

The Canadian Entomologist.

VOL. XLIII.

LONDON, MARCH, 1911.

No. 3

GEOMETRID NOTES ON THE GENUS *HYDRIOMENA*, HUB.

BY L. W. SWETT, BOSTON, MASS.

As I was unable to identify material in this group, and realizing that the species were badly mixed, I decided to try to straighten them out. First, I was puzzled by the markings, I could find little constancy and every style of variation; secondly, in similarly marked species every variety of colour occurred, which made the specimens so different looking that I did not dare call them the same. Starting with the first species of *Hydriomena* in Dyar's List, namely, *Hydriomena sordidata* Fab., I was struck with the variability of coloring and markings, and realized that I must depend on something more constant than markings to separate such an unwieldy mass of specimens. The genitalia, an important character, I was unable to study much, as most of the material at my disposal was loaned, so that I could not proceed very far, but I noticed that the palpi of certain species seemed to be of approximately the same relative length, allowing for variation in size of specimens. This set me on the right path, as I found that by grouping certain species with palpi of the same length I could follow the variations in colour, and that there seemed to be a regular colour scheme in variable species, so that by knowing the colour of the type specimen I could predict the variations to a certain extent that ought to occur under the species. The colour scheme suggested itself to me from a French author's work on another group, and I found I could apply it here. *Hydriomena sordidata* Fab., or more properly *furcata* Thunberg, Diss. Ins. Suec., pt. 1, Dec. 11, 1784, has priority over *sordidata* Fab., Ent. Syst., III, pt. 2, p. 185, 1794, which my kind friend, Mr. Louis Prout, first points out in the Entomologists' Record (London). Vol. 9, p. 84-87, April, 1897. *Hydriomena sordidata* Fab. does not become a synonym, as it is a green variety of *furcata* Thunb., and should be listed so. An excellent figure of *furcata* is given, tab. 3, No. 10, and it is strange that the older authors did not recognize this. The colour scheme of *Hydriomena furcata* Thunb. is as follows, and applies to the other variable species: 1, cinereous or gray; 2, greenish; 3, reddish; 4, yellowish; 5, suffused; 6, mesial space white.

All these colours may occur with or without the dark bands, or there may be combinations. The first five colours seem to be most commonly met with, the white-banded form being the rarest. Now, according to my theory, we should find all the above variations of colour with palpi of approximately the same length, which we do find; and this enabled me first to see my way clear through the variations. Food-plants, I feel sure, play an important part in the colour variation, as does altitude; mountainous forms varying more than lowland. I should like to make the revision more complete by comparing the life-histories of the American species with those of the European, and also the genitalia, but until this can be done my work will remain rather crude, but, at any rate, a ready means of grouping them. The specimens examined were mostly loaned, so that is why I have done so little work on the genitalia, and it may be possible that the true *furcata* Thunb. is not found in North America, the variety *quinquefasciata* Pack. taking its place here. This point can be, perhaps, decided on a more complete comparison with the European form. The length of the palpi seems to be a very constant character, and I examined some six hundred specimens. It is surprising that the older authors like Packard and Guenée failed to notice this, Packard having lumped species with very long palpi, such as *glaucata* Pack., *bistriolata* Zell., with such species as *nubilofasciata* Pack. and *furcata* Thunb., in which they are short. *Hydriomena furcata* or its variations have never been taken in New England, and I should say are strictly western. Just what the boundaries are I cannot say, as the species have been so confused. I notice one difference between European and American forms of *furcata*, that is the basal band is heavier and wider in the latter than in the European form, but I would hesitate to separate them on such slight differences. Both forms have sometimes a white streak on inner margin of fore wings, but this is not always present.

Taking the species of Dyar's List, and applying my palpi and colour scheme they would arrange as follows:

I. *Hydriomena furcata* Thunberg, Diss. Ins. Suec, pt. 1, 1784.

—*sordidata* (of authors) not Fab.

Short palpi, cinereous ground colour.

The true *furcata* (like fig. 10, table 3) may not occur in North America, as I have not seen a specimen exactly like the European form, and the forms seem closer to *quinquefasciata* Pack. than *furcata*. If it is found here, the west will probably be its home, as none of the varieties

or typical form are recorded from the east. *Hyd. furcata* is more heavily speckled than *quinquefasciata* Pack., and the extradiscal line is much narrower after it leaves the costa than in *quinquefasciata*, where it is heavy and broad the entire distance. I saw a ♂ in Dr. Barnes' collection from Arrowhead Lake, B. C., July 16-18, which seems nearer to typical *furcata* than anything I have seen. It is not unlike German and Iceland specimens in my collection. There seems to be some doubt in the Rev. Geo. W. Taylor's mind whether we get the true *furcata* here, and I am inclined to agree with him, yet they run so close in markings as to be difficult to separate, and I shall leave them as listed until I can study the genitalia and compare the life-histories, which must be done to complete my work, as it is, in a way, superficial.

Var. (a) *elutata* Hüb., Schmett Eur., 224 (post 1797). This is a synonym of *furcata* Thunb. according to Mr. Prout's and my own views, and should be dropped from our lists.

Var. (a) *quinquefasciata* Pack., Proc. Boston Soc. Nat. Hist., XIII, p. 397, 1871, Monog. p. 100, 1876.

Short palpi, smoky bands, clear discal space.

This may be the North American form of *furcata* if we do not get the European here, and it is a variety at any rate. The figure in Packard's Monograph, Plate VIII, fig. 36, is excellent. There is an error in fig. 35, as this is not *furcata* nor a variety of it, but a green form of *nubilofasciata* Pack., which is in his collection and which I examined. The differences between *quinquefasciata* and *furcata* are in the former having a clear gray mesial space where the latter is irrorated, in the smoky bands of the former and form of the extradiscal or fifth band from body. Dr. Barnes has a ♂ from Arrowhead Lake, Aug. 24-31, in which the bands are bluish instead of smoky, otherwise it is like *quinquefasciata*. I have seen a similar form from Calgary, July 24. This var. *quinquefasciata* is found probably through the whole Northwest, and does not vary greatly. Mr. A. J. Croker, of Victoria, B. C., has a specimen from there, taken July 27, 1909, in which the white round spot of typical *furcata* appears in the middle of the fifth band of fore wing, near the inner margin. The general colour is smoky-gray, and resembles a variety of *speciosata* Pack., and would be hard to separate were it not for the long beak-like palpi of the latter. The ground colour varies from greenish to reddish, the specimen I have from the Rocky Mts. seems more brownish. In the European varieties of *furcata* the extradiscal line tapers to a narrow line near the inner

margin, as a general rule, whereas, in the American, it is the same width from costa to inner margin. Packard's statement that the outer margin is clear has little weight, as it is so in most forms of *furcata* Thunb., except in var. *infusata* Staudinger, where it is smoky-brown. The type, one ♀, Calif (Behrens), is in the Packard collection.

Var. (B) *viridata* Pack., Proc. Boston Soc. Nat. Hist., XVI, p. 21, 1874. Monograph, p. 101, 1876.

Short palpi, greenish.

In his original description Packard calls attention to this form as being close to *quinquefasciata*, and he is quite correct, as it is a greenish variety of *furcata* Thunb., and is almost exactly like German examples of var. *sordidata* Fab., which is the green form of the European variety. Variety *viridata* may sink later to a synonym of *sordidata* if we get the true *furcata* here. The palpi of the type are only moderate, and not long as Packard states, and the ground colour of the fore wings is greenish-yellow. The type, 1 ♀, Calif. (Behrens), is in the Packard collection and very perfect.

Var. (C) *sordidata* Fab., Ent. Syst., III, pt. 2, 185, 1794.

Short palpi, heavily irrorated, greenish.

This green form I retain in our lists until it is proved that the European one does not occur here, but if it does, then *viridata* Pack. will become a synonym of var. *sordidata*. There is very little difference between the two in the markings, but until the genitalia are studied we cannot be certain as to their standing. *Hyd. sordidata* in Europe is said to feed on the willow, but we have no records of the food-plant of *viridata* here. Mr. Fred. X. Williams, of San Francisco, sent me a specimen from there, captured May 12th, 1909, that is very close to specimens in my collection from Germany, except that the basal line is broader, as is also the extradiscal, and straighter, which may be the differentiating point between the North American and European forms. So *sordidata* becomes a variety and not a good species, on account of Thunberg's priority.

Var. (D) *resecta* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, reddish ground colour.

This is the red form of *furcata* Thunb., and corresponds to the European, red variety, *testaceata* Prout, only the markings are same as in *furcata*. This is very similar to *Hyd. reflata* Grote, only the latter is gray and has a broad black mesial band where *resecta* is reddish, and has a narrow mesial band, which also distinguishes it from the red variety of *reflata* which sometimes occurs in Arizona. This form *resecta*

is deeply suffused with red, and sometimes has the typical white spot near outer portion of fore wing, but always has narrow mesial band. I imagine this variety is not very commonly met with, as I have seen only short series and mostly from California.

Var. (E) *periclata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, suffused.

This is the smoky, suffused form of *furcata* Thunb. The type specimen is speckled with green, but probably in specimens not so perfect, the green colouring may not be so prominent. This is related to var. *infuscata* Stgr., of Europe, and holds the same position, only it lacks the smoky-brown of the Iceland specimens before me and is more like a melanic form than the European. The bands are as in typical *furcata*, only the basal is broader.

Var. (F) *albifasciata* Pack., Sixth Rep. Peab. Acad. Sci., p. 41, 1874. Previously figured Proc. Boston Soc. Nat. Hist., XVI, pl. 1, fig. 5, 1874. Monograph, p. 97, 1876.

Short palpi, greenish, white mesial space.

Mr. G. W. Taylor, of Wellington, B. C., first separated this variety from the genus *Euchoria* Hulst, and placed it correctly as a *Hydriomenid*, but stopped there (Ent. News, p. 310, July, 1907). Where to place it is the next question. It has the short palpi, so will go in the short palpi group, and remembering that *furcata* Thunb. has a white-banded form in Europe, it seems not unreasonable to suppose this is the white-banded variety of our species. I so place it according to palpi and colour scheme, and I notice Mr. L. B. Prout does the same in his article, Ent. Record (London), Vol. IX, p. 84-87, April, 1897, and was the first to so place it. I did not put it there on that account, but because of the relationship to the white-banded *fusco undata* Donovan of Europe, which it somewhat resembles, the only difference being the course of the extradiscal line of fore wing, which runs out almost to outer border at vein 4, while this does not occur in the European form. Thus, *albifasciata* Pack. becomes a variety of *furcata*, and in this I believe I am quite correct, as the white mesial space would show. This colour variety may be caused by its food-plant, as var. *fusco undata* Donovan is said to be produced by feeding on the bill-berry, but there is no record of the food-plant of *albifasciata* so far as I know. Rev. G. W. Taylor and Mr. Grosbeck both suggest that *reflata* Grote and *abacta* Hulst may be synonyms of *albifasciata* Pack., but after comparing types with specimens in my collections, there are differences which I will point out later in the revision. On page 310, July, 1907, Ent. News,

Rev. Taylor says it is not a variety of *sordidata* Fab. This is true in a measure, as *sordidata* is only a variety itself. The suffused green colour with white central band will distinguish *albifasciata* from any variety. It is closest to var. *vulnerata* of Swett, but in the latter the green is replaced by red and has more bands on the fore wing, there being a marginal band in *vulnerata*. Type, 1 ♀ from Calif., in Pack. coll. This includes all the varieties under *furcata* for the present, and the others listed in Dyar's Catalogue under *sordidata* Fab., such as *glauca*, *bistriolata*, *nubilofasciata*, are all good species and go into other groups, as I intend to show later. Next after *furcata* and its colour varieties comes a very closely allied species, *Hyd. reflata* Grote.

2. *Hydriomena reflata* Grote, CAN. ENT., XIV, 186, 1882.

Short palpi, grayish.

This species has been a stumbling block for all of us, as the types in the Brooklyn Institute of Sciences (Neumoegen coll.) were unknown for some time to specialists. Rev. G. W. Taylor (Ent. News, July, 1907, p. 310 and 311) says *albifasciata* Pack. is very close to this, which is true, but the following differences can be distinguished, as I have just returned from examining the types of both. The mesial band or second band from body is very broad and black. Mr. Grote makes special mention of this, and it is constant in all specimens I have seen so far, and the general colour is gray, where the mesial band in *albifasciata* is very narrow and the general colour is greenish with white mesial space. There is a cone-shaped projection in the extradiscal band which is not found in *albifasciata*. Dr. Barnes has a beautiful red variety of *reflata* from Arizona, male and female, but the wide black mesial band is constant as in the types. Specimens from Arizona and Victoria, B. C., both show this striking black band and cone-shaped projection, which I do not find in *albifasciata*. I place *reflata* Grote as a good species on account of these differences, and because it has a red variety with the characteristic markings. The white spot near the outer margin would tend to show that it is an allied form of *furcata*, so I place it to follow *furcata*. *Mesoleuca abucta* Hulst, described in CAN. ENT., Vol. XXX, p. 117, 1898, was said to be a *Hydriomena* by Mr. Grossbeck in Trans. Am. Ent. Soc., XXXIII, Nov., 1907, and would probably be a synonym of *reflata* Grote. This is quite true, as I have a photograph of the type sent me by Mr. Grossbeck through Prof. J. B. Smith's kindness, and it is the same as *reflata*, the broad black mesial band showing plainly. The specimen in Brooklyn is

also the same, so *abacta* Hulst becomes a synonym of *reflata* Grote. There is a type in the National Museum, 3924, which I did not see. Types of *reflata* Grote, 1 ♂ and 1 ♀, Arizona, coll. of B. Neumoegen, Brooklyn Institute.

3. *Hyd. nubilofasciata* Pack., Proc. Boston Soc. Nat. Hist., Vol. XIII, p. 398, 1871. Monog., p. 98, pl. VIII, figs. 31 and 35.

Short palpi, yellowish.

This is a good species and not a variety, as Packard placed it, being distinct in its size and markings from *furcata*. It is incorrectly spelled in Dyar's Catalogue. The marginal band on fore wing separates it from any other species at a glance. The type have yellowish ground colour with reddish shading in the mesial space, and it looks rather different from all other species and varieties. It is closely allied to *furcata* Thunberg, so I placed it to follow *reflata*. Prof. Packard's plate in the Monograph clearly shows the markings, and I think most collections have this form correct, but it is a very variable species, and according to my colour theory has the same varieties as *furcata*, which are as follows: The types, ♂ and ♀ (Edwards & Behrens), from California, are in the Packard coll. at Cambridge. I have specimens from Oregon, Arizona, California and British Columbia before me, showing that it occupies a wide range of territory.

Var. (A) *raptata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, greenish.

This is the green form of *nubilofasciata* according to my colour scheme, and the markings are the same as type, only the ground colour of the fore wings is green, without any other shading, making it look quite distinct.

Var. (B) *scalata* Warren, Nov. Zool., p. 519. Vol. II, 1904.

Short palpi, green, red shading.

I believe this to be a colour variety of *nubilofasciata*, as the latter is found in the type locality, Mr. Marloff sending me specimens from Oregon. Mr. Warren, in his description, speaks of the characteristic marginal band which is found only in *nubilofasciata*, the difference being the colour of the fore wings of *scalata*, green with red shading.

Types, 2 ♂'s, Gold Hills (Biederman); the size, 38 mm., is rather puzzling, as the type is small.

Var. (C) *cupidata* Swett, CAN. ENT., XLII, Aug., 1910.

Short palpi, reddish.

This is the red form of *nubilofasciata*, and corresponds to red form *resecta* Swett, of *furcata* Thunb., for the marginal band separates them, as it does in all forms of *nubilofasciata*.

Var. (D) *cumulata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.
Short palpi, suffused.

This is the suffused form of *nubilofasciata*, and should be so placed. It resembles slightly var. *inter-fuscata* Staud., of *furcata*, and corresponds to this variety, but the marginal band on fore wings separates them.

Var. (E) *vulnerata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.
Short palpi, white-banded.

This is the white-banded form of *nubilofasciata*, and corresponds to *fusco-undata* Donovan of Europe, and is closer than to the American variety of *furcata*, form *albifasciata*. The ground colour of *vulnerata* is reddish, with snow-white mesial space.

Var. (F) *sparsimacula* Hulst, Trans. Am. Ent. Soc., XXIII, p. 285, 1896.

Short palpi, marks on costa only.

I saw a specimen of *sparsimacula* marked "type," in the handwriting of Hulst in the Brooklyn Institute, agreeing with a photograph of the type in the Hulst collection at New Brunswick, and this is a variety of *nubilofasciata*, being greenish, with the bands showing at costa only. It is possible these are rubbed specimens and not worthy the name, but it is best to give it the benefit of the doubt until a series can be examined. Types in Brooklyn Institute and New Brunswick are labelled "Calif." Mr. Hulst says in his description, "near *californiata* Pack.," but it resembles neither this species nor *glaucata*, both of which belong to other groups.

4. *Hyd. manzanita* Taylor, CAN. ENT., Vol. VIII, also Grossbeck, Proc. Ent. Soc. Wash., Vol. X, Sept. 11, 1908.

Short palpi, gray.

This is the long-winged species, and not to be confused with any other. Mr. Taylor kindly sent specimens from Victoria, and I have seen them from other localities, and I do not see that they vary, all being a dull gray.

5. *Hyd. cochiseata* Swett, CAN. ENT., July, 1909.

Short palpi, gray, white mesial space.

This is a large species, and does not resemble any other so far as I can see. The wide, white-banded mesial space would make one imagine

that it might be the white-banded form of some undescribed species. Mr. Broadwell has another specimen in which the central band is suffused, and the whole insect has a grayish appearance. Types, 2 ♂'s, in Mr. Broadwell's coll., Newark, N. J.

6. *Hyd. pernotata* Hulst, CAN. ENT., XXX, p. 117, 1898.

Short palpi, gray. Said by Dr. Dyar "to be *Hyd. magnoliata*."

This species seems very hard to place, and as I have not seen the type, I cannot say exactly what it is like, but, according to the description, it belongs to the short-palpi group. The type is from Fort Wrangel, Alaska, and is in the U. S. National Museum.

7. *Hyd. irata* Swett, CAN. ENT., Vol. XLII, p. 280, Aug., 1910.

Short palpi, gray, reddish suffused.

This is a very peculiar species, and looks almost exactly like *californiata* Pack., except that it lacks the longer palpi and has subdentate antennæ. It also resembles var. *perfracta* Swett, of *autumnalis*, but differs again in the antennæ and palpi, and also in the black lines across the mesial space on veins 2 and 3. The peculiar antennæ would almost seem to place it out of the *sordidata* group, as it really lacks the smooth flattened antennæ of that group, in some specimens being very subdentate. No doubt this species has been confused with *californiata* Pack., but its earlier appearance (in May, where *californiata* flies in July) will also help to separate them. The females appear to be quite rare, as Mr. Croker, who kindly sent me a series of males, stated that he took but one or two.

This includes all the species and varieties of the short-palpi group so far as known. By "short palpi," I mean hardly projecting beyond the head, or 1 mm. in length. The "mesial band" is the group of three bands forming the basal, second and intradiscal. The mesial space is the area between intradiscal and extradiscal lines. In regard to the colour varieties, I am opposed to giving every form a name, as it would fill up the catalogue unnecessarily, and I do it only where variable species could be confused, as it would be impossible to separate the species if this were not done, e.g., the red varieties of *nubilofasciata* and *furcata*, *californiata* and var. *perfracta* Swett, of *autumnalis*. The colour scheme seems to work out well, and gives us the first means of separating an unwieldy mass of specimens, but the palpi seem to be the most important character, as we know in which of the three groups—short, moderate or long—to place it. There is possibly one change to be made later in the colour scheme regarding green and yellow. I notice that specimens emerge yellow, while others, at first green, turn yellow after flying for some

time. These two colours, therefore, might be merged under one, but the effect is so different in some cases that I believe it is better to keep them separated until they are better understood. I have made a key to the species and varieties which ought to make their classification fairly easy. I shall be glad to have any criticisms or corrections on my work, as it is impossible not to make errors on such a difficult group and one so little understood at present.

I wish to thank the following gentlemen for either loan of specimens or help: Messrs. William Reiff, Barnes, Taylor, Broadwell, F. X. Williams, Grossbeck, Doll, Croker, Pearsall, Henshaw, Prout, Marloff and Bastleberger, and it is owing to their generosity that I have been able to accomplish this beginning.

SHORT-PALPI GROUP.

- | | |
|---------------------------------------|--|
| 1. <i>Hyd. furcata</i> Thunb. | } Colour scheme cinereous. |
| Syn. = (a) <i>elutata</i> Hub. | |
| Var. (A) <i>quinquefasciata</i> Pack. | (a) fuscous, less irrorated, clear discal space. |
| " (B) <i>viridata</i> Pack. | (b) green, smoke bands. |
| " (C) <i>sordidata</i> Fab. | (c) yellowish-green. |
| " (D) <i>resecta</i> Swett. | (d) reddish. |
| " (E) <i>periclata</i> Swett. | (e) suffused. |
| " (F) <i>albifasciata</i> Pack. | (f) white mesial band. |
| 2. <i>Hyd. reflata</i> Grote. | } Gray, wide black central band. |
| Syn. = <i>abacta</i> Hulst. | |
| 3. <i>Hyd. nubilofasciata</i> Pack. | Yellow, reddish cast. |
| Var. (A) <i>raptata</i> Swett. | (a) green, suffused. |
| " (B) <i>scalata</i> Warren. | (b) red and green, green shaded. |
| " (C) <i>cupidata</i> Swett. | (c) red. |
| " (D) <i>cumulata</i> Swett. | (d) suffused, smoky. |
| " (E) <i>vulnerata</i> Swett. | (e) white banded. |
| " (F) <i>sparsimacula</i> Hulst. | (f) marks on costa only. |
| 4. <i>Hyd. manzanita</i> Taylor. | Gray, long fore wings. |
| 5. <i>Hyd. cochiseata</i> Swett. | Gray, white banded. |
| 6. <i>Hyd. pernotata</i> Hulst. | Gray, red stained. Probably <i>Hyd. magnoliata</i> Gn. |
| 7. <i>Hyd. irata</i> Swett. | Gray, red shaded. |

This includes all the species and varieties that should be placed in the short-palpi group. The others I shall treat of in the moderate and long palpi groups.

THE LIFE HISTORIES OF TWO LYCÆNID BUTTERFLIES.

BY E. J. NEWCOMER, PALO ALTO, CAL.

Chrysophanus zeræ Bdv.

Nothing has hitherto been written on the early stages of *Chrysophanus zeræ*, except a short description of the egg, made from a single specimen by Mr. K. R. Coolidge, in *Psyche*, XVI, 31. This egg was collected by me at Deerpark, Placer Co., Cal., in 1908. It was the only one found, and I did not at that time have the leisure to hunt for others. However, I spent six weeks in the same locality during the summer of 1909, and determined, if possible, to work out the life-history of this species, which is quite abundant in the Sierra Nevada Mountains. The one egg I had found (I saw the female lay it), was on an inconspicuous plant not over eight or ten inches high, growing on a flat place among other species of plants of the same general size and appearance.

In 1909 I looked over the ground and decided that the food-plant of *zeræ* was one of two species. A careful search for eggs on these two species revealed none. I then watched every female I came across, and one day was rewarded by seeing a female lay an egg, and it was on one of the two likely plants. I immediately captured several females and confined them under mosquito netting placed over growing plants of this species, which is *Polygonum douglasii* Greene. The next morning all that was left of the butterflies was a wing or two—ants had taken care of the rest; but there were a number of eggs on the stems of the plant. By a repetition of this method I secured about sixteen eggs. These eggs were laid on July 27th and 28th. As they had not hatched when I returned home, I put them in a cool place to hibernate. The larvæ began to come out on February 15th, and the last one hatched late in March. I gave the first larvæ leaves of our common *Polygonum aviculare*, but they refused to eat them, and died in a few days. Several which hatched later, I tried on *Rumex*, and succeeded in rearing some of them.

The young larva begins eating the shell of the egg at the micropyle, and makes an irregular hole, through which it escapes. It does not consume the remaining eggshell. The larva, in its earlier stages, eats pits into the leaves, but in the last two instars the leaves are entirely devoured. The larvæ that I reared pupated about seven weeks after hatching, and the adults emerged two or three weeks later. Thus in one case the larval stage lasted 48 days and the pupal stage 17 days, making a total of 65 days from egg to adult. In another case the larval stage was 52 days and the pupal 14 days, making 66 days altogether.

March, 1911

Egg.—Diameter, 0.85 mm.; height, 0.50 mm. "Shape depressed spheroid,"* ornamented with deep, polygonal pits, smallest and shallowest about the micropyle; micropyle in a rather deep depression. Base of the egg flat and smooth. Colour pale bluish, the raised network about the pits white.

Larva, First Instar.—Length, a little over 1 mm. Slug-shaped; brownish-yellow, thickly covered, particularly laterally, with minute black dots. A row of long, dark brownish, rough hairs on each side of the dorsal line, extending from segments 2 to 12, one hair to a segment in each row; another row of finer, shorter hairs laterad of this row, extending from segments 2 to 9, the individual hairs caudo laterad of the corresponding ones of row 1. A fringe of more delicate hairs on the lateral ridge, also a number of scattered ones on first segment. All these hairs proceeding from tubercles of a shiny brownish colour, black at insertion of hair. A hairless tubercle laterad of each large subdorsal hair on segments 2 to 10, and another caudo laterad of this on segments 5 to 9; also a pair caudo-laterad of large hairs on segment 10, corresponding to those bearing hairs of second row on preceding segments. Cervical shield shining brown, with some small hairs. A brownish plate on each side of dorsum of segment 12. Some minute hairs on ventral side. Head retracted, dark, nearly black. Later the colour becomes dull greenish, and a pinkish dorsal stripe appears.

Second Instar.—Length, 3.5 mm. Colour greenish, dorsal line dull, deep rose, a whitish line on each side; lateral margin light pinkish or whitish; head black. Hairs arranged as in first instar, with the addition of a long hair on each side of cervical shield and several cephalad; a hair on segment 11 on the dorsal line, caudad of the two described in first instar, and one on segment 12 cephalad of the other two. Plates on segment 12 indicated by two depressions.

Third Instar.—Length, 5 mm. Dorsum more convex than before. Body uniform pale green, except for a slight rose-coloured dorsal line; cervical shield green, slightly darker than the body. A sparse covering of whitish or brownish pile. Arrangement of hairs as before; plates of 12th segment indicated by two slight depressions.

Fourth Instar.—Length, 11-12 mm. Slug-shaped, widest at about the third or fourth segment, narrowing somewhat, and becoming more flattened posteriorly; segmentation distinct. Body pale grass green,

*Psyche, l. c.

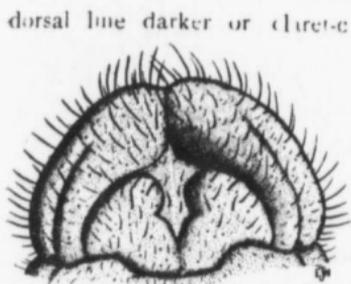


FIG. 3.—Cervical shield of larva of *Chrysophanus serotus*.

dorsal line darker or claret-colored, most conspicuous on middle segments, and with a lighter line on each side; lateral line whitish; cervical shield (Fig. 3) sunken, in the shape of a double diamond, the one cephalad largest, bluish-gray, with a lighter line down the centre. Dorsal and lateral hairs and a few small ones dorso-laterad, brownish; remaining small hairs whitish. Dorsal side of body covered with scattered, white, hairless tubercles, scarcely visible to the naked eye. A small pit on each side of 12th segment, grayish at the bottom. Head dark brown, fore legs light brown, claws darker, prolegs light green; the minute hooks on these reddish brown. Length before pupation 17 mm.; width, 5 mm.

Pupa.—Length, 10.50–10.75 mm.; width, 4–4.25 mm. Rather stout, but longer for its breadth than usual with *lycænid* chrysalids; venter approximately straight; dorsum with two humps, one on the thorax and the other at the third and fourth abdominal segments; widest near the posterior end of the wing-cases, opposite the third abdominal segment; head abruptly narrower than the thorax. Colour at first very pale yellowish-green, with a pinkish dorsal stripe; later, ground colour pale straw-yellow, with a slight greenish tinge about the thorax. An irregular reticulation of brown lines on dorsal and lateral sides, visible with a low-power lens; a number of brown blotches on the ventral side of the head, also some lighter ones on the cases of the antennæ, palpi and wings. A distinct, narrow, brown or pinkish, dorsal line on the thorax, and a wider, more suffused one on the abdomen. An irregular double row of brown spots on the thorax and abdomen, dorsal of the spiracles, which protrude slightly. Hairs, resembling trumpets, and called by Dr. Chapman trumpet-hairs, † scattered thickly on dorsum of head, and more sparingly on thorax and abdomen, here most numerous along the line of the spiracles. These hairs are quite small, appearing, with a low-power lens (x45), like minute tacks stuck into the skin.

Lycæna fulla Edw.

Lycæna fulla is the most abundant *Lycæna* occurring about Lake Tahoe. I discovered a female on July 8 ovipositing on *Lupinus meionanthus* Gray. On the 18th I took thirty eggs, sixteen of which were laid on

†Ent. Rec., XVII, 172, 322, ff.

the leaves, thirteen on the seed-pods, and one on the stem of the plant. These eggs hatched in about ten days, and the larvæ continued to feed until the second instar, when they stopped and hibernated until the following spring. I took a number of rather large larvæ of this species in August, and the only one that lived pupated in the later part of the month, and emerged the following spring. It is thus evident that, although the adults fly uninterruptedly from June until September, the species hibernates both in the pupal and larval conditions, and not improbably also in the egg stage. Apparently larvæ coming from eggs laid in the early summer pupate the same year, and hibernate thus, while those hatching later hibernate as larvæ. It is possible that some of the last eggs to be laid do not hatch until the following spring, though I did not observe this. A considerable number of the larvæ which I took had Tachinid eggs on them, but by removing these the larvæ were reared successfully. I also obtained a Braconid parasite in the spring from a larva which had hibernated.

The larvæ of *fulla* are attended by a small black ant. I often discovered larvæ by looking for these ants on the food-plant, for the larvæ themselves are very inconspicuous. The ants, as has been observed in the case of various Lycænidæ, by Edwards and others, obtain a liquid excreted by a gland on the 10th body segment of the larva, and in return probably afford the latter some protection. In fact Edwards[†] noted on one occasion an ant driving an ichneumon fly away from a larva. With *fulla* the Tachinid flies are probably not interfered with by the ants, as the flies lay their eggs on the larvæ in the first and second instars, while the ants do not pay much attention to the latter until they become larger. A pair of eversible sacs (Fig. 4) on the 11th segment is also made use of by the larvæ, either repelling or attracting the ants. Neither these sacs nor the gland on the 10th segment have been carefully studied. Several writers, however, have published descriptions of the external organs, in two or three cases accompanied by drawings. Little has apparently been done in the way of carefully observing the behaviour of the ants toward the larvæ, except by Edwards and one or two others.



FIG. 4.—Eversible sac of larva of *Lycæna fulla*.

[†]Butt. N. A., ii, Lyc., II, p. 14; CAN. ENT., X, 135.

The larva, in escaping from the egg, eats an irregular hole in the top, and leaves the rest. The larva feeds by making pits in the leaves or seed-pods of its food-plant. My larvæ hibernated about the middle of August, some three weeks after hatching. I kept the larvæ over winter by placing them in a small tin box, which I put into a baking-powder can fastened outside a window, on the north side of the house (our winter storms come from the south). I previously punched holes in the bottom of the can, giving a free circulation of air, and yet keeping out the rain. In this way I succeeded in keeping alive practically all of the larvæ. The larvæ moulted the following spring from March 9th to 11th, bringing them into the third instar. About a month later they pupated, and the adults emerged at the end of two or three weeks. Thus the total time spent from the hatching of the larva to the appearance of the adult, not counting the six months of hibernation, is from 65 to 70 days. In moulting, the skin becomes loosened a segment at a time, from the posterior end forward. After a few minutes, a split appears cephalad, extends back and divides, forming a Y-shaped opening. Then the larva slowly crawls out, the old shell of the head falling off. As the larva comes out, the eversible sacs are extended, a skin apparently coming from them also.

Egg—Diameter, 0.65 mm.; height, 0.25 mm. Of the ordinary Lycenid shape, covered with a raised network forming polygonal cells, each cell having a rounded process at each angle. Cells smallest about the base of the egg, becoming gradually larger at the sides, and again somewhat smaller about the micropyle, which is slightly depressed. Colour light pearly bluish-green, the network lighter.

Larva, First Instar.—Length, a little over 1 mm. Slug-shaped; yellowish-green; head black. A row of long, light brownish hairs on each side of dorsal line, from segments 2 to 11, one hair to a segment in each row, except segment 2, which has two hairs on each row. A secondary row of smaller hairs, laterad of each primary row, one hair to each row on segments 2 to 9. A number of irregularly placed hairs on first segment, about and on the cervical shield. A fringe of long hairs on lateral margin. Toward the end of the instar the body becomes darker green, with minute dark dots on dorsal surface, and the dorsal line dark green, with a light line on each side.

Second Instar.—Length, 3.75 mm. Colour silvery bluish green dorsal line dark green; body surface scattered with minute dark dots, except along the dorsal line; some very indistinct oblique lateral dashes

and bands; head rather small, nearly black. Hairs arranged as in preceding stage, with the addition of a long hair on each of segments 3 to 9, situated on the dorsal line, and a number of short hairs scattered over body.

Hibernating Larva.—Dull rose colour, with greenish showing through dorso-laterally; cervical shield light yellowish, with a number of blackish tubercles; ventral side light apple-green; head shiny black.

Third Instar.—Length, 6-7 mm. Colour varying from dull rose to dull greenish, with indistinct oblique dorso-lateral dashes, and a dark dorsal line; a light green line on each side of this, showing only on middle part of each segment; also a whitish, or light pink, lateral line, with a pink or rose-coloured stripe below it, and sometimes one above; ventral side bright green; head shiny black. Dorsal hairs rather short, arising from translucent tubercles; lateral hairs longer; both sets roughened and light brown. Black tubercles scattered over body, most of which give rise to short, curved, white hairs. Opening of gland on 10th segment surrounded by a ring of thick, blunt hairs. Eversible sacs on segment 11 very pale green, with a number of plumose hairs on tips (Fig. 4).

Fourth Instar.—Length, 9.5-10 mm. Dull grayish-green or dull claret; median line deep claret, lateral line light pinkish, with a dull rose line above and below it, the former extending dorsad of the spiracles; between this and the dorsal line two rows of oblique dashes, dull rose; cervical shield grayish; ventral side pale green; claws of thoracic feet brown; hooks on prolegs reddish-brown; head shiny black. Body thickly scattered with tubercles, some nearly white, others black, the white ones most numerous. From these tubercles arise short, roughened light brownish hairs. Lateral fringe of hairs, and some on the first segment, longer, but dorsal rows of hairs scarcely distinguishable from the scattered ones. Some of the tubercles on each side of dorsum larger, forming a more or less distinct white line. Length, before pupation, 14 mm.; width, 4.75 mm.

Pupa.—Length, 9.5-10.5 mm.; width, 4.5-5 mm. Of the usual stout, Lycænid form. Colour at first bluish-green; later, abdomen dull dirty greenish, with a dark dorsal stripe; dorsum of thorax brighter green; head greenish, with traces of brown markings; wing-cases greenish-cream colour. Brown reticulations and spined hairs, chiefly about the head and lateral parts of abdomen, and visible with low-power lens.

NOTES ON DIABROTICA AND DESCRIPTIONS OF NEW SPECIES.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

(Continued from page 58.)

D. mapiriensis, n. sp.

Head and antennæ black; thorax olivaceous, tinged in front with piceous, shiny, bifoveate, scutel black; elytra castaneous green, thickly and coarsely punctate, rather opaque, strongly plicate, and with one or more longitudinal sulcations on the disk, three black spots at the base, one common sutural, the other humeral, all quadrate, the suture narrowly piceous until near the apex, also a round spot on the convexity, about equidistant between the margin and the suture; below prasinous, with black pectus; tibæ and tarsi black or piceous. Length, 3 mm.

Ten examples, Mapiri, Bolivia.

Antennæ nearly as long as body in ♂, joints 2-3 short, equal, 4 longer than both preceding together, the basal joints a little tinged with piceous, thorax widest in front of the middle, and longer than broad, foveæ deep and well marked, the surface sparsely punctate; elytral punctures confluent in spots, and with the longitudinal sulcations showing in places almost as costæ; the sutural black lining has a tendency to increase in thickness between the apical spots. The most salient point for quickly recognizing this form is its small size, dull greenish colour, with two black spots behind, these being much more prominent casually than the front marks.

D. surinamensis, nov. sp.

Head piceous, with anterior face pale, antennæ pale fuscous, last three joints flavous, thorax pale flavous, smooth, convex, shining, impunctate, scutel black, elytra pale flavous, not placate, shining, with three basal vittæ, one sutural common, the other humeral, connected at the base, and an apical lunule on the convexity, concave behind, all black, below and legs pale flavous, with piceous pectus, tibæ and tarsi dark yellow. Length, 6 mm.

One example, Surinam (orange label).

The clypeal ridge in front is almost wanting, the mouth tinged with piceous, the antennæ three-fourths as long as body, joint 2 short, 3 a trifle longer, 4 one-half longer than the two preceding, thorax broader than long, moderately sinuate behind; the basal vittæ reach the beginning of the median third of the elytra, are broad, and the humeral obliquely truncate,

March, 1911

upward to the scutel, the scutellar being wedge-shaped, the apical lunule ends at equal distance from the suture and margin; the punctuation is moderate and thick.

Very like some of the forms of *septemliturata* Er., but readily separated by the not plicate elytra.

D. clarkellita, nov. sp.

Head black, antennæ a little more than one-half length of the body, black, last two joints yellow, 2-3 short, nearly equal, 4 slightly longer than both together; thorax rufous, convex, smooth, shining, obsoletely bifoveate, scutel rufous; elytra honey-yellow, plicate, shining, with three short, broad, even cyaneous vittæ at the base, one common sutural, the other humeral, covering the anterior third, also on each elytra two similar spots at the rear, one nearly round median, the other sublateral oblong, both on the convexity; body below and legs yellow, pectus black. Length, $5\frac{1}{2}$ mm.

One example, St. Catharine, Brazil, sent me by Mr. Klages.

Will be placed near *dysoni* Baly, from which it is easily distinguished by the three short, even cyaneous vittæ in front, and the antennæ with last two joints yellow. The thorax is longer than broad, faintly sinuate, nearly parallel; the elytra are rather closely punctate, and have a tendency to be slightly corrugated, and the cyaneous vittæ at the base are not narrowed behind but are rather abruptly truncate.

D. lünderwaldti, nov. sp.

Form almost parallel, head black, antennæ black, with the three lower and two upper joints flavous; thorax pale flavous, convex, smooth (σ), impunctate on the disk, scutel black, elytra pale flavous, plicate, thickly, finely punctured, three spots at the base, one common sutural wedge-shaped, one humeral, the latter prolonged to a point just beyond the middle, and a large round spot near the apex black; below and legs flavous, pectus black. Length, $5\frac{1}{2}$ mm.

Two examples, St. Catarina, Lünderwaldt; one St. Catharine, Brazil, Klages.

The antennæ (σ) about three-fourths the length of the body, joints 2-3 equal, 4 one-third longer than the preceding two; in the ♀ antennæ 3 is longer than 2, and 4 equal the two preceding, the thorax is a little wider than long, sides nearly parallel, and with a few punctures at the sides; the plication of the elytra is strong and extends nearly to the convexity, the punctuation is thick and even, the reflexed edge is marked and wide, the sutural spot is about one-fourth of the length of the elytra, the

thorax in the Klages specimen which I regard as the ♀ is faintly bifoveate, the elytra are very slightly dilated behind, so the general appearance is parallel with two conspicuous black spots behind.

D. callangaensis, nov. sp.

Head black, antennæ dark fuscous, base and three apical joints pale, thorax pale rufous-flavous; shining, punctured, depressed, bifoviate, scutellum flavous, elytra pallid yellow, obsoletely plicate, dilated behind, with a sublateral blue-black stripe from the shoulder, along the side for about two-thirds the elytra; the suture is also narrowly tinged with the same colour on the anterior half or two-thirds; below flavous, with pectus black; legs flavous, with dark fuscous tibiæ and tarsi. Length, $6\frac{1}{2}$ - $7\frac{1}{2}$ mm.

Five examples, Callanga and Vileanote? Peru.

The antennæ are more than three-fourths as long as the body, slender, joint 3 nearly one-half longer than 2, 4 equal to the two preceding, the four or five lower joints flavous, and the three upper ones, the extreme tip of the last excepted, pallid; the thorax is a little wider than long, the punctuation scattered but very obvious; the punctures of the elytra are fine and even.

Near *facialis* Baly, but smaller and more pallid.

D. neolineata, nov. sp.

Head flavous, labrum black, antennæ light yellow-fuscous, lightest at base and apex; thorax flavous-rufous, smooth, shining, depressed behind, and obsoletely bifoveate; scutellum yellow, elytra pallid yellow, plicate, smooth and finely punctured; three longitudinal blue-black lines at the base, one sutural common, the other basal humeral, also two behind, one discal on the convexity, the other sublateral; below and legs pallid yellow, pectus black. Length, 5-6 mm.

Three examples, Mapiri, Bolivia.

I also place here three examples from Pachitea, Peru, which differ somewhat, but have the black labrum.

This species is very close to *brevilineata* Jac., from Bugaba and Bogota; the present species is, however, smaller, and the Mapiri form has the thorax very obsoletely foveate at the best, the antennæ are more wholly flavous, and the labrum is always black, whereas *brevilineata* has always a yellow labrum. The antennæ has joint two short, 3 one-half longer, 4 long as the two preceding. One of the Mapiri specimens has the humeral stripe elongated to the rear, indicating a form which may connect with the rear spot, but in the type the spot is short and humeral.

D. semisuclata, nov. sp.

Head black, antennæ slender, nearly as long as body, flavous, gradually darkening to joints 9-10, which are pale, 11 piceous; 2 short, 3 a trifle longer, 4 nearly twice as long as both preceding together; thorax about as broad as long, rufous, shining, convex, finely and sparsely punctate, an obsolete depression in front of the scutel, which is rufous; elytra flavous, shining, rather thickly and coarsely punctate, very strongly sulcate plicate, with a supplemental sulcation from the humerus over the disk, three spots at the base, one small wedge-shaped sutural, the other humeral, broad, extending to the middle; also two spots transversely parallel at the rear, one discal on the convexity, the other lateral, the latter in line with the humeral, all black, below and legs yellow, pectus black. Length, $6\frac{1}{2}$ mm.

One example, Peru, square, pale, olive-green label (Callanga?).

Will be placed in division O (Baly's paper), but is very distinct from any there mentioned; the sinuation of the thorax is slight, but the dilatation in front is marked, and the reflexed edge is very noticeable behind. The sutural black spot does not attain the base, and is drawn to a fine point at about one fourth the length of the elytra; the rear spots are both parallel to the suture; the plica extends from the shoulder to the rear outside spot, and takes the form of a deep groove.

D. baeri, nov. sp.

Head black, antennæ three-fourths as long as body, fulvous at base, last three joints (the upper half of last excepted) pale; thorax rufo-flavous, smooth, convex, bifoveate, scutel piceous, elytra shiny, obsoletely plicate, flavous, dilated behind, distinctly evenly punctured, with a thin, common scutellar line, a short humeral spot, a small median discal, and two small postmedian spots on the convexity, placed obliquely in the usual manner, black beneath and legs yellow, with pectus black, and tarsi tinged with piceous. Var. elytra with only the basal spots. Length, 7 mm.

Two examples, Rio Mixiollo, 1200 m., Prov. Huallaga, Peru, C. C. Bier, 7-8-1900.

The elytral markings would place this form somewhere near *apicornis* Jac. = *palpalis* Jac., but the body is even more dilated than in the former. The joint 2 of the antennæ is short, 3 stout and barely one-half longer, 4 longer than the two preceding, 5-8 black; thorax is wider than long, barely depressed in front of the scutel, a few minute punctures at the lateral edges, which are moderately sinuate; the foveæ are well

impressed, though not very large; the elytral punctures are everywhere distinct, but nowhere crowded; the specimen I have marked var. shows the sulcation of the elytra more plainly and has a supplemental sulcation inside the shoulder over the disk; the humeral spots are of uniform width and rather truncated, and cover hardly more than the shoulder knob; the sutural line embraces the scutel, and is gradually drawn to a fine point at the middle of the elytra; the basal spots are practically the same in both examples.

D. peruensis, nov. sp.

Head very dark piceous, antennæ a little more than one-half the length of the body, black, joints 2-3 and part of 4 ferruginous, 9-10 and base of 11 pale; thorax rufous, convex, shiny, with a few scattered punctures, scutel piceous; elytra very obsoletely plicate, shining yellow, strongly and evenly punctured, three basilar spots, one wedge-shaped sutural, the others humeral and tapering to a point at the middle, and a heavy lunule on the convexity; concave behind, dark steel blue, beneath yellow, pectus, tibiæ and tarsi black. Length, $5\frac{1}{2}$ mm.

One example, Rio Mixiollo, 1200 m., Prov. Huallaga, Peru, C. A. Baer, 7-8-1900,

I place also under this species another example from the same place, having two spots in place of the lunule, and the antennæ and feet lighter (immature?).

The antennæ are rather stout, the joint 2 short, 3 one-half longer, 4 as long as the two preceding; the thoracic punctures are very fine and only visible with a strong lens; the obsolete plication of the elytra is very slight, and at first I called the elytra not plicate, but at a certain angle a very slight plication is visible as a depressed or flattened space; the elytra are slightly dilated at the rear.

Would probably be placed near *dysoni* Baly, which I cannot satisfactorily identify with any of my forms.

D. rendalli, nov. sp.

Head black, antennæ three-fourths the length of the body, yellow, joints 5-8 running to piceous, joints 2-3 short, the latter a trifle the longer, and 4 equal the two preceding; thorax yellow, rather shiny, depressed, trifoveate, the antescutellar fovea being transverse; scutel yellow, elytra plicate, yellow, moderately coarsely and evenly punctate, a small common sutural line occupying the anterior fourth, and a sublateral line from the

humerus to about the end of the median third, black below and legs yellow, pectus black. Length, 5 mm.

Two examples, Caparo Valley, Pt. of Spain, 1-97, Dr. Rendall. One example, Trinidad.

Comes near *cavicollis* Baly. The piceous colour of the antennæ stops abruptly at the end of the eighth joint, the thorax is broader than long, with moderately sinuate sides, impunctate; elytra are dilated as in *cavicollis* Baly, and the colour and markings are just as in that species, but the antennæ and thorax are very different, and at once separate the two.

D. boggiani, nov. sp.

Head yellow, antennæ about one-half the length of the body, black, with the first three and last three joints pale; thorax yellow, shining, impunctate; scutel yellow, elytra pallid whitish-yellow, a common sutural line reaching the middle, a humeral sublateral stripe extending nearly to the apex, a discoidal stripe, abbreviated anteriorly just before the middle and posteriorly at the convexity, black, below and legs yellow, pectus black. Length, 5 mm.

One example, Pt.° 14, de Mayo G. Boggiani, 1-1897 (Mus. Genova).

Near *kirbyi* Baly. The antennæ are stout, the fourth joint barely as long as the two preceding; the thorax is broader than long and only moderately sinuate behind; the elytra are not plicate, and the punctures are uncoloured and fine, so they are not at all prominent; the sutural line vanishes at the middle at a fine point; the sublateral line is, however, of the same width until it ends just before reaching the suture; the general form is almost parallel.

D. clio, nov. sp.

Head bright yellow, labrum piceous, eyes black, antennæ short and stout, barely one-half the length of the body, black, with basal joint flavous, tinged with piceous, and last joint piceous-flavous; joint 2 short, 3 one-half longer, 4 barely equal to two preceding; thorax bright yellow, convex, shining, deeply bifoveate and a slight antescutellar depression, scutel concolourous with thorax; elytra not plicate, pallid whitish-yellow, with moderately thick, fine, piceous punctures, a narrow sutural line almost attaining the apex, a sublateral humeral stripe nearly attaining the apex, and a discoidal stripe, beginning just before the middle and passing the convexity, black, below and feet yellow, pectus black. Length, $4\frac{1}{2}$ mm.

One example, Rio Nobilecchi Luglio, 1897, G. Boggiani (Mus. Genova).

I place this near *kirbyi* Baly, though the long sutural line indicates a relationship with *submarginata* Baly; the relative lengths of the second and third antennal joints to the fourth would almost place this form in §2, but it is otherwise so like the allies of *kirbyi* that I have placed it here; the thorax is a trifle broader than long, moderately sinuate; elytra slightly dilated behind, shining, with the punctures showing as fine piceous points; the sutural line is very fine except in front, but the other stripes are of the same width throughout.

D. juncto-linea, nov. sp.

Head black, antennæ one-half the length of the body, black, somewhat piceous at base, joints 9-10 and basal half of 11 white; thorax broader than long, pallid yellow, depressed, and obsolete bifoveate; scutel black; elytra pallid, almost white, the suture narrowly, anteriorly, the basal margin and a sublateral vitta from the base to the turn of the convexity, as well as a discoidal vitta, abbreviated before and behind, brilliant blue-black; body below and legs pallid, with the pectus, tibiæ and tarsi black. Length, $5\frac{1}{2}$ mm.

One example, Caracas, Venez. (yellow label).

Close to *nigrolineata* Jac., from Central America. My seven specimens of this species (including the type) have the sublateral vitta extended to the suture, which is narrowly black for its whole length, and the discoidal vitta almost connected with the basal black margin; *juncto-linea* has the sublateral stripe only as far as the middle of the convexity, the discoidal stripe occupies about the middle two-fourths of the elytra, and the suture is black only for about one-third of the anterior portion; the antennæ are darker and the elytra smoother and less evidently punctate, joint 2 of the antennæ is short, 3 one-half longer, 4 equal the two preceding. The general appearance is that of *Neobrotica oberthuri* Baly.

D. underwoodi, nov. sp.

Head black, antennæ about three-fourths the length of the body, light piceous, the first four or five joints and the last three pale; thorax pale rufous, smooth, shining, bifoveate; scutel piceous; elytra plicate, pallid-yellow, the anterior third of the suture narrowly, a sublateral humeral stripe half rounding the convexity, and a discoidal stripe abbreviated shortly before the base and at the convexity black; body beneath and legs yellow, pectus black. Length, $6\frac{1}{2}$ mm.

Two examples, San José, Costa Rica (Underwood).

This species is close to *nigrolimbata* Jac.; one of my two examples being so labelled by Jacoby, but it is abundantly distinct, the lateral vitta does not attain the suture, there is no narrow cross basal vitta joining the two lateral stripes, and the sutural mark is much shorter, also the legs are entirely flavous, the punctuation and plication is the same; one example has the discal stripe interrupted at the middle.

D. bakeri, nov. sp.

Head yellow, labrum piceous, antennæ more than one-half length of body, black, joints 1-3 flavous, 9-10 pallid; thorax wider than long, yellow, convex, shining, scutel yellow, elytra yellow, plicate, thickly and rather coarsely punctured; body below and legs yellow, pectus, tibiæ and tarsi black. Length, 6-6½ mm.

Twelve examples, Para, Brazil (C. F. Baker).

Seems to be near *assignata* Baly (which I have not seen), but that species is said to have the elytra *not* plicate, the reverse of *bakeri*. The joint 2 of the antennæ is short, 3 not one-half longer, 4 slightly longer than the two preceding, the three lower joints are more or less tinged with piceous, and the base of 11 is pale; some examples show an obsolete fovea on the thorax and about two or three obsolete longitudinal sulcations on the disk of the elytra.

D. chacoensis, nov. sp.

Head, thorax, scutel and elytra dull blue-black; antennæ prasinous, with last four joints flavous; the thorax smooth, depressed and semi-shining, bifoveate, with a few fine punctures at the sides; elytra with about nine elevated costæ, vague at base and apex, the whole surface, including the costæ, punctured; anus and last segment of abdomen rufous; body below black, abdominal segments fringed with golden pubescence, sides of the breast clothed with golden-sanguineous hair, feet prasinous, tibiæ and tarsi dark black-green. Length, 8½ mm.

Two examples, Chaco, Bolivia.

Should be placed in § 5, Baly's paper. Joints 2-3 of the antennæ are very short and equal, the latter being more obconic (♂), 4 twice as long as both preceding (♂), joint 3 in ♀ is one-half longer than 2, and 4 a little longer than the preceding two; the eighth joint is pale flavous and the last three sanguineous; the thorax is about square, with a dull smooth finish, with fine scattered punctures; the costate elytra and red anus at once distinguish this form from anything else, the nearest, perhaps, being

variolosa Jac.; the colour of the tibiæ and tarsi is obscured by the thick sericeous pubescence, the last joint of the tarsi is sanguineous.

D. pachitensis, nov. sp.

Head black, antennæ fuscous-flavous, joints 9-10 white; thorax fuscous-flavous, transverse, punctate, trifoveate, scutel black, elytra fuscous-flavous, obsoletely plicate, coarsely and confluentely punctured, each with three black stripes, a common sutural, a median discal and a humeral sublateral, all end at or just after the middle; body beneath and legs flavous, pectus black. Length, $5\frac{1}{2}$ -6 mm.

Two examples, Pachitea, Peru.

Antennæ (♂) longer than the body, joints 2-3 very short and about equal, 4 twice as long as the preceding two; thorax broader than long, the punctures quite coarse at the sides, the third fovea being longitudinal before the scutel, sides almost parallel; elytra strongly dilated behind, the punctuation being much less evident at the rear, strong and coarse anteriorly; the humeral stripe is truncated behind, shorter than the others and ends about the middle; the other stripes are gradually drawn out, and end at or about the convexity; all, with the exception of the sutural, are about equal in width throughout their length; the sutural is, however, broader anteriorly; the five black stripes, two on each elytra and one common sutural, easily separate this form.

D. atrobasis, nov. sp.

Head rufous, labrum black, antennæ nearly as long as body, black, with the last three and one-half joints pallid; thorax rufous, depressed, bifoveate; scutel black; elytra pallid-yellow, with the anterior third occupied by a large quadrate black spot, which does not attain the lateral margin; body beneath, except the thorax, black; legs black, femora with base and apex yellow. Length, 4 mm.

Two examples, green label (Marcapata?).

Antennæ with joint 2 short, 3 one-half longer, 4 equal two preceding; thorax a little wider than long, finely punctate, sides feebly sinuate; elytra not plicate, slightly depressed back of scutel, very finely and not thickly punctured, the rear of the black mark almost truncate, but a little drawn down at the suture, the spot extending entirely across the elytra, omitting the lateral inflexed margin and a rear corner on the outside, which is rounded.

Judging by the description and figure, the species has a general resemblance to *bicolor* Jac., from Nicaragua.

THE LITHOBIOMORPHA OF WISCONSIN AND NEIGHBOURING STATES.

RALPH V. CHAMBERLIN, BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH.

This paper is based primarily upon collections made by the author in Nebraska, Iowa, Illinois, Wisconsin and Peninsular Michigan during a brief trip through these States in the early part of the summer of 1910. The excessive dryness of the season in this section of the country was very unfavourable for the collecting of chilopods and diplopods. The species reported from Indiana and Minnesota by Bollman have been included. Specimens of all but a few of the forms previously recorded from the States mentioned, as well as a number which are new, were obtained by the author. The new locality records give a clearer knowledge of the distribution of a number of species. The key to species of *Lithobius* is intended to include all those now known to occur within the region above indicated.

Family HENICOPIDÆ.

This family is represented in this region by but one species—*Lamyctes fulvicornis* Meinert.

Lamyctes fulvicornis Meinert.

The many specimens secured seemed to agree fully with the European form.

Localities.—Omaha, Neb.; Peoria, Ill.; Haugen, Eau Claire, Ashland, Marinette and Beloit, Wis.; Watersmeet, Powers and Menominee, Mich. Also reported from Winona, Minn.

Family LITHOBIIDÆ.

Of this family the genera *Lithobius* and *Bothropolys* are represented. Species conforming to *Monotarsobius*, as defined by Verhoeff, do not occur among those thus far known from the region.

Genus *Bothropolys* Wood.

But one species of this genus has been found within these States.

Bothropolys multidentatus (Newport).

One of the most abundant and widespread of the North American Lithobiomorpha.

Localities.—Franklin Grove and Peoria, Ill.; Ann Arbor, Mich. Also reported as occurring throughout Indiana, and at Ludington, Mich. March, 1911

Probably will be found within Wisconsin, where, however, the excessive abundance of *L. forficatus* doubtless militates against it.

Genus *Lithobius* Leach.

KEY TO SPECIES.

- a. Posterior angles of the 7th, 9th, 11th and 13th dorsal plates produced. (*Neolithobius*.)
- b. Claw of the anal legs not armed at base.
- c. Claw of the penult legs unarmed,
Articles of antennæ 30-40; prosternal teeth 5+5 to 7+7; spines of first legs 2, 2, 1-3, 3, 2; of penult legs 1, 3, 3, 2.....*L. mordax* Koch.
- cc. Claw of the penult legs armed with one spine.
Articles of antennæ 31-36; prosternal teeth, 6+6 to 8+8; spines of first legs 1, 2, 1 to 2, 2, 1; of penult legs 1, 3, 3, 1-1, 3, 3, 2....*L. tyrannus* Bollman.
- bb. Claw of the anal legs armed with one spine.
- c. Claw of penult legs armed with one spine.
Articles of antennæ 31-32; prosternal teeth 2+2; spines of first legs 1, 1, 1; of the penult, 1, 3, 3, 1.....*L. juvenus* Bollman.
- aa. Posterior angles of the 9th, 11th and 13th dorsal plates produced. (*Lithobius* s. str.)
- b. Claw of anal legs unarmed.
- c. Claw of penult legs unarmed.
Prosternal teeth 3-3; articles of antennæ 20-21; spines of penult legs 1, 3, 3, 2; of anal 1, 3, 2, 0; claw of female gonopods entire....*L. sexdentatus* Kenyon.
- cc. Claw of penult legs armed with one spine.
- d. Articles of antennæ 20, or near that number.
Prosternal teeth 3+3; spines of first legs 2, 3, 2; of anal, 1, 3, 3, 1.....*L. howei* Bollman.
- dd. Articles of antennæ 30 or above.
- e. Coxal pores transverse; spines of first legs 2, 3, 2.....*L. forficatus* Linn.
- ee. Coxal pores round; spines of first legs 1, 2, 1-2, 2, 1.....*L. celer* Bollman.

- bb. Claw of the anal legs armed with one spine.
- c. Claw of the penult legs armed with one spine.
Spines of first legs 1, 3, 2; of penult, 1, 3, 3, 1; of anal, 1, 3, 2, 1; length, 8-11 mm. *L. politus* McNeil.
- cc. Claw of penult legs armed with two spines.
Spines of first legs 1, 3, 1-2, 3, 1; of penult, 1, 3, 3, 2; of anal, 1, 3, 2, 0. *L. numius*, sp. nov.
- bbb. Claw of anal legs armed with two spines.
- c. Claw of penult legs armed with two spines.
Prosternal teeth 3+3; articles of antennæ 20; spines of penult legs 1, 3, 3, 2; of anal, 1, 3, 2, 1; coxal pores round, 3, 4, 5, 3. *L. bius*, sp. nov.
- aaa. Posterior angles of none of the dorsal plates produced. (Metalithobius aut.)
- b. Claw of anal legs unarmed.
- c. Claw of penult legs armed with two spines. .
- d. Claw of gonopods of female entire.
- e. Articles of antennæ 20-23; prosternal teeth 2+2 to 4+4.
- f. Spines of penult legs 1, 3, 3, 1; of anal, 1, 3, 2, 0; anal legs of male with 3rd and 4th joints produced mesad into conspicuous lobes, the corresponding joints in female also usually bearing lobes. *L. bilabiatu*s Wood.
- ff. Spines of penult legs 1, 3, 3, 2; of anal, 1, 3, 3, 1; 3rd and 4th joints of anal legs not thus produced into lobes, the 5th joint in some males with a small keel at distal end dorsad. *L. jowensis* Meinert.
- ee. Articles of antennæ 24-29; prosternal teeth 5+5 to 6+6. *L. providens* Bollman.
- dd. Claw of gonopods of female tripartite.
- e. Length, 9-11 mm. *L. pullus* Bollman.
- ee. Length, 15 mm. or above.

- f. Articles of antennæ 23-32; spines of first legs, 2, 3, 2; of penult legs 1, 3, 3, 2 *L. holzingeri* Bollman.
- ff. Articles of antennæ 20; spines of first legs 1, 3, 2; of penult legs 1, 3, 3, 1 *L. minnesota* Bollman.
- bb. Claw of anal legs armed with one spine.
- c. Articles of antennæ 20.
Spines of first legs 1, 3, 1; ocelli, 18-25; length, 10-12 mm. *L. trilobus* Bollman.
- cc. Articles of antennæ 25-32.
- d. Spines of first legs 0, 0, 1 *L. exiguus* Meinert.
- dd. Spines of first legs 0, 1, 1-1, 2, 1. *L. tivius* Chamberlin.
- bbb. Claw of anal legs armed with three spines.
- c. Claw of penult legs armed with two spines.
Articles of antennæ 20-31; spines of first legs 2, 3, 2; of penult legs 1, 3, 3, 1; of anal legs 1, 3, 3, 1-1, 3, 3, 2; length, 6-9 mm. *L. cardinalis* Bollman.

1. *Lithobius mordax* Koch.

A species abundant in the south and south-east.

Localities.—Tama, Iowa (common); Wisconsin (one young male, probably this species); Nebraska (Kenyon). Also reported from Winona, Minn. In 1887 Bollman reported the form from Indiana, but the following year eliminated it from the State list, referring the specimens which he had to the following species:

2. *Lithobius tyrannus* Bollman.

Localities.—Reported as common in Indiana at Bloomington, La Fayette, Greencastle, Salem, New Providence.

3. *Lithobius juvenus* Bollman.

Locality.—Bloomington, Indiana.

4. *Lithobius howei* Bollman.

Localities.—Reported from Ft. Snelling and Winona, Minn., and from Bloomington, Kokoma and Dublin, Indiana.

Lithobius forficatus (Linnæus).

The most common chilopod in the northern sections of the United States. It is exceptionally abundant throughout Wisconsin.

Localities.—Peoria, East Peoria, Franklin Grove, Dwight and Sterling, Ill.; Mongona, Boone, DeWitt, Marshalltown, Tama and Ogden, Iowa; Kimball's, Fond du Lac, Marinette, Eau Claire, Haugen, Devil's Lake, Janesville, Ashland and Beloit, Wisconsin; Ann Arbor, Watersmeet, Powers and Menominee, Michigan. Also reported from Winona, Minn. (common), and from Lawrenceburgh; Greencastle, Connersville, Westfield and Bloomington, Indiana (common in northern section).

6. *Lithobius celer* Bollman.

Localities.—A specimen from Michigan and one from Wisconsin are referred provisionally to this species. There is considerable doubt as to their position. Both are not fully-grown males.

7. *Lithobius numius*, sp. nov.

Angles of the 9th, 11th and 13th dorsal plates produced, those of the 7th plate also slightly extended.

Antennæ with 20 articles.

Prosternal teeth 2 + 2.

Last two pairs of coxæ laterally armed, last three pairs dorsally armed.

Spines of the first legs 1, 3, 1-2, 3, 1; spines of the penult legs 1, 3, 3, 2, the claw armed with two spines; spines of anal legs 1, 3, 2, 0, the claw armed with one spine.

Coxal pores round, 3, 5, 5, 5.

Gonopods of female with the claw tripartite or almost bipartite through the pronounced reduction or almost obliteration of one tooth; spines 2 + 2.

Length, 11 mm.

Locality.—Haugen, Wisconsin.

8. *Lithobius bius* sp. nov.

Angles of the 9th, 11th and 13th dorsal plates produced.

Antennæ with 20 articles.

Prosternal teeth 3 + 3.

Last three pairs of coxæ laterally armed; last four pairs armed dorsally.

Spines of first legs 1, 3, 2; of penult legs 1, 3, 3, 2, the claw armed with two spines; spines of the anal legs 1, 3, 2, 1, the claw armed with two spines.

Coxal pores small, round, 3, 4, 5, 3.

Length, 13 mm.

Locality.—Saunders, Michigan.

9. *Lithobius sexdentatus* Kenyon.

Locality.—Sioux Co., Nebraska (Kenyon).

10. *Lithobius politus* McNeil.

Localities.—Peoria, Ill. Previously reported from Ludington, Mich., and from Bloomington and Dublin, Indiana.

11. *Lithobius cardinalis* Bollman.

Localities.—Reported from Bloomington, Westfield, Salem and New Providence, Indiana.

12. *Lithobius bilabiatus* Wood.

Syn. *L. tuber* Bollman, Proc. U. S. N. M., 1887.

L. malterris Kenyon, CANADIAN ENTOMOLOGIST, 1893.

Localities.—Grand Island, Neb.; DeWitt and Tama, Iowa; Rock Island and East Peoria, Ill.; Devil's Lake, Wisconsin. Also reported from Winona, Minn., and from Bloomington, Indiana.

13. *Lithobius jowensis* Meinert.

Syn. *L. bilabiatus* Bollman, Proc. U. S. N. M., 1887.

L. bruneri Kenyon, CANAD. ENT., 1893.

A very common species throughout the region.

Localities.—Omaha and Fremont, Nebraska; Mongona, Boone and DeWitt, Iowa; Rock Is., Franklin Grove, Sterling, Peoria and East Peoria, Ill.; Watersmeet, Saunders and Menominee, Michigan; Haugen, Marinette and Beloit, Wisconsin. Reported also from Ludington, Mich., and from Bloomington, LaFayette, Richmond, Greencastle, Salem, New Providence and Wyandotte, Indiana.

14. *Lithobius providens* Bollman.

Localities.—Reported from Bloomington, LaFayette, Richmond, Brookville, Salem, New Providence and Wyandotte, Indiana.

15. *Lithobius pullus* Bollman.

? Syn. *L. dorsospinorum* Kenyon, CANAD. ENT., 1893.

Localities.—Dwight, Ill. Also reported from Nebraska and from Bloomington, Indiana.

16. *Lithobius holzingeri* Bollman.

Localities.—Devil's Lake, Wisconsin. Also reported from Winona, Minn. (common).

17. *Lithobius minnesotæ* Bollman.

Localities.—Haugen, Wisconsin. Reported from Ft. Snelling, Minn.

18. *Lithobius trilobus* Bollman.

Localities.—Reported from Bloomington and Salem, Indiana.

19. *Lithobius exiguus* Meinert.

Localities.—Columbus, Neb.; Mongona, Boone, Marshalltown, Iowa; Peoria, Dwight, Sterling, Ill.; Janesville and Beloit, Wisconsin.

20. *Lithobius tivius* Chamberlin.

Localities.—Fremont and Omaha, Nebraska.

The specimens present slight differences from typical *tivius*, but probably represent the same species.

HABITS OF *SMERINTHUS GEMINATUS* SAY, AND *S. CERISYI* KIRBY.

I have sometimes taken the above two species here, night after night, in about equal numbers, "playing" over water. The habit is a peculiar one, which I have not noticed in any other species. I sometimes find them singly, and sometimes five or six together, flying to and fro, close to the water at open places between the willows, in a creek which runs through my place, generally at places where the banks have been worn down by stock crossing. Their motion is not regular, as in the *Hepialidæ*, but varied and meandering, usually over an area of about 20 feet square or less. So close do they fly to the water, that in striking at them with the net I often splash in mud and water. Though they generally vary their flight a few feet if a net is thrown close to them, they are not easily driven away unless actually struck at and missed, and not always then. The flight lasts about half or three-quarters of an hour, commencing in late dusk, and lasting for some time. Often I have to use a lantern to see to catch them. If a light is shown too close to them, they just move away a few feet, as they do from the net. All I have caught in this manner have been males, but their behaviour has not suggested an assemblage to females. Nor do they seem to be drinking, as I very rarely see one dip. Mr. G. O. Day, of Duncans, B. C., tells me that his son mentions having noticed the habit in *cerisyi*. F. H. WOLLEY DOD, Millarville, Alberta.

INSECTS AND DISEASE.

"THE PREVENTION OF MALARIA," by Ronald Ross, with contributions by other authorities. XIII—669 pp., with plates. (London: John Murray.)

INSECTS AND DISEASE," by R. W. Doane. XIV—227 pp., 112 figs. (American Nature Series, New York: Henry Holt & Company.)

If the goal of civilization is the supremacy of man over the antagonistic forces of nature, then the part which the entomologist is playing in enabling the human race to reach that goal is no small one. No other branch of entomological study has drawn the attention of men, and in particular of statesmen, to the importance which insects play in the economy of mankind, as that which deals with the direct relationship of insects to man as the carriers of disease. When an insect-borne disease is responsible in India alone for an annual mortality of over a million people, when another exacts a penalty of fifty thousand lives from the French as a toll for cutting a portion of the Panama canal, and a third disease in a few years results in the loss of over two hundred thousand lives in Central Africa, it is then that the importance of insects, as the necessary hosts of such diseases as Malaria, Yellow Fever and Sleeping Sickness, is recognized. At the anniversary meeting of the Royal Society, held in December, Lord Robson gave an indication of the forcible manner in which these questions are appealing to men of to-day. He remarked that it is the man of science who is to decide the fate of the tropics, not the soldier or the statesman with his programmes and perorations, but the quiet entomologist. He is the man of science who above all others strikes popular imagination the least and gets less of popular prestige, but he has begun a fascinating campaign for the sanitary conquest of those enormous tracts of the earth, and before long he will have added their intensely fertile soil, almost as a free gift, to the productive resources of the human race. Coming from one who is not a scientist, this statement is all the more significant of the trend of opinion among our public men. The mosquito is shown to be the factor which has prevented the opening up of enormous areas of Africa, and likewise the tse-tse fly by its attacks upon domestic beasts of burden; the flea is proven to be the means of disseminating the plague bacillus; the house-fly is condemned as a serious menace to public health as a carrier of the germs of typhoid and other infectious diseases, and so the story is

continued, the commonest creatures in our midst are proving to be our greatest enemies.

Laveran's discovery of the parasitic organism of malaria in 1880, and the subsequent demonstration seventeen years later by Ross of the part played by the mosquito in its transmission, have, as Prof. Osler has said, "a greater significance for a greater number of persons than any single observation made in connection with disease." The treatment for a subject whose literature stretches back over a period of more than two thousand years, would be an enormous undertaking, and the first of the two books under review does not attempt it. It treats of the prevention of the disease, based on the investigations which have been carried on in malarial regions since the author's discovery of the part which the mosquito plays. A brief history is given of the disease, and of the facts concerning its etiology as a necessary preliminary to a proper consideration of the prophylactic measures with which the volume is chiefly concerned. The various antipaludic measures are discussed and compared as employed in different regions of the world, and the results are given. The author has included contributions by twenty-one other experts on antipaludic measures in different countries, among which those of Dr. Howard on the work in the United States, and of Col. Gorgas on malaria prevention on the Isthmus of Panama, are of special interest. Coming from the pen of one who has rightly received the highest honours as an investigator, and as an authority on antipaludic measures, one would expect such a volume to be of singular merit, and we find that not only are our anticipations fully realized, but that the lucidity of the scientific details is made all the more attractive by the author's power of literary expression, thereby increasing to no small degree the circle of readers to whom the work will appeal.

The second volume is "a popular account of the way in which insects may spread or cause some of our common diseases," and as such will be of real service in explaining to the general reader the more important facts concerning the relations of such insects as mosquitoes, house-flies, fleas and others to human disease. It is extremely readable, and has the advantage over many of the popular accounts which find their way into print of having been written by one who is qualified by acquaintance with the facts to write such an account. While the value of the work is certainly enhanced by the inclusion of so many original photographs, a little more care might have been taken concerning them.

Some idea should have been given as to the relative size of Figures 22 and 23, and it would appear that Figures 53, 55, 56, 57, 59 and 61 are rather needless repetition of what might well have been illustrated in one or two good photographs. Figure 64 is inverted. Of the mistakes in the letterpress, we notice (p. 64) "the larvæ (of *M. domestica*) will become fully developed in from eight to fourteen days"; the minimum period for the larval stadium is about five days; and should not "responds to," on p. 82, line 7, be "records"? The seta of the flagellum of the antenna respond to the note, and this response is probably interpreted by the characteristic nerve-end cells in the swollen base of the antenna.

C. GORDON HEWITT.

BOOK NOTICES.

COLEOPTERORUM CATALOGUS, pars 23, Cleridæ. Sigm. Schenkling, Berlin. W. Junk, Nov., 1910.

This valuable contribution by the recognized authority on the subject is fully up to the high standard established by the author in his masterly work on the family in the "Genera Insectorum."

In the first general catalogue of Coleoptera, that of Gemminger and Harold (1869), only 697 species of Cleridæ were listed; in Lohde's "Cleridarum Catalogus" (1900), the number was increased to 1,822; and in the "Genera Insectorum" (1903), the number recorded was 1,971 species, exclusive of 187 varieties, 162 genera being necessary for their reception. In the present "Catalogus" 2,285 species, 224 named varieties and 185 genera are given as valid, the whole making a volume of 174 pages, of which 39 are devoted to a comprehensive index.

The system followed is essentially that of Lacordaire, with numerous modifications and amplifications. The family is primarily divided into two subfamilies—the CLERINÆ taking the place of Lacordaire's *Clérides vrais*, the CORYNETINÆ that of his *Enopliides*.

The genera are arranged in natural sequence, while the species are given in alphabetical order. The bibliographical and synonymical references, both generic and specific, are quite exhaustive, including those of a biologic and anatomic nature, and the general distribution of each species is also given.

Twenty-seven genera are recognized as members of our fauna, *Laricobius* Rosenhauer being properly omitted from the catalogue, as the

general consensus of opinion is that it should be placed in the family Derodontidæ. Some of the more important nomenclatorial changes noted are as follows: *Monophylla* Spin. takes the place of *Macrotelus* Klug; our two species of *Colyphus* (*furcatus* Schaeff. and *melanopterus* Dury) are referred to *Derestenus* Chevr.; *Tarsostenus* Spin. and *Phyllobænus* Spin. are removed from the subfamily CLERINÆ and assigned to the subfamily CORYNETINÆ. *Clerus* Fabr. is retained for the American species, usually known as such, but for which Prof. Chas. J. Gahan proposed the name *Enoclerus*, our species not being congeneric with the type of *Clerus*—the European *C. mutillarius*.

The letterpress is excellent; the mistakes are few and mainly unimportant, several of these being clearly chargeable to the typographer.

A. B. WOLCOTT.

MEIGEN 1800 ONCE MORE.

The supreme importance of the subject in the nomenclature of Diptera seems to justify a further comment on my part, although the mere difference of view between Mr. Coquillett and myself would not in itself require notice.

The decision of the Commission is that Meigen 1800 was actually published, therefore available if "found valid." Mr. Coquillett omits the word "found," which, to my mind, changes the meaning somewhat. The process of "finding" is what Mr. Stiles leaves to specialists, and as far as I am eligible to express an opinion under that head, I have already indicated that I have no use for Meigen 1800. I have had considerable correspondence with the publishing dipterists of the country in the last few weeks on the subject, and I have yet to find a single one of them who agrees with Mr. Coquillett, that Meigen 1800 should be allowed to take precedence over Meigen 1803.

To illustrate the point that there is a good deal at stake, I might mention Mr. Coquillett's two papers on the types of genera in Empididæ. About seven years ago he published a paper on the subject, applying the rules of the International Zoological Congress; lately, in his work on the types of all the North American genera of Diptera, he necessarily passed over the same field again, this time adopting Meigen's 1800 names. I have taken the trouble to count up the North American species of Empididæ that have their generic names changed in the later paper, and I find that they comprise no less than *forty-five per cent.* of the family!

J. M. ALDRICH, Moscow, Idaho.

ERRATUM.—CAN. ENT., XLIII, p. 51, line 4, for "*le long du*" read "*longe le.*"

Mailed March 11th, 1911.