NOTES ON A POLYMORPHIC BUTTERFLY, SYNCHLOE LACINIA, GEYER (IN HUB. ZUTR.), WITH DESCRIPTION OF ITS PREPARATORY STAGES.

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"Godman and Salvin, Rhopal. I., p. 177, 1882, under the specific name *Lacinia*, place *Saundersii* and *Tellias*, Bates; *Quehtela* and *Ardema*, Reakirt; *Paupera*, Felder; *Mediatrix* and *Misera*, R. Felder; *Pretoria*, Boisduval; *Crocale*, Edwards; *Adjutrix*, Scudder, and *Adelina*, Staudinger; all of which they consider but inconstant forms of one species. From their works we quote: 'Between these extremes, *Adelina* and *Saundersii*, every gradation of colour 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 *Saundersii*, and is prevalent in Texas. This is *Adjutrix*, Scudder, but we doubt the possibility of maintaining its distinction. In Arizona another form occurs, *Crocale*, Edw., which we take to be undistinguishable from *Adelina*, and therefore connected with the whole series.'" Quoted from E. M. Aaron, in Papilio IV., p. 177, in his paper entitled List of a Collection of Diurn. Lepid. from Southern Texas. Mr. Aaron adds: "Among these Texas captures were *Saundersii*, *Adjutrix* and *Mediatrix;* the latter two were taken in copulation."

I have not access to the works of Godman and Salvin, but Dr. Skinner informs me that they figure eleven forms of this species, and its localities extend even to Peru and Bolivia. These authors based their opinion as expressed not at all, so far as appears, from rearing the larvæ. Indeed, until recently, no one seems to have been acquainted with any of the preparatory stages, not only of *Lacinia*, but of any species of the genus *Synchloe*. In 1892, Prof. Packard sent me in a tube with alcohol an adult larva and pupa, received by him from Prof. Tyler Townsend, of Las Cruces, N. M. In 1893, by the aid of Mr. T. D. A. Cockerell, also of Las Cruces, I have been able to study all the stages from egg to pupa. He wrote 7th July: "I saw a black and white butterfly, rather like a small Limenitis (was it not Synchloe *Crocale?)* settle on two or three leaves of a sunflower." On 26th July: "Yesterday, Prof. Owen took me to his ranch, a short distance from Las Cruces, and I got there some *Crocale* larvæ, which I send herewith. I find that the young are gregarious, feeding as closely as they can stand on the upper side of a leaf of

Helianthus, which they skeletonize, instead of devouring the whole thickness, as older ones do. They remind me of the young larvæ of Vanessa *Urticæ*. The older larvæ I send are of a red variety. The larvæ are trimorphic, with forms as follows:

1. *nigra*, a black form.
2. *bicolor*, black with broad red dorsal stripe.
3. *rufa*, red form."

Again: "The Helianthus appears to be the common H. annuus. One finds several larvæ (adult) on one plant. Each has a leaf to itself, and they select the large leaves, not the young tops. They rest on the middle of the leaf, feeding by day, exposed to the sun. They must be inedible to birds, as they are very conspicuous. They gnaw holes out of the middle of the leaf. I could not see that they make any sort of web, and when alarmed they drop to the ground. At one place I found three or four, all black. One larva found on a narrow-leafed composite (not in flower) was about to pupate. It may have wandered from a sunflower, though there was none nearer than several yards. It was pupating quite exposed on the leaf."

On July 29th: "Yesterday, I found some batches of larvæ about one-half grown, still gregarious, and for the most part on the under side of the leaves. One batch was entirely of black larvæ, but another, to my surprise, contained all the variations mentioned in former letter. In the majority of cases a brood is all of one colour, but at least sometimes the three colours may all appear in one brood. I also enclose a *Crocale* butterfly which was caught and killed by a large Asilid fly (Proctacanthus Philadelphicus, Mocq.)"

Aug. 27th: "Yesterday I was in Juarey, Mexico (across the river opposite El Paso), and got a lot of insects. Among them both typical *Crocale* and the orange-shaped *Adjutrix*, as also a very pretty aberration, *rufescens*. I send all these herewith, as also what I call ab. *nigrescens*, an unusually black form of *Crocale* proper, which I bred here in Las Cruces."

There came two labelled *rufescens* and considerably unlike. One has a broad red band across both wings reaching nearly to costa of primaries, with marginal red spots on both wings; the other has the red band on hindwings one-half wider than usual and of deep colour, but there is nothing of it on forewing, nor are there marginal red spots. Both these varieties, I doubt not, have received species names. The bred *nigrescens*

has the spots that compose the white mesial band on hindwings reduced to mere streaks of white on the nervules. No doubt this has received a species name. But one of the Juarey examples is plainly *Ardema*, of Reakert: "hindwings black, with an indistinct orange-brown shade across the disk."

Mr. Cockerell wrote 9th Sept.: "On the college farm, yesterday, I found a batch of Synchloe eggs on the under side of a sunflower leaf. They are like the eggs I sent before. They are like the eggs of Melitæa, as figured by you in Butt. N. A. Synchloe seems to be practically a Melitæa in its earlier stages. I send one example of larva, black with numerous yellow-white dots, a sub-variety of the black type. I found several such."

During the season I had also received several batches of larvæ of Phyciodes *Carlota*, from Montana, and eggs of same from Colorado, and the larvæ from the *Crocale* eggs were reared at same time with the others, so that I was able to compare the two species step by step. The eggs of the two are in no way distinguishable, nor are the larvæ in the first two stages; as regards shape and armature they are alike in the succeeding stages, but differ in coloration. But the pupa of the Synchloe is not like that of *Carlota*, which is of the typical Phyciodes shape and appearance, and like *Tharos*, but is closely like the pupa of Melitæa *Baroni*, as given in Butt. N. A., Vol. III., pt. 3. The stages are described as follows:—

EGG.—Similar to Phyciodes *Tharos:* obovoid, truncated at top, rounded at bottom, the lower three-fifths, or about that, examples varying, covered with irregular shallow indentations; the upper part ribbed, about twenty-four ribs, not much elevated, not sharp, the interspaces roundly and shallowly excavated; top slightly depressed; colour when first laid pale green, later changing to green-yellow. Laid in close clusters side by side in several rows. In the cluster under view each complete row (4) contained just nine eggs, and there were shorter rows on either side of these; on the top was part of another layer, placed irregularly and more or less on their sides. These eggs were believed to have been laid 8th Sept., or on the day when found, and hatched on 15th, or after six days.

YOUNG LARVA.—Length at one day from egg, .06 inch; cylindrical, even, each segment well rounded; furnished with many tapering black hairs, or processes, of which those on segments 3 and 4 are in cross line on the middle, four on either side above the spiracular line; on 2 is a black oval chitinous paten on top of dorsum, on which are six shorter

processes in line, and another on each side just below the patch; also two others in vertical row to the front and opposite the spiracle, on segments 5 to 12 inclusive six processes, three on either side, arranged in triangle as usual in the family; on the front of 13 are six in cross line, and the triangle on either side to the rear; along base of body one similar short process over each foot, two on 5 and 6 each, and one each to the remaining segments up to 12, in addition to which is a still shorter process over base of each proleg, and on 5, 6, 11 and 12 below the other; colour green, with a brown tint; head scarcely broader than 2, obovoid, slightly bilobed, shining black-brown, with scattered short processes over the face like those of body. Duration of this stage three days.

After first moult: Length at one day, .1 inch; colour variable, some examples being light brown with a green tint, some of brown of darker shades; the spines as in Phyciodes, rather short, slender and tapering, glossy black, with short bristles about them at a small angle, and rising from shining black tubercles; head cordate, glossy black, with many curved processes on the front. Duration of this stage, three days.

After second moult: Length at one day, .14 inch; colour variable, some larvæ being wholly black, some rust yellow, some of this last have on dorsum and lower half of side, a dark brown sub-dorsal band intervening; the spines rather longer in proportion than before, otherwise similar; head as before. Duration of this stage, three to four days.

After third moult: Length at one day, .3 inch; shape and spines as before; the colour as before, but the russet more red, and on those which are wholly russet are two black cross lines to each segment, one on the rear, the other at the junctions; head as before. To next moult, about four days.

After fourth moult: Length at one day, .52 inch; variable as before, the rust colour deepened into red-fulvous. At about six days was full-grown.

MATURE LARVA.—Length, .1 to 1.2 inch. Cylindrical, even; colour very variable, some being bright red-fulvous; at the junction of the segments a stripe of glossy black, and on 4 to 10 inclusive a narrow, dull black stripe near the rear of each; under side greenish-brown, as is also the front of 2; on the middle of 2 a dorsal chitinous collar, on which are six small spines, three on either side the mid-dorsal line; a little below these another; a long spine below the spiracle; the spines on the succeeding segments arranged as in Melitæa, black, shining, not long in pro

portion to the size of the body, rising from shining black tubercles, tapering to an irregular top, and surrounded by many short black bristles set at a small angle; head cordate, black, glossy, with many tapering hairs or processes on the face. Other examples are yellow-fulvous; others have a continuous red-fulvous band on dorsum, rather wider than the tubercles of the dorsal row of spines; or this band is macular, a rectangular spot being on each segment, bearing the spine; the lower part of side is also red-fulvous, and the intervening space is dark-brown, forming a sub-dorsal band the length of the body. The red on dorsum is sometimes reduced to a small patch on each segment, on rear. Others are black throughout, except that over the upper part are specks and minute spotes of white or yellowish; others are black, but from the second lateral row of spines to basal ridge is a band of greenish-white and black, mottled, and sometimes the upper edge of this band shows a macular fulvous line. In all, the spines are black. There are at least three distinct types of larva:

1st.—All red- or yellow-fulvous.

2nd.—The dorsum and lower part of side fulvous; the subdorsal area dark-brown.

3rd.—All black, or black with a greenish band on side.

From fourth moult to pupation, about seven days.

CHRYSALIS.—Length, .45 to .52 inch ♂; .55 to .64 inch ♀. In an example of which the length was .52, the breadth both at mesonotum and abdomen was .2 inch; cylindrical, shape of Melitæa; head case short, narrow at top, and a very little incurved, the sides excavated; mesonotum rounded both ways and rising to a slight prominence on the rear, but not carinated, followed by a slight depression; abdomen conical; the wing cases somewhat elevated, bevelled down to the abdomen on the margin; colour the first day white, pink-tinted, then becoming ivory-white, specked and spotted with black, with some black bands or stripes; a stripe across the top of head case, a band from end to end on the ventral side; some spots on the head case; on mesonotum two spots in front, two on rear, one on either side (at the tubercle); in some examples these are mere points, but in others large, and form a ring around the middle of the mesonotum; on the abdomen a black crescent on the anterior side of each tubercle; on middle of wing case a bent bar, two patches at hind margin, and several dots; the tubercles correspond to the spines of the larva, and are low, conical, orange. But there is great

variation in the size of the black marks, and there is every grade to a nearly black pupa, black marked with white. No two of the melanic examples were alike. Duration of this stage, five to seven days. By the above, it will appear that the pupæ also are polymorphic, some being almost wholly white, some almost wholly black, with all sorts of intergrades.

These resulted from the pupæ reared in July and August imagos which came out between 2nd August and 19th :—

1st.—From all red larvæ.....3 orange banded, or *Adjutrix*
8 white banded, or *Crocale*

2nd.—From all black larvæ.....15 .....*Adjutrix*
3 .....*Crocale*

From pupæ of the succeeding brood of larvæ, the imagos out between 29th August and 8th September :—

1st.—All red larva.....4 .....*Crocale*

2nd.—All black larvæ.....2 .....*Crocale*
4..... .....*Adjutrix*

3rd.—Red backed larvæ.....13..... *Crocale*
3..... *Adjutrix*
1 with a very slight orange tint.
1 very red and broad band.

The last brood of larvæ of the year, out of eggs hatched Sept. 15th, hibernated after third moult early in October. As this is exactly the habit of the Phyciodes (as *Nycteis* and *Carlota)*, we may assume that the larvæ on their waking up early in spring, (Feb. or March, no doubt, at Las Cruces), would be in pupæ within two weeks thereafter, to give imagos a few days later. Probably, therefore, the butterflies are on the wing by April, and thereafter a brood will appear at least monthly. If this is so, the first larvæ received by me, in July, would have come from the third generation of butterflies of the year. This generation, from 29 pupæ, gave 18 *Adjutrix* imagos to 11 *Crocale*, or 62 per cent. *Adjutrix*, and 38 per cent. of *Crocale*. The following generation, from August larvæ, out of 28 pupæ gave 19 *Crocale* to 9 *Adjutrix* (including all red-banded), or 68 per cent. *Crocale* and 32 *Adjutrix*. The proportions in the two generations were nearly reversed, and as the season goes on there would seem to be a tendency to produce the white banded form. It will be of interest to watch the outcome of the hibernating larvæ, and I hope by Mr. Cockerell's aid next season to learn which form prevails in the two or three earliest generations.

As I am correcting the proof of this paper, I can add from a letter of Oct. 21st, from Mr. Cockerell ;—"The Synchlœ is still flying here in fair numbers. I find that in a state of nature the larvæ hibernate gregariously in the dead, curled up leaves of the sun-flower.