and terminating at anal angle.	Orange margin; nervules terminating in black spots.
Secondaries:	With rosy margin; sub-marginal series of fine large geminate dark brown spots at terminations of nervules.	
Markings, primaries:	A large black disco-cellular spot; a sub-apical series of angulated lunules between the nervules; a point of same color [black] between median branches.	With large black disco-cellular spots; sometimes an indistinct series of discal spots towards apex.
Below, color:	Under surface paler; Costa rosy.	Golden-yellow;
Margins:	With bands and spots as above, but deep rosy;	the margins deeper colored [than above];
Markings, primaries:	a large geminate silver-centred ring-spot at end of cell; and a zig-zag series of irregular characters on disk, all rosy brown.	a large silver-centred ring-spot; and a deeply bi-sinuate series of eight red-brown spots beyond it.
Secondaries:	Two silver-centred ring-spots placed obliquely at end of cell on a brownish streak; encircled by a series of bracket-shaped characters beginning at base and continuing in the form of a heart through disk, all rosy brown.	Two silver-centred ring-spots placed obliquely upon a squamose rusty band at end of cell; encircled by a discal series of irregular reddish markings;
		several reddish spots at base.

From the foregoing table it will be clearly seen that the principal so-called points of distinction consist of describing the same characters in different terms. The color character, the most marked difference indicated above, seems to be of about the same value as it is in *Terias Nicippe*, in which specimens grading from pale lemon-yellow to deep orange are frequently found in the same brood.

Callidryas Agarithe, Boisd. Very common.

This is the species found commonly in the southern portion of the U. S. It may be separated from *Argante* (which we have never seen from the U. S.) by the continuous band on the under side of the primaries, (see Edw. Trans. Am. Ent. Soc. IX, 13.) All the females taken were of the white variety; three of them were only $1\frac{3}{4}$ inches in expanse.

Kricogonia Lyside, Godt., var. *Terissa*, Luc. (Summer form.) Very common.

var. **LANICE**, Lintn., (Winter form.) Moderately common.

The summer form (*Terissa*) may be told by the prominence of the short black band on the costal edge of the secondaries above, while it is frequently wanting, or nearly obsolete, in the winter form (*Lanice*.) Mr. Lintner's type specimen of *Lanice* (δ) which he has kindly sent us is a small specimen of the winter form of *Lyside*; we have specimens that are smaller. As the short black band on the costa of secondaries (*Terissa*) disappears, the presence of the indistinct band of intranervular dusky spots on secondaries beneath *Lanice* can be seen. The type of *Lanice* is a little darker yellow at the base of the wings than our specimens; this may have been caused by cyanide; it certainly has no specific value. We have also many females which agree with the description of *Lanice*. We regret that Mr. Lintner has described this as a new species; we retain the name to designate the winter form.

Kricogonia Fantasia, Butl. Moderately common. Taken during the summer with *Lyside*, var. *Terissa*. *Fantasia* differs from *Lyside* in the general deeper shade, approaching yellow, in the absence of the sulphur-yellow patch at base of wings, by the fuscous apex of the primaries, and by the somewhat nacre reflection of secondaries beneath.

Colias Cæsonia, Stoll. Rather common.

Colias Chrysotheme, Esper. = *Kcewaydin*, Edw. Common.

var. **EURYTHEME**, Boisd. Common.

Terias Nicippe, Cram. Occasional.

Terias Mexicana, Boisd. One specimen taken on Guadeloupe River.

Terias Lisa, Bd.-Lec. Common. ♀ var., *Alba*, Strecker, both pure white with no apparent markings beneath, and greenish white with distinct markings, also common.

Danais Archippus, Fab. Occasional.

Danais Berenice, Cram. Occasional.

var. **STRIGOSA**, Bates. Common.

This variety can be generally determined by the pruinose atoms along the veins on secondaries above, by the somewhat lighter shade of ground color towards the margins of both wings, and by the less spotted black margin of secondaries.

Agraulis Vanillæ, L. Occasional.

Euptoieta Claudia, Cram. Common.

Melitæa Elada, Hew. Common.

Ulrica, Edw.

Imitata, Strecker.

var.—**PERSE**, Edw. Occasional.

Our specimens of *Ulrica* (= *Imitata*) agree with Hewitson's description and figure of *Elada* beyond a doubt. Godman and Salvin, (Biol. Cent. Amer., Rhopal. Vol. I, p. 196, Aug. 1882) without a large series think that they may prove identical. The only difference between *Elada* and var. *Perse* is the much less diffused and smaller yellow spots, thereby revealing much more of the darker ground color. Specimens of *Perse* from Sonora, Mexico, differ from specimens of the same from Arizona by wanting the double row of fulvous spots before margin of secondaries. Specimens of *Elada* have the two rows distinct. The Sonora *Perse* is darker than the typical Arizona specimens, thereby approaching *Elada* more closely. Godman and Salvin's figures of *Imitata* agree more closely with *Perse* than the typical *Elada* from Texas, but as *Imitata* and *Ulrica* are admitted by the authors of each to be equal the synonymy should stand as above.

Melitæa Albiplaga, n. sp.—(E. M. Aaron.) 1 ♀.

Expanse 1.15 inch. Upper side black with fulvous markings. Primaries with two spots in middle of cell, one over the other, near base two small spots, two others below middle of cell and two oblique spots at end of cell. Across disk a double row of fulvous spots, those towards base oblong, the outer rounded, the two subapical ones small. Secondaries, with a double spot in middle of cell and at the end of cell; a row of small fulvous spots, larger posteriorly, crossing the wing two-thirds from the base. Fringes black with white points.

Under side: primaries mostly fulvous, with a black spot in cell from which extends an abbreviated line towards base and another to inner margin; beyond this a narrow black line across wing, bent outwardly; this line bends abruptly near costal margin and extends across the end of cell, where it again bends and growing broader, reaches the costal margin; outer half of wing with the fulvous markings of the upper side repeated, but larger and more confluent; a marginal row of fulvous lunules, the two at apex largest. Secondaries at base with a white spot on a black stripe, which is narrowly bordered on each side with white; below this a small white spot encircled with black; beyond this a fulvous band crossing wing, then a broad black space containing a

fulvous spot on costa, two fulvous spots in cell and between them a white spot, and another fulvous spot below cell; beyond this, reaching nearly to margin is a broad white space, cut by the black nervures; from end of cell to near the abdominal margin extends a wavy black line which cuts off a small portion of the white area; this white area is divided by an irregular black band extending from anal angle to two-thirds the distance to costal margin, followed by five pale fulvous spots; beyond the white area black with a marginal row of fulvous lunules.

Melitæa Dymas, Edw. 1 ♂, 1 ♀. This is Mr. Strecker's *Larunda*.

Melitæa Chara, Edw. 1 ♂.

Melitæa Bollii, Edw. Three examples. One of these, which was identified for us by Mr. W. H. Edwards as *M. Thekla*, is much paler than typical *Bollii*, though more closely related to the latter in markings. A comparison of Mr. Edwards' types, kindly loaned us, shows these two species to be very distinct in general appearance, though the difference appears to be caused entirely by the relative intensity of the markings. A large series will probably prove them to be one species.

Melitæa Definita, n. sp.—(E. M. Aaron.) Moderately common. This species belongs to the *Bollii* and *Minuta* Group (Group III, Edwards' Catalogue, 1885), but may be readily distinguished from its congeners by the two pairs of submarginal brick-colored spots on the secondaries beneath. In its markings above, and in size, it is allied to *Bollii*; beneath it resembles *Dymas*.

Expands from 1.2 to 1.5 inches.

The sexes do not differ in color or pattern. Above, black spotted and banded with deep brick-red. Primaries with two to four spots and a basal dash in the cell, occasionally the latter is nearly obsolete; beneath the cell one or two spots, the inner frequently prolonged into another basal dash; across outer half of wing a double row of oblong spots, the third and fourth, seventh and eighth confluent; a submarginal row of whitish points of which the submedian are the largest, the others sometimes nearly obsolete. Secondaries with the same pattern, the basal area varies from only two small spots in the cell to four therein with a broad dash above and two below; the double row across outer half of wing more clearly separated, the inner occasionally, on both wings, of a lighter color; the submarginal row of white points repeated, and generally more distinct. Fringes alternately white and black.

Beneath: primaries with the markings of the upper side larger and more confluent; the submarginal row of white points much larger, elongate, the median ones conical. Secondaries at extreme base with indistinct white markings surrounded by black, and a red spot on costa; a band of four white spots surrounded by black, followed by a broad irregular red band with a white spot encircled by black in cell; three parallel black wavy lines (the middle nearly obsolete in one specimen) alternating with three rows of white spots, the outer of which is com-

posed of larger spots, the third and fourth, sixth and seventh largely fulvous; a submarginal row of white lunules. Fringes as above.

Hab.—Inland from Corpus Christi.

Phyciodes Nycteis, Doubl.-Hew. North of the Guadalupe River. Moderately common.

Phyciodes Vesta, Edw. Common.

Eresia Graphica, R. Feld. Verk. k.-k. Zoöl.-bot. Ges. Wien, 1869, p. 470.

var. **BOUCARDI**, God.-Sal. Rhop. Vol. I, p. 194. Rare.

Godman and Salvin (Biol. Cent. Amer. Rhopal. I, p. 195, Aug. 1882) speak as follows of this species: "Our single Guatemalan specimen we took to Vienna some years ago, and comparing it with the type of *Graphica* found them agree, showing that this name and *Vesta* are synonymous. Which of the two names was first published cannot now readily be determined; but we use Mr. Edwards' title on account of its having become current in literature of North American butterflies."

Mr. Felder's description was read April 7, 1869; Mr. Edwards' was published September, 1869.

Godman and Salvin (p. 194), under the specific heading *Boucardi*, point out the likelihood that this supposed species may be but a variety of *Vesta*, but as their series was a small one they preferred to catalogue them as distinct. The series taken in Texas shows *Boucardi* to be a summer form of *Vesta*. Intergrades between these forms were also taken.

Phyciodes Phaon, Edw. Common.

Godman and Salvin do not mention this species as found in Mexico. It is, however, in the collection of E. M. Aaron, from Sonora, Mex., collected by Mr. H. K. Morrison.

Phyciodes Tharos, Drury. Common.

The typical form and var. *Morpheus*, var. *A.* and var. *C.* (after plate in Edws. Butt. N. Am., Vol. II.) were taken.

Phyciodes Texana, Edw. Common.

Phyciodes Tulcis, Bates. Ent. Mo. Mag., 1, 82, 1865. Nueces Bottoms. Rare.

Eresia Punctata, Edw. (1871.)

The figures of *Tulcis* by Godman and Salvin (Rhopal. I, 203, pl. 22, figs. 1 and 2) and Bates' description agree in every particular with our specimens from Texas and specimens from Yucatan (from Gaumer, in the collection of E. M. Aaron) which have been determined by Mr. Edwards as his *Punctata*. It is closely allied to *P. Ardys*, Hew.

Synchloe Janais, Drury. Common.

Synchloe Lacinia, Geyer, in Hüb. Zutr. p. 25, figs. 899, 900. Common.

Chlosyne Adjutrix, Scud.

Synchloe Mediatrix, Feld.

Synchloe Saundersii, Doubl.-Hew.

Godman and Salvin (Rhopal. I, p. 177, June, 1882) under the specific name *Lacinia*, place *Saundersii*, *Tellias* (Bates), *Quehatala* (Reak.), *Ardema* (Reak.), *Paupera* (Feld.), *Mediatrix*, *Misera* (R. Feld.), *Pretona* (Boisd.), *Crocale* (Edw.), *Adjutrix*, and *Adelina* (Staud.); all of which they consider but inconstant forms of one species. From their superb work we quote as follows: "Between these extremes *Adelina* and *Saundersii*, every gradation of color can be traced and all the rufous markings, as well as the yellow ones of the under side can be exhibited in different individuals from their maximum development till they vanish altogether. * * * In the Southern States of North America a form occurs which is very like *S. Saundersii*, and is prevalent in Texas. This is *S. Adjutrix* Scud., but we doubt the possibility of maintaining its distinction. In Arizona another form occurs, *S. Crocale* Edw., which we take to be undistinguishable from *Adelina*, and therefore connected with the whole series. * * * *S. Mediatrix* comes between *S. Lacinia* and *S. Saundersii*."

Among these Texas captures were *Saundersii*, *Adjutrix* and *Mediatrix*; the latter two were taken in copulation.

Grapta Interrogationis, Fabr.

var. **UMBROSA**, Lintn. Rare.

Pyrameis Atalanta, Linn. One specimen.

Pyrameis Huntera, Fabr. Common.

Pyrameis Cardui, Linn. Common.

Junonia Cœnia, Hüb. Common.

Apatura Celtis, Boisd.-Lec. Moderately common.

Apatura Antonia, Edw.

Apatura Leilia, Edw.

Apatura Cocles, Lintn.

Our specimens have the basal bar in cell broken as in *Celtis*, to a more or less degree (this character is evidently of no value), the ocellation oval as in *Leilia*, the centers pupiled as in *Celtis*, with three ocellations on under side of primaries and a double ocellus on anal angle of secondaries as in *Leilia*; ground color beneath in most of our specimens as in *Celtis*, while on the upper side it is more like *Leilia*; the space separating the bars in cell on primaries is lighter colored, but varies; spots on upper side of disc distinct, as in both species.

Furthermore, certain of our specimens agree with the description of *Antonia*, and were determined by Mr. Edwards as that species, while others show an absence of the very characters on which Mr. Edwards has separated *Antonia*, viz.: the pupillated spots and the presence of the anterior ocellus on primaries. The general color also varies. In short we have among our specimens a combination and gradation of the characters of all three forms, nor is there a character given in Mr. Edwards' descriptions and superb plate that is not found to be inconstant.

Apatura Cocles, Lintner, described (PAPILIO, IV, p. 141, 1884) from 1 ♀, the type of which has kindly been loaned by Mr. Lintner, is undoubtedly a ♀ of typical *Leilia*.

Apatura Clyton, Boisd.-Lec.

var. OCELLATA, Edw. Rare.

Apatura Flora, Edw. Moderately common.

Anæa Andria, Scud. Common.

Our specimens agree with Mr. Edwards' figures of *Glycerium* (But. N. Am. 1, pl. 46). This species it has been pointed out by Mr. Scudder is not *Glycerium* as figured by Doubl.-Hew., and he proposes the name *Andria* for the species common to the United States. Mr. Edwards, in his latest Catalogue, places his *Glycerium* and Scudder's *Andria* as synonyms of *Troglodyta*, Fabr.; he has also determined our specimens for us as that species. But *Troglodyta*, however, is known to be synonymous with *Astinax*, Cram., and *Astina*, Hüb.; unfortunately the description of *Troglodyta* and the figure of *Astinax* are too imperfect to be of any use, hence we have had to depend on the excellent figures of *Astina*, in Hübner's Sammlung. From these figures our specimens differ in a marked degree, and we therefore have no hesitation in adopting Mr. Scudder's name.

Mr. Scudder in his Historical sketch has pointed out the fact that the generic name *Paphia* must be abandoned to the use of the MOL-LUSCA, where it was first used.

Neonympha Gemma, Hüb. Three specimens.

Neonympha Sosybius, Fabr. Common. San Antonio River and northward.

Libythea Bachmani, Kirtl. 1 ♂.

Libythea Larvata, Strecker. Very common.

Our specimens agree thoroughly with Mr. Strecker's most excellent description. Cramer's figures are usually worthless for purposes of identification, but in this case they are sufficiently accurate to enable us to separate this species from his *Carinenta*.

Charis Cænius, Linn. Very common.

Thecla Halesus, Cram. 1 ♀. Nueces River.

Thecla Melinus, Hüb. Common.

Thecla Humuli, Harr.

A very careful examination of a large series from all parts of the United States fails to show any difference by which *Melinus* and *Humuli* can be separated even as varieties.

Thecla Blenina, Hew. Common.

Thecla Siva, Edw.

Our specimens agree with Hewitson's figures and descriptions and with specimens of *Siva* from Arizona, determined by Mr. Edwards, and also with his description. They were returned by Mr. Edwards as his *Castalis*, but the absence of the white spot at the base of secondaries beneath separates them therefrom.

Thecla Poeas, Hüb. Very common.

Thecla Clytie, Edw. 3 ♂.

Probably equals *T. Adria*, Hew., but with such limited material we cannot decide.

Thecla Leda, Edw. 1 ♀.

Lycæna Isola, Reak. Common.

Lycæna Alce, Edw.

There are no differences to be found in the description of *Isola* and *Alce*. Our specimens, of which we have a large number, entirely agree with both descriptions, and also with specimens of *Alce* from Arizona, determined by Mr. Edwards.

Lycæna Cyna, Edw. 1 ♀.

This species was described from one ♀, captured at San Antonio, by the late Mr. Boll. Until the capture of the specimen now under consideration the type has remained a unique in collections. Our specimen agrees perfectly with the very complete description.

Lycæna Antibubastus, Hüb. Common.

Lycæna Filenus, Poey.

Rusticus Adolescens Hanno, Hüb.

Lycæna Exilis, Boisd. Very common.

Ancyloxypha Numitor, Fabr. Moderately common. Collette River.

Copæodes Procris, Edw. Not common.

var. *Waco*, Edw. Common.

The variety *Waco* may readily be distinguished by the lighter colored striæ on the secondaries beneath.

Pamphila Campestris, Boisd. Very common.

Pamphila Huron, Edw.

A large series taken. These specimens compared with a very large series from New Jersey to Texas and Illinois to New Mexico confirm an opinion long held that the species described as *Huron*, by Mr. Edwards in 1863, is in every particular identical with Boisduval's *Campestris*, described in 1852.

These series, embracing perhaps 300 examples, fail to exhibit any marked difference that will warrant their separation as varieties, as is done by Mr. Strecker in his Catalogue; much less can they be separated specifically, as is still done by Mr. Edwards in his recent Catalogue. In our collections will be found specimens from San Bernardino, Cal., Waco, Texas, and Maryville, East Tennessee, examined by Mr. Edwards and labeled by him "*Campestris*, Boisd."

Pamphila Phylæus, Drury. Exceedingly common in August.

Pamphila Brettus, Boisd.-Lec.

var. *BRETTOIDES*, Edw. 1 ♂, 2 ♀.

This variety may be distinguished by its wanting the row of fuscous markings near outer margin on the under side. The female does not

differ. A male specimen from Texas, from the late Mr. Belfrage, serves as a connecting link.

Pamphila Otho, Sm.-Abb. 3 ♂. Collette River.

Pamphila Osceola, Lintn. 1 ♂.

This species is placed as a synonym of *Vestris*, Boisd., in Mr. Edwards' recent Catalogue. It is now known by a few examples from Florida, Colorado, Texas, and California.

Pamphila Panoquin, Scud. 2 ♂.

Pamphila Ethlius, Cram. 3 ♂, 1 ♀.

Pamphila Iowa, Scud. 1 ♀.

This species has long been catalogued as *P. Vitellius*, Sm.-Abb., erroneously as we believe. Smith and Abbott (Vol. 1, p. 33) speak as follows of this species: "Having no mode of determining this fly but by the description of Fabricius, nor any figure to refer to, we have thought it best to affix a mark of doubt, though the characters agree well with Mr. Abbott's drawings; but in so intricate a tribe even the best descriptions, such as those of Fabricius really are, will not always be sufficient."

Fabricius' description, in ten words, would indicate any one of a dozen of our American Hesperids; fortunately Hübner has given us an excellent figure of Fabricius' *Vitellius*, and this figure shows it to be nothing else than *Delaware*, Edwards. This being the case *Vitellius*, Sm.-Abb., should be abandoned, and *Iowa*, the name proposed by Mr. Scudder take its place.

— **Pamphila Eufala**, Edw. Not common.

Pamphila Fusca, Gr.-Rob. Common.

Pamphila Comus, Edw. Moderately common.

Pamphila Eos, Edw. 3 examples.

This and the preceding species are very closely related; at first sight, unless the specimens are in very perfect condition, they are likely to be mistaken for the same species. Though different specifically they should be placed one after the other in a Catalogue, and not separated generically, with such widely separated species as *P. Hianna* and *P. Viator* intervening, as is done by Mr. Edwards in his latest Catalogue.

Pamphila Nysa, Edw. Common.

Pyrgus Tessellata, Scud. Very common.

Though this species has been known to students from the time of Fabricius, and has doubtless been described under at least six names, there has never been an accurate figure of it published. It seems to be impossible to bring order out of the chaos created by the brief and insufficient descriptions by Fabricius and others; therefore there is no recourse but to retain the name proposed by Mr. Scudder, nearly one hundred years after Fabricius' description of *Syrictus*.

Pyrgus Locutia, Hew., Exot. But. vol. 5, pl. 2 of *Leucochitonea*, figs. 19, 20, 1875.

This species is described as follows, by Mr. Hewitson:

“Upper side white, with the apex and outer margin brown. A sub-apical spot and some minute spots near the outer margin white. Posterior wing with the outer margin and spots at the end of nervules brown.

“Under side. Anterior wing as above. Posterior wing with a large bifid spot at the base of the costal margin, a small spot at the middle of the abdominal fold, and the outer margin, which is broad, rufous-brown.

“Expands 1.5–20 inch. Island of Taboga, Panama.”

Thanaos Juvenalis, Fabr. Three specimens.

We place these specimens under this species with some hesitation. Unfortunately they are not perfect examples, nor are they in sufficient numbers to use for study in this most puzzling genus.

Thanaos Tristis, Bosid. Moderately common.

Nisoniades Funeralis, Lintn.

The characters on which Mr. Lintner separates his *Funeralis* from *Tristis*, viz.: the absence of the discal spot on the primaries, and the presence of the clear white border on the secondaries, are seen to be of no value when a series is under comparison. These specimens from Texas show that intergrades are the rule, not the exception.

Systasea Zampa, Edw. Moderately common.

Pholisora Catullus, Cram. Common.

• **Pholisora Hayhurstii**, Edw. Moderately common.

Spilothyrus Nessus, Edw. Moderately common.

Achlyodes Thraso, Hüb. Common.

Eudamus Pylades, Scud. 2 ♀.

• **Eudamus Bathyllus**, Sm.-Abb. 1 ♂, 2 ♀.

Eudamus Tityrus, Fabr. 1 ♂.

Eudamus Proteus, Linn. Moderately common.

Eudamus Simplicius, Stoll. 1 specimen.

Eudamus Albofasciatus, Hew. Moderately common.

Mr. Hewitson, (Desc. 100 New Hesp. p. 3) describes this species as follows:

“Upper side dark brown. Anterior wing with eight transparent spots; four forming a central band (the lowest spot very minute), one outside of these, and three in a band before the apex. Posterior wing with a very long tail.

“Under side. Anterior wing as above, except that it is gray near the apex, and marked by a triangular dark brown spot. Posterior wing dark brown, crossed obliquely by a central band of white; a submarginal band of gray.

“Expanse 2 inches.

“Habitat.—Guatemala (Poloehic Valley).”

Three or four new species of *Hesperidae* were also taken; they will be described in subsequent papers of a monographic nature.

HÜBNERIAN!

BY JOHN B. SMITH.

Hübnerian and anti-Hübnerian! These terms express the feelings of two camps into which Lepidopterists have long been divided, and most of them adhere to one or the other of these views, without having had an opportunity to fairly examine and judge. Between unqualified blame, and unqualified praise, students have been at a loss; and with a feeling of uncertainty one student writes *Agrotis*, Hb., while another writes *Agrotis*, Tr. Hübner's *Coiti* have become a bye-word, and his "genera" have been abused up hill and down dale. But does Hübner deserve such treatment?

Hübner when he started, found the LEPIDOPTERA in a decidedly mixed condition, and being of a systematic turn he began arranging matters, and did a perfectly astounding amount of work in the way of describing and figuring species, arranging them according to his own views on the subject. In the "Verzeichniss bekannter Schmetterlinge" Augsburg, 1816, there is perhaps as good an opportunity of learning what Hübner's ideas on classification were, as in all his other works combined. An abstract of some portions I give here.

Primarily he divides the LEPIDOPTERA into nine PHALANGES which he defines as follows, though in a different form :

- Antennæ obviously clavate at tip; tongue spiral; body short, wings large. I. PAPILIONES.
- Antennæ not clavate; with leaf-like appendages to the joints; mouth and tongue prolonged, the latter spiral; primaries long, narrow; secondaries short, broad; body long and thick. II. SPHINGIDES.
- Antennæ setaceous, but feathered; head small; tongue short and weak, palpi sub-obsolete; legs small; body hairy. III. PHALÆNÆ.
- Antennæ setaceous. Tongue moderate, strong; palpi projecting into a blunt snout; collar and patagæ large; thorax basally clothed with dense scaly hairs; wings fringed; legs spurred. IV. NOCTUÆ.
- Tongue moderate but soft; antennæ delicate; palpi short; body smoothly scaled; wings large; legs rather weak, but with long spurs; abdomen slender. V. GEOMETRÆ.
- Tongue moderate; eyes large; palpi long; wings large, but the primaries longer than secondaries; legs, but especially the tarsi, very long; abdomen elongate, slender. VI. PYRALIDES.
- Palpi short and broad; primaries short, narrow, obtuse; secondaries rather short; legs and abdomen short. VII. TORTRICES.
- Palpi prominent; head tufted; wings peculiar in various ways. VIII. TINEÆ.
- Wings divided; legs long; abdomen long and slender. IX. ALUCITÆ.

Compared with our later-day classifications Phalanx I equals our *Rhopalocera*. Phalanx II equals the *Sphinges* of Staudinger, including *Sesia* and *Zygæna* with their near allies. Phalanx III nearly equals the mass classed as *Bombycidae*, including however, a few now referred to the *Noctuidæ*. IV contains the larger part of what are now classed as *Noctuidæ* with an occasional Bombycid intermixed. V very nearly equals the *Geometridæ* of to-day. VI includes the Deltoids, many of the lower *Noctuidæ*, and the true *Pyralidæ*. This phalanx was to Hübner what the *Molluscæ* were to Linné; everything not otherwise referable found a place here; and this is the most mixed of all the phalanges. Not that he deserves blame for considering the Deltoids as *Pyralides*, for Guenée does the same thing, and some authors, among them Dr. Packard, still join them. VII nearly equals the present idea of the *Tortricidæ*, while phalanx VIII, despite its peculiar definition, still nearly corresponds to our *Tineidæ* or *Tineinæ*, as some prefer. Phalanx IX includes our *Petrophoridæ* and *Alucitæ*.

It will be seen from the table that Hübner used only the most superficial characters to define his principal divisions, being in that respect no better, and certainly no worse than his predecessors, and indeed to this point there is little original except the term for the divisions.

Each phalanx is divided into *Tribes*, which nearly equals the term sub-family as used to-day. The tribes are divided into *Stirpes*; these are divided into *Familie* which are finally divided into *Coiti*. Each division is defined, the definition of the most superficial description, of course.

Some excerpts from the classification of phalanx IV may serve as an illustration.

This phalanx is divided into three tribes as follows:

Body, head, abdomen and legs coarsely clothed, wings gray, primaries with scarcely distinct orbicular, reniform and wavy transverse lines.

I. BOMBYCOIDES.

Collar and pategiæ evident; primaries very variously colored and marked, secondaries uniform, generally pale 2. GENUINÆ.

Palpi ascending and pointed; both wings ample, very variously colored and marked 3. SEMIGEOMETRÆ.

Despite the curious definitions the essential meaning or intent is sound, for the Noctuids divide into just such groups—Deltoids of course excluded.

The *Bombycoides* embrace but a very small number of species and are divided into three stirpes.

Palpi short, black marked; primaries rather narrow, pale in color, with grayish transverse shades and lines; secondaries almost without maculation.

I. APATELÆ.

Head, thorax, wings and legs distinctly marked, and handsomely variegated.

2. DIPHTHERÆ.

Thorax humped, the vestiture tufted; primaries dentate, with a widely curved black t. p. line; else blotchy (scheckig bezeichnet) 3. JASPIDLÆ.

Hübner was thus the first to associate these forms, and so they remain to this day, all the names being in use.

The *Apatelæ* are divided into three families: A, *Miræ* with narrow primaries, very short secondaries, and long abdomen; B, *Perconformes* with somewhat broader primaries, maculate with sagittate marks; and C, *Consimiles*, with distinct ordinary spots and lines, gray.

To the *Miræ* he refers a single Coitus; *Exareta* for *Acronycta ulmi*. To the *Perconformes* he refers four Coiti, *Hyboma* for *A. strigosa* (body slender, primaries pale spotted, with darker ground); *Triena* (pale species with *psi* mark and sagittate dashes) for *tritona* and allies; *Jochæara* (with sagittate marks, rather distinct stigmata and variegated marking) for *alvi*; and *Acronicta* (white with only interrupted black marks) for *leporina* and *bradyporina*. All these species are to-day classed as either *Apatela* or *Acronycta*, though Mr. Grote not long since revived some of the coiti names to designate divisions of the genus.

The *Consimiles* contain three coiti; *Calocasia* for *Demas coryli*, and another; *Pharetra* for *auricoma* and *menyanthidis*, and *Arctomyscis* for *aceris* and allies.

This illustrates the character of Hübner's work. His idea plainly was to form assemblages of related forms, and in a very large proportion of cases he was remarkably successful.

Except for the genus *Calocasia* (*Demas* St.) the entire stirps *Apatela* is now referred to *Acronycta*. They form an assemblage somewhat variable in color and habitus, and these differences are seized on to mark families, to which he gives names expressive of some attractive or marked feature, such as *Miræ*, *Maculatæ*, *Clarocoloratæ*, *Nubilæ*, etc.

Finally come his coiti, which correspond to our genera. Rarely has he a coitus name like that of the stirps. Thus he says stirps *Apatelæ*, but nowhere does he have a coitus *Apatela*; while he has a coitus *Acronictæ*, and writes *Acronicta leporina*. The coiti rarely contain heterogeneous material, though not rarely a family corresponds to a genus of to-day. In descriptive work Hübner uses terms like the following: say for *Drasteria cuspidæa* "A noctua semigeometra and Euclidia maculata;" giving the phalanx, tribe, stirps and family as descriptive terms; *Drasteria* being the coitus. Carefully examining Hübner's works it will be found that he had for *coitus* the idea we have for *genus*. *Familia* represents a simple group of allied coiti or genera, and family terms are used over and over again. A *Stirps* represents to him an association of similar families, while a *Tribe* represents our present idea of sub-family.

The term "stirps" did not have for Hübner that meaning that the term genus has with the latter-day Entomologists, and his terms for stirpes should not be used for genera; his coiti, where used, should be

credited to him, for the names were first proposed by him, and the coiti such as they are, are as well defined as genera usually were in those days. Hübner's language was peculiar, and his classification was based on superficial characters—but he was in advance of his contemporaries in his arrangement and classification, which is fully equal if not superior to that of Entomologists of greater repute. Why, for instance, should Hübner's genera be rejected or credited to others, while Guenée's genera, in the *Tortricidæ* for instance, not sanctioned by a word of description are adopted without question and credited to him?

I do not desire to convey the impression that I advocate the adoption of Hübner's genera—not so. I believe that where an author has subsequently correctly limited and accurately defined a genus his name should be adopted and Hübner's coiti cited as synonyms. What is objectionable is, that coiti names are used in the same sense that Hübner used them and credited to others. It is allowable, where one of Hübner's stirps names is used for a genus, that it be credited to the one that first used the name in a generic sense—thus *Apatela* is a stirps name, and the genus *Apatela* is not Hübner's. *Agrotis* is used for a stirps, and *Agrotis* as a genus is properly credited to Treitschke. This leads to a consideration of the Tentamen, and this is entitled only to consideration as what it purports to be—a proposed classification. None of the divisions are defined, and only stirpes are proposed, which should never be used as genera for the reasons above stated. Verzeichniss names, where they refer to good genera ought in justice to be adopted as far as possible.

A settled nomenclature is desirable and necessary, and in the course of the work on the monograph of the American Noctuidæ at which Prof. C. V. Riley and myself are engaged, the consideration to be given to Hübner's works will be carefully discussed.

The above represents extracts and notes made, but not conclusions reached.



EDITORIAL COMMENT.

For several years the question of publishing an American magazine devoted to general Entomology has been under discussion through the medium of private correspondence among leading friends of science. This question was brought before the Entomological Club of the American Association for the Advancement of Science, at their last meeting, in Philadelphia, last September. A committee appointed to consider this matter (*Psyche*, *The Bulletin of the Brooklyn Entomological Society*, and PAPILO were represented by their editors) reported adversely; not so much on account of their disapproval of the plan, as on account of their unwillingness to commit the Club to what in their opinion could not fail to prove a failure.

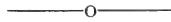
Before this meeting PAPILO, so far as its present management was concerned, was doomed. An appeal to its subscribers, two months before, not for alms, but for money justly its due, had been answered by the receipt of the money owed it by three subscribers; in other words *the princely sum of six dollars* had been added to its treasury, though much over \$150 was needed, and nearly \$200 was due.

It was, therefore, with much pleasure that the editor was informed by the representatives of the Brooklyn Society that they stood ready to publish a monthly devoted to general Entomology, provided PAPILO would discontinue, and would hand its subscription list over to the new journal. This was immediately agreed to; it was a great relief to look forward to such a speedy termination of a very unpleasant undertaking, viz. : giving alms to those who needed it not.

Since that agreement two numbers of *Entomologia Americana* have appeared. It bids fair to be a valuable addition to the list of Entomological periodicals, and we trust that the subscribers to PAPILO will do all in their power to aid it. It is not, as some suppose, a successor to PAPILO; it is simply a new periodical which will attempt to satisfy the same want that was filled by this journal. This it can hardly expect to do; it will not have the room for papers on LEPIDOPTERA alone that has been afforded by PAPILO, as it will contain but few more pages than this journal, and as *Coleoptera* and the other orders are to be placed on an equal footing with LEPIDOPTERA. In this respect it will follow its predecessor, *The Brooklyn Bulletin*; we may be pardoned, however, if we express the hope that in matters of typography and attention to the printers' art it will more closely follow PAPILO than any other model that it may have before it.

With this number PAPILO ceases to exist. Its editor, being a young man, hopes to live many years to remember with gratitude the many

expressions of appreciation and words of cheer received from his supporters; he also hopes to live to forget entirely the names of those whose indifference to their obligations has made his brief experience in scientific journalism so unpleasant. To the latter he has nought else to say; to the former he hopes occasionally to speak in the pages of *Entomologia Americana*.



CORRECTION IN DR. GRUBER'S PAPER.

In this volume, pages 83 and 115 and illustrated article (Plates 1, 2 and 3) from the pen of Dr. A. Gruber, is translated from the

Since the publication of the translation we have received an author's extra, through the kindness of Mr. W. H. Edwards, of a correction made by Dr. Gruber in the *Jena Zeitschrift*, Bd. XVIII, N. F. XI, of which the following is a translation: EDITOR.

I owe it to those who have taken an interest in my efforts, to make a slight correction in my article "On the Caterpillars of N. Am. Papilionidæ and Nymphalidæ," (a translation of which appeared in this journal). I described the caterpillar represented in Fig. 17, Pl. VII, as the Second Stage of *Papilio Ajax*, but incorrectly; it is only a larger example of the First Stage, which had been wrongly marked. Mr. W. H. Edwards, of Coalburgh, from whom I obtained the described caterpillars, kindly called my attention to this error, and sent me a few examples of the Second Stage. I am thus enabled to offer the following changes in my description: *Pap. Ajax*, Second Stage: the color is still dark; the skin appears smooth to the naked eye, but by the aid of the lens we see that the warts are still present, though much smaller, while the long forked bristles have quite disappeared and have been replaced by very short fine hairs.

The Second Stage is consequently an easy transition to the Third, in which latter the striking markings have completely supplanted the bristles; and there is, therefore, no such sudden change as I had believed to take place in passing from the Second to the Third.

A. GRUBER.

Freiburg, April, 1885.

CURATORSHIP.

Since our note of page 166 was written the American Entomological Society has established a salaried Curatorship, and has elected Mr. S. Frank Aaron to that position.

This Society is now, and is likely to continue to be, in a condition to care for all bequests and loans of books and material. Collectors can make no better disposal of their duplicate material and extra type specimens than to forward them to the Society, Nineteenth and Race Streets, Philadelphia.

As we go to press, we are pained to hear of the death of Mr. Herbert K. Morrison, of Morganton, North Carolina. None of the particulars of what must have been a sudden death have reached us.

Mr. Morrison has long been known as an energetic and painstaking collector, and a student of no mean ability in the *Heterocera*. For the past ten years he has taken extensive trips into unexplored regions; principally along either side of the Rocky Mountains, during which he has done more to advance our knowledge of geographical range, and local variation, and to unearth new species than any collector of his day.

PAPILIO, Vol. iv, Nos. 5 and 6, was published on July 22, 1884.

PAPILIO, Vol. iv, Nos. 7 and 8, was published on January 29, 1885.

PAPILIO, Vol. iv, Nos. 9 and 10, was published on July 13, 1885.

ERRATA.

- Page 11, line 7, for *impossible* read *possible*.
“ 17, “ 1, omit comma after *pinkish spots*.
“ 19, “ 23, for *osternalis* read *ostreonalis*.
“ 21, “ 2, after *wings* insert *and*.
“ 37, 4th line from bottom, the quotation mark after *other* should be omitted and placed at the end of the last line.
Page 42, line 16, for *Pseudohagia* read *Pseudohazis*.
Pages 72 and 73, for *Vulurraria* read *Vulneraria*.
Page 75, 5th line from bottom, omit comma after *broadly*.
“ 82, line 9, omit comma after *Thyridopteryx*.
“ 82, “ 11, for *Vulgivellus* read *Vulgivagellus*.
“ 105, “ 7, for *describers* read *describer*.
“ 105, “ 10, after 100 place comma instead of period.
“ 105, “ 21, omit *the* after *capture of*.
“ 106, last line, for *our* read *one*.
“ 118, line 1, for *Arterias* read *Asterias*.
“ 122, last line, omit comma after *Reniform*.
“ 125, line 1, for *intranervular* read *intronervular*.
“ 125, “ 5, for *marginal* read *margin*.
“ 126, “ 9, (and below) for *Crotalaræ* read *Crotalariæ*.
“ 146, 4th line from bottom, for *Apatalodes* read *Apatelodes*.
“ 152, line 36, for *specimen* read *species*.
“ 153, “ 1, after *this* insert *is*.
“ 154, “ 11, the last word should read *oenotherella*.
“ 158, “ 17, for *absolete* read *obsolete*.
“ 167, “ 4, the period after *Survey* should be a colon.
“ 170, “ 24, insert) after *mine*.
“ 182, “ 15, for *Bosid.* read *Boisd.*
“ 182, 3d line from bottom, insert) after *Valley*.

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