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NEW HISTORIES IN HYDRÆCIA.

BY HENRY BIRD, RYE, N. Y.

(Continued from Vol. XXVII., page 283.)

Continuing under this heading, the writer would offer a few remarks subservient to a fuller knowledge of the early stages of this genus, which may be considered supplementary to some former papers that have appeared. There is some discussion at present in the current literature as to whether the term *Gortyna*, Och., should not replace *Hydræcia*, Gn., and it is to be hoped definite conclusions may be reached and the proper one fully established. The following early histories are perhaps unknown, or at any rate remain as yet unpublished.

Hydræcia inquesita, G. & R.

This is such a widely-diffused and familiarly-known species that it makes it gratifying to expose some traits of its earlier existence. So general was the poor condition of practically all examples previously seen, that the notion of its being a thin-scaled and ill-marked species had gained quite a hold on the writer. With the specimens bred last season, some light has dawned in the matter, and he would hasten to make amends in behalf of such erroneous impressions. For with conditions right, specimens, rich in a full complement of scales and attractive in their warm, red-brown colouring, were plentifully obtained. In making a choice of food-plant, the larva takes an unusual departure and makes a selection among the Cryptogamous plants, namely, *Onoclea sensibilis*, Linn. One would hardly think of associating these borers with a delicate fern, and, as may be expected, it is the roots which serve as a domicile. These latter are a bit peculiar, at least to a novice in botany. Growing slightly below and parallel to the surface, a principal root-stock creeps with rapidity, sending up fronds at various intervals. Its advancing end is green and soft, and it is to this point that the larva extends its burrow, though free access is kept up to the original entrance. An exceedingly dense growth of tough, hairy rootlets, which resembles the curled hair used by upholsterers, draws nourishment for the plant. By the time the larva has reached maturity, the part of

the root first occupied has died and become more or less decayed, and this point is sought for the pupal transformation; quite often the cell containing the chrysalis is formed among the fibrous rootlets. In no case can any exit arrangement be made, and it goes hard with those examples that have to reach daylight by passing through such a tangle. To this condition it seems possible to attribute the preponderance of rubbed specimens which are taken at light or other sources.

It may be remarked that *Hydracia* pupæ do not attempt to reach the surface or outlet of their burrows by any process of wriggling when about to give up their imago, a circumstance frequently noted among borers in other families. So *inquasita* must reach freedom as best it may, and generally comes out the worse for wear; the only perfect examples to result from those bred were secured from those last to appear and which had been taken from their natural quarters and were placed on the surface of damp leaf-mould. So long had this species been sought in its larval state, that the ease with which its whereabouts may be known and the flagrant evidence it leaves behind as it first enters the plant make it seem ludicrous that it could have been passed by for so long. One may drive along a country road or even board a trolley car and yet not see this species by the wayside. This, however, only applies to a certain season, as later there is nothing to guide one, while a search for the pupæ would be time wasted. About the first of June the young larvæ (presumed to have hibernated in their first stage) enter the frond stem and begin active operations. In a few days the root is reached and henceforth remains the only portion inhabited; in fact, the delicate stem could not long accommodate the enlarging insect. Here the list of casualties begins, as that telltale secret of a hidden larva which appears in the foliage of the plant at this period is as conspicuous to the eyes of its parasitic foes as it can be to human optics. So, a fearful percentage suffer from this source, and many more attain a violent end. *Onoclea*, with true fernlike propensities, is fond of damp places, though less so than many others, and often grows in depressions that are for a time inundated after heavy rains or showers. If we then visit an infested locality which has a low situation, the number of drowned individuals will quite appal us and our hopes of a rich harvest will receive a serious jar.

When first detected, the larva had certainly passed through at least one moult, though it was noted almost as soon as work was begun. At this period it is very delicate and slender, translucent except on the first

four abdominal segments, which are dark, somewhat purplish in hue. Lines on the thoracic joints may be faintly made out, whitish; their continuations on the last abdominal one are less so. An important individual point is that no lines, not even a faint continuation of the dorsal, cross the dark contrasting area shown on the first four abdominal segments. The head and plates are semi-transparent; but little can be made out of the tubercles, though there seems a fair complement of setæ; length .65 inch.

Next stage: The salient characteristics with *Hydracia* larvæ belonging to this section of the genus are now well exemplified. The abrupt termination of the usual dorsal and subdorsal lines on four of the middle segments leaves this space presenting the contrasting effect of a dark band or girdle, thus making it always easy to distinguish the young larvæ of this group.

Head now measures .06 inch across, a shining honey-yellow colour. Its development is normal, a few minute setæ arise on the front; a black, oblique line at the side, which takes in the ocelli, is the only marking. The thoracic shield is a shining plate as wide as the head and very nearly covers the first segment above the line of the spiracles. It is prominently edged at the lateral borders with black, which finds a continuation on the head in the line above mentioned. The tubercles are hardly definable, though their position is usually indicated by minute setæ. The anal plate is similar to the thoracic in texture, projects outwardly over the last pair of pro-legs and offers a protective shield at this extremity. The usual preceding plates on the last segment are well developed for this early stage. On the segments where they occur the ordinary lines are whitish and so wide as to overbalance the dark body colour. The spiracles are black. Larva now measures .95 inch in length.

Following stage: A marked gain in bulk is noticed, otherwise appearance remains similar. The black side line disappears from the head; the lateral tubercles come into prominence, iv is most noticeable behind the spiracles except on joint ten where it is low down. On the next to last segment i and ii have become much enlarged.

Length 1.10 inches.

Penultimate stage: Head and shields retain their respective proportions, tubercles improminent, i and ii, on all joints but the last, are the merest dots, requiring close scrutiny to observe when unaided by a lens.

The colour has faded toward the conventional translucence of maturity, though there still remains a flush of purple-brown on the first four abdominal segments. Length 1.48 inches.

Mature larva: All traces of the longitudinal lines have disappeared, its shade may perhaps be designated as a translucent flesh colour, lightest on the thoracic joints. The tubercles show no gain in importance, and compared with its congeners are not strongly defined. On the seventh abdominal segment iv is low down below the line of the spiracles, very low down, in fact, and close beside v. Other features remain as before. Head now measures .11 inch across; length of larva 1.65 inches. The actual duration of the various stages was not noted, but the entire time consumed after feeding had begun until maturity is reached was reckoned at about fifty-one days.

The pupa is similar to its allies and agrees with the regulation noctuid type. From being formed in more or less of a cell, it does not show the cylindrical shape of some others which, by reason of the small diameter of their burrows, are so confined as to be unable to assume a truly normal form. It is of the usual shining chestnut brown, with ordinary delineations, armed with a bifidate spur of slender proportions. Length .65 to .80 inch. Pupation occurs about August 20, but the species are in no way regular upon this event. Imagoes appear twenty-eight days later.

It was a matter of some gratification that the specimens bred last season proved to be partly those forms or variations of the imago having the orbicular white-marked. Previous acquaintance with local examples had only encountered those in which the ordinary spots were concolorous, and it seemed possible the species might be subject to some geographical or racial variations where these features might predominate. That this variation occurs indiscriminately and does not bear on geographical lines is slightly important, since the matter of variation in *Hydræcia* is still open to some study, and any fully-established points in evidence offer a help toward final solutions.

Hydræcia limpida, Gn.

This species had never been taken in this locality; in fact, the writer had not been able to secure an example from any source, so that the discovery of its larva and the subsequent acquisition of a good series of imagoes was as great a surprise as it was a pleasure. Like many of its associates which are strictly root-borers, this larva gives but a slight intimation of its whereabouts, and one is indebted to some chance incident

for its discovery. The food-plant is *Veronica virginica*, which grows sparingly in this section, and although a borer may have attained maturity in its principal root, there is often no evident deterioration of growth. Sometimes, however, the mature larva will have consumed so much of the root at its crown, to provide itself with more commodious quarters, that the stock will have died and become blackened, thus standing a mute sentinel to all who are apprised of its secret. The young borer enters the stem slightly above the ground level, where a small opening is made, furnishing air and an outlet for accumulations which would otherwise clog the gallery. Free access is kept up to this point until maturity, even though the widely-extending roots permit the larva to bore a foot or more in various directions. The roots are small for the habitation of such a guest, and it is the extended mining which they do that often results in the destruction of a specimen when the larvæ are sought for transference to the breeding cage. One never knows at what point to expect his quarry, and a fatality often occurs. Aside from this the species seemed to thrive very peacefully. The change to pupa appears to be made in the neighboring soil, and the gallery is not used as an exit by the moth, though this point has not been settled definitely, since no pupæ were obtained in the field. Larvæ were encountered in second stage from the last. They were quite as easily recognized as belonging to *Hydracia* as the preceding, having the usual characteristics well in evidence. The colour is a pale, sordid sienna; the lines dirty white; plates not strongly defined and the tubercles less so. Specimens were so scarce that this period was insufficiently observed.

Penultimate stage: Inflates were now secured and definite notes taken. This next to last stage is the most important in making comparisons in this genus, as the individuality fades later into a very general translucence, though of course the tubercle arrangement and structural details still point to their specific attributes.

Larva now shows some points in common with its near ally *cerussata*, though the size and colour are quite dissimilar. On the thoracic joints the skin is puckered or creased, so as to appear slightly contorted, and all tubercles or plates are well defined; the anal plate, however, does not show the departure occurring with its ally.

Head measures .08 inch; regular, smooth and shining; of a honey-yellow colour, the mouth-parts alone showing tipped with brown; there seems a full complement of setæ, but the side or ocellar line is wanting.

Body is slender, of the usual cylindrical build, the constrictions of the thoracic regions are already noted. Colour as in earlier stage, a pale sienna, in some specimens showing rather pink on the first four abdominal joints. This area is not crossed by the longitudinal lines. These latter are whitish; on the thoracic segments they are rather confused, their continuation on the rear abdominal ones shows well-defined and regular. Thoracic shield a little wider than the head, of the same shining, corneous texture, edged faintly at the sides with brown; anal plate is similar, smooth and shining, its setæ of usual prominence. The tubercles are all well defined, of an umber shade, iv the largest of the lateral ones. On joints two and three, iii, iv and v are clustered in their triangular setting, and by reason of their large size, especially iv, almost touch one another. On all segments but the next to last, i and ii are small, as is customary, and show somewhat darker. On joint eleven these are very large and placed in quadrangular form. The plates preceding the anal one are barely cut in twain by a thread of the dorsal line. The spiracle on joint one is most conspicuous by reason of the lighter colour of this segment, and it is entirely black. The other spiracles show a light centre and have their elliptical margin ringed with black. On the seventh abdominal segment there are five tubercles clustered around the spiracle. What had previously been considered as a raising of iv, in some cases, to the upper corner of the spiracle, seems now very plainly the acquisition of an accessory tubercle at this point, the normal iv all the while retaining its usual position on this segment, lower down. But this additional one is as fully developed as iv is on this or the preceding joints, and its placing corresponds identically with the arrangement as occurring on joints four to eight. With two other species this additional tubercle first appears in this penultimate stage, iv previously occupying its lower position and remaining unchanged after entering the stage, the additional tubercle now appearing, but causes no alteration with the normal iv. We may designate this acquisition as iv a, looking upon its arrival in the same light as the other cases cited, though observations with *limpida* were insufficient to say at what time it was acquired. Larva now measures 1.38 inches.

Final stage: There appears no structural change from the preceding period. The lines disappear, a flesh-coloured translucence is now the tint. The spiracles, tubercles and true-legs are all black; the shields are unchanged. Length 1.63 inches. Larvæ attain full growth by August 19.

The pupa is formed in the adjoining soil, at least this happened with the examples in confinement. It shows no departure from the usual form, agreeing very well with the preceding species. Length .90 inch.

No larval history so far encountered has been quite so satisfactory to the writer, nor possibly of greater general importance than this meeting with *limpida*. From the date of its first conception a certain haziness existed regarding the species. Guenée himself was not sure of its distinctness, though his fear of its being a variety of *marginidens* or *nebris*, simply because they were all white-spotted forms, has proved to be groundless. Prof. Grote sees it in another light, and in naming his *cerussata*, pauses over the matter lest his newer term might be simply a more robust form of the Guenée species. Yet the differentiation has proved correct. With the recent "Revision," by Prof. Smith, and the more abundant material of this later date, the specific distinctness of the two are not questioned by him, though there seems no strong line to be drawn between the two.

Adding to this the many queries received from all sides, makes it seem worth while devoting a word in these pages to descriptive detail, since the literature is in no way burdened with a reference to this species. An eminent lepidopterist long ago gave me a translation of the original description, which is as follows: "♂ 26 mil., ♀ 40 mil. Fore wings very entire, of a deep brownish black with traces of ordinary lines. Subterminal line marked at apex by a vague yellowish point. Reniform white, divided by brown threads and shaded centrally with yellowish; the three outer spots white like the preceding species (*marginidens*), nearly even. Hind wings similar in both sexes, whitish, a little transparent, with external margin and veins brownish. Beneath the four wings gray, powdered with brown, with dark mesial lines. Thorax gray, no white spots at the base of the primaries. Illinois; Coll., Doubleday."

Fresh examples of *limpida* are beautiful insects indeed; there is a certain violet tint pervading its colouring, which, unfortunately, soon fades, and the contrasting white spots tempered by a fleck of cream, together with an exceedingly trim appearance, quite captivate one upon first meeting the species. The mention of the hind wings being "whitish, and a little transparent," should not be misleading, as they are in fact much less smoky than *cerussata*, more silky, and with worn or badly-faded material could easily be construed into a certain semi-transparency. The salient feature of the description is the remark noting the absence of any

white in the basal area. Rye specimens are plainly typical in this respect, for this latter feature is somewhat a departure from the general rule and at once becomes noticeable. In the "Revision," specimens having a white basal line or a few whitish scales here, together with a more reddish tinge of the median field, are described and show to some extent how to gauge our conception of its variation.

But this is along the conventional lines upon which variation occurs in the group. The prevalence or absence of white in the basal area, the orbicular, claviform and reniform spots, and finally in the scales at the base of the antennæ, is not a point by which any very rigid rule can hold. Examination of a good series of any of the allied species will soon show this, yet individually this variation is not so great—it is in the mixing of the species wherein results confusion. Perhaps the greatest point of specific constancy as we glance superficially at a collection, though apparently a very insignificant matter, is the general hue or tint of the body vestiture (applicable only with fresh specimens), and secondly, the wing outline is important. But, fortunately, we are not dependent on conceptions of varying shades and colours, since individual opinions differ in such matters and colour-blindness exists to a wide degree—rather may we rejoice that these closely-related species cannot always mystify us, but in their larval stages show departures easy of recognition.

The unravelling of these early histories seems necessarily a slow task and one which often brings the student under, to him, an amusing criticism, since it becomes so necessary to dig and delve in such a varied number of locations—be it the side of the village turnpike or a neglected corner of a country churchyard—and one frequently hears the passer-by remark upon the sad affliction of being "slightly touched on the subject of bugs and all that." But with success as a reward to our efforts, such remarks only elicit a smile, and we are well satisfied indeed if we have but found our quarry.

THE THIRTY-FIRST ANNUAL REPORT of the Entomological Society (1900) has just been published by the Ontario Department of Agriculture. In its pages will be found many articles of an interesting and important character, dealing for the most part with entomological subjects of a practical nature.

THE GENERAL INDEX to the Thirty Annual Reports, 1870 to 1899, is now on sale by the Society. Price (including postage): unbound, 25 cents; bound in black cloth, 50 cents.

SOME PLANT-LICE AFFECTING PEAS, CLOVER AND LETTUCE.

BY E. DWIGHT SANDERSON, NEWARK, DEL.

(Continued from page 39.)

LETTUCE APHIDS.

Nectarophora lactuce, Walk.

(Pl. III., 8.) Several writers have listed *S. lactuce*, Kalt. as an American species. That of Thomas is noted below. Dr. J. B. Smith gives the species in his Insects of New Jersey. Whether the species occurs in this country or not is open to question. It should be noted here that Kaltenbach's *Aphis lactuce* is a *Rhopalosiphum*. Buckton gives both *Siphonophora lactuce*, Kalt. and *Rh. lactuce*, Kalt., though Kaltenbach described but one species. Walker (Ann. and Mag. Nat. Hist., Ser. 2, p. 49, 1849) in his description of the species confused it with *Rh. lactuce*, Kalt., as Passerini has pointed out. Walker described it as *Aphis lactuce*, Linn. and as a synonym of *A. lactuce*, Kalt., though Kaltenbach had already shown *A. lactuce*, Linn. to have been invalid, and that his species was entirely distinct. Walker also gives *A. ribis-nigri*, Mosley (Gard. Chron. I., 684) as a synonym. Mosley's description is hardly recognizable, but evidently is the same as some of the varieties described by Walker, both undoubtedly referring to *Rhopalosiphum ribis*, Linn., and *Myzus ribis*. Unfortunately, Walker describes only the coloration of his species. Part of his species is evidently, however, *N. lactuce*. Passerini's description is too brief to be recognizable, but probably refers to the same species, as Buckton thought. Why Buckton described the species as *S. lactuce*, Kalt., is not clear. Buckton follows Walker in giving *Ribes nigrum* and *grossularia* as food-plants, and remarks that Walker states that the cornicles are enlarged at the middle, but does not otherwise seem to confuse the species with others as did Walker. Mr. Buckton has kindly loaned me specimens which correspond very closely with his description. The slide is labelled, "(18) A. R. *Siphonophora lactuce*," and "*S. lactuce*, Walk." They are as follows:

Winged Viviparous Female.

Length, 2.32 mm.; width, 0.82 mm.; antennæ, 3.10 mm.; III., 0.73 mm., IV., 0.50 mm., V., 0.41 mm., VI., 0.12 mm., VII., 1.11 mm.; Tibia, I., 1.35 mm., II., 1.45 mm., III., 1.85 mm.; Cauda, 0.19 mm.;

Cornicles, 0.50 mm.; Wing expanse, 7.50+ mm.; Beak extending to mesocoxæ.

Antennæ dark, III. and IV. with sensoria, hairs capitate; legs light, tips of femora and tibia, and tarsi dark, some of hairs on legs capitate; cornicles straight, cylindrical, reaching to or slightly beyond tip of cauda, darkish at bases and tips, cauda dark; lateral edges of abdomen with black spots, abdominal segments banded and irregularly marked with dark, bases of setæ in lateral spots and of two dorsal setæ on caudal segments, large and conspicuous. Two specimens.

Apterous Viviparous Female.

Length, 2.5 mm.; width, 1.30 mm.; antennæ, 2.65 mm.; III., 0.63 mm., IV., 0.48 mm., V., 0.38 mm., VI., 0.10 mm., VII., 0.92 mm.; Tibia, I., 1.2 mm., II., 1.35 mm., III., 1.70 mm.; Cauda, 0.28 mm.; Cornicles, 0.57 mm.; Rostrum extending to between meso- and meta-coxæ.

Antennæ light, joints, tip of V., VI. and VII. dark, III. with sensoria, abdomen unmarked. One specimen.*

This species is readily distinguished from the allied American *Nectarophora* described above by the sensoria on IV. of the antennæ of the winged female, and by the larger number (12 or so) of sensoria on III. of the apterous female.

Kaltenbach and Buckton both consider *S. lactuæ*, Koch., as probably *S. sonchii*, Linn.

Rhopalosiphum ribis, Koch., is probably *Myzus ribis*.

Rhopalosiphum lactuæ, Kalt.

(Pl. III., 9.) This species was taken October 27, 1899, on *Sonchus oleraceus* at Newark, Del., in large numbers, and was kindly determined by Mr. Th. Pergande. It corresponds closely to Buckton's description. Many of the nymphs and pupæ were pink. No search was made for the sexes at the time, but several males have been found in the preserved material. No oviparous females were found, and apterous females were scarce. The males and winged females seem to be almost absolutely alike in size and markings.

Winged Male.—Length, 2.20 mm.; width, 1.00 mm.; antennæ, 2.95 mm., III., 0.71 mm., IV., 0.51 mm., V., 0.46 mm., VI., 0.12 mm., VII.,

* The number of specimens mentioned under each species refers to the number of perfect specimens from which the description was drawn; a much larger number are preserved of most of them.

1.20 mm.; Tibia, I., 1.25 mm., Cauda, 0.21 mm.; Cornicles, 0.34 mm.; III., IV. and V. with numerous sensoria. Two specimens.

Winged Viviparous Female.—Length, 2.56 mm.; width, 1.00 mm.; antennæ, 2.75 mm., III., 0.74 mm., IV., 0.50 mm., V., 0.40 mm., VI., 0.12 mm., VII., 0.84 mm.; Tibia, I., 1.10 mm., III., 1.66 mm.; Cauda, 0.28 mm.; Cornicles, 0.44 mm.; III., IV. and V. with numerous sensoria. Five specimens.

Apterous Viviparous Female.—Length, 2.7 mm.; width, 1.30 mm.; antennæ, 2.55 mm., III., 0.72 mm., IV., 0.47 mm., V., 0.33 mm., VI., 0.11 mm., VII., 0.84 mm.; Cauda, 0.29 mm.; Cornicles, 0.53 mm.; Rostrum extending to mesocoxæ; two or three sensoria on III. Three specimens.

Myzus Pergandii, n. sp.

Winged Viviparous Female. (Pl. III., 10., Fig. 5.)

Wing expanse, 7.00 mm.; length, 1.69 (1.25–2.00) mm.; width, 0.71 (0.50–0.85) mm.; antennæ, 2.07 (1.60–2.10) mm., III., 0.52 (0.40–0.60) mm., IV., 0.43 (0.30–0.46) mm., V., 0.30 (0.24–0.34) mm., VI., 0.15 (0.14–0.16) mm., VII., 0.56 (0.42–0.62) mm.; Tibia, I., 0.96 (0.70–1.10) mm., II., 0.94 mm., III., 1.28 (1.00–1.50) mm.; Cauda, 0.19 (0.15–0.23) mm.; Cornicles, 0.36 (0.28–0.40) mm.

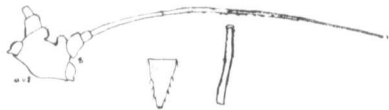


FIG. 5.—*Myzus Pergandii*, n. sp.: Antenna, cauda and cornicle of apterous viviparous female.

Head, antennæ, thoracic dorsal, lateral, and ventral sclerites, distal half of femora, tips of tibia, tarsi, and cornicles, black; membrane of thorax brownish, as are legs; abdomen dirty white, marked with three large lateral blackish spots in front of cornicles, a large dark spot dorsally covering segments three, four, and five, with two lateral branches on either side, segments six and seven dark, eight light with small dark band, cauda and ventral plates dark, eyes black; small brown ring at base of III. (antennal segment), 12 to 15 sensoria on III.; stigma brown, slightly smoky. Twelve specimens.

Apterous Viviparous Female.

Length, 1.85 (1.50-2.10) mm.; width, 1.05 (0.90-1.10) mm.; antennæ, 1.80 (1.75-2.20) mm., III., 0.48 (0.40-0.64) mm., IV., 0.37 (0.35-0.41) mm., V., 0.25 (0.20-0.32) mm., VI., 0.13 (0.10-0.15) mm., VII., 0.45 (0.38-0.54) mm.; Tibia, I., 0.81 (0.70-1.00) mm., II., 0.83 (0.70-1.00) mm., III., 1.15 (0.93-1.40) mm.; Cauda, 0.20 (0.16-0.22) mm.; Cornicles 0.50 (0.48-0.60) mm.; Rostrum extending to mesocoxæ. Eyes, tips of cornicles, and tarsi black, otherwise pure whitish, with indistinct greenish mesal stripe on abdomen, sometimes with a few capitate hairs on caudal segments, tibia, and head; no lateral tubercles; antennæ lie flat over back when at rest, and the gibbous tubercles are thus bent upwards. Thirteen specimens.

This species is closely allied to *M. achyrantes*, Monell (*M. malvæ*, Oest.), as described by Monell and Oestlund. The apterous females are distinguished from it by the longer antennæ, which are whitish, eyes black instead of red-brown, and abdomen whitish instead of pea-green as in *malvæ*. The winged female is distinguished by having the inner angles of I. straight or but slightly rounded, VII. slightly longer than III., and cornicles black. The apterous females are very similar to *Siphonophora calendulella*, Monell, but the description of that species is too brief to be recognizable. Monell mentions that a species closely allied to *S. achyrantes* occurs on lettuce.

The winged females bear a resemblance to *Rhopalosiphum dianthi*, Schr., but are smaller, the cornicles are not swollen and are black, and only III. bears sensoria, while Oestlund describes the winged *dianthi* as having sensoria on III., IV. and V.

Specimens of this species were kindly loaned me by Prof. W. G. Johnson, from Baltimore Co., Md., collected on lettuce, February, 1899; were found by me on garden peas, November 1, 1900, at Newark, Del., and were collected by Prof. G. H. Powell, May 3, 1897, on eggplant under glass—to which they were doing considerable injury—at the same place.

The description given by Thomas under *Siphonophora lactucæ*, Kalt., refers either to this species or *M. achyrantes*, Monell.

Types deposited in the U. S. Nat. Museum. Type No. 5422.

EXPLANATION OF PLATES.

Plate II. (page 34).

1. "*Siphonophora pisi*," from G. B. Buckton.

2. "*Siphonophora pisi* (?)," from G. B. Buckton.
3. (*Nectarophora destructor*, Johns.)
4. *N. pisi*, var. *reticulata*.
5. *N. pisi*, var. from Iowa :
 A, apterous viviparous female ; W, winged viviparous female ;
 M, male ; a, antenna ; ca, cauda ; cl, cornicle ; wg, wing ; sp,
 spring.
 (From camera lucida drawings by the author.)

Plate III.

8. "*Siphonophora lactuæ*, Walk.," from G. B. Buckton.
9. *Rhopalosiphum lactuæ*, Kalt.
10. *Myzus Pergandii*, n. sp.
 (From camera lucida drawings by the author.)

CICADIDÆ — AMERICAN GENERA AND SPECIES.

BY ALEX. D. MACGILLIVRAY, ITHACA, N. Y.

The following bibliographical catalogue was prepared several years ago, and thinking that other workers might find it of use, it is offered for publication at this time. A table of the genera, compiled from the writings of various systematists who have dealt with this family, is added to make the paper more complete.

TABLE OF GENERA.

- A. Lateral margins of the pronotum not angulately dilated.
 - b. Basal abdominal segment of the male not expanded or dilated above so as to conceal the tymbal or drum ; the operculum usually rudimentary or wanting.
 - c. The ulnar* veins coalesced at base ; tegmina with eight apical cells. *Melampsalta*, Kol.
 - cc. The ulnar veins not coalesced at base.
 - d. The first apical cell of the tegmina distinctly longer than the second *Tibicen*, Latr.
 - dd. The first and second apical cells of tegmina equal.
 - e. Costal margin of the tegmina very convex ; second ulnar cell large and triangular ; the posterior wings with six apical cells *Platypedia*, Uhl.

*See Stal, Hemip. Afr., IV., p. 264, for terminology of wing veins.

- ee. Costal margin of the tegmina only very slightly convex.
 f. The posterior wings with four apical cells* *Prunasis*, Stal.
 ff. The posterior wings with five apical cells *Calyria*, Stal.
- bb. Basal abdominal segment of the male expanded or dilated above so as to conceal the timbal; the operculum well developed.
- c. The cross-vein at the base of the second apical cell of the tegmina not oblique, forming right angles with the longitudinal veins. *Proarna*, Stal.
- cc. The cross-vein at the base of the second apical cell oblique, forming angles greater or less than a right angle with the longitudinal veins.
- d. The postcostal marginal and the postcostal ulnar veins not parallel, more distant towards the apex.
- e. Metasternum not at all or slightly elevated at middle, elevated part not produced in front at middle. *Tympanoterpes*, Stal.
- ee. Metasternum transversely elevated, elevated part longitudinally impressed, slightly produced in front, the produced part truncate or sinuate. . . *Fidicina*, A.-S.
- dd. The postcostal marginal and the postcostal ulnar veins parallel, not more distant towards the apex.
- e. Basal area of the tegmina rarely twice as long as wide; apex of the clypeus truncate or subsinuate truncate *Cicada*, Linr.
- ee. Basal area of the tegmina twice as long as wide; apex of the clypeus subacuminate or very slightly rounded *Tettigia*, Kol.
- AA. Lateral margins of the pronotum angulately dilated.
- b. Ulnar veins contiguous at base, interior ulnar area narrowed at base. *Zammaria*, A.-S.
- bb. Ulnar veins distant at base, interior ulnar area with its sides subparallel. *Odopoea*, Stal.

*Stal is not consistent regarding the number of apical cells in this genus: in his original description, Rio Jan. Hem. Faun., II., 2: he says, "*Alae areolis apicalibus quattuor*, and in Hemip. Africana, IV., 9, says, *Atis areis apicalibus sex*, while Ashmead, Entomol. Amer., IV., 141, says, "Elytra with 4 apical cells."

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Habitat—Southern California.

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 Habitat—Texas.

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 1866. Stal, Hemip. Afr. IV., 25.
Blaisdelli, Uhl.
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 Habitat—California.
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 Habitat—Colorado, Nevada, California.
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 Habitat—East of the Rocky Mountains.

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 Habitat—Utah.

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 Habitat—Colorado, Illinois.

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Championi, Dist.1881. *Proarna*, Distant, Biol. Cent. Amer. Homop., 12.1888. *Proarna*, Woodworth, Psyche, V., 68.

Habitat—Mexico, Texas.

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Habitat—Texas, Arizona.

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Habitat—Rio Grande Region of Texas, Mexico, West Indies, South America.

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Habitat—Southern Texas, Mexico, Brazil.

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 1888. = *marginata* Say, Woodworth, Psyche, V., 68.
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 Habitat—Konza Indian Settlement, ? Nebraska.

biconica, Walk.

1850. *Cicada*, Walker, Cat. Brit. Mus. Homop. I., 120.
 1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 153.
 Habitat—Florida, West Indies, Mexico.

bicosta, Walk.

1850. *Cicada*, Walker, Cat. Brit. Mus. Homop. I., 112.
 1881. *Cicada*, Distant, Biol. Cent. Amer. Homop. 7 ; pl. III., 1.
 1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 154.
 Habitat—Key West, Florida ; Costa Rica, Mexico, Lower California.

canicularis, Harris.

1841. *Cicada*, Harris, Ins. Inj. Veget., 175.
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 Habitat—East Rocky Mountains.

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 Habitat—New Mexico, California.

dorsata, Say.

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 1859. *Cicada*, LeConte, Comp. Writ. Say, II., 252.
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 1856. *Cicada*, Fitch, Rept. Inj. Ins. N. Y. I., 41.

1888. = *dorsata* Say, Woodworth, Psyche, V., 68.
Habitat—Missouri, Colorado, Illinois to Texas, New Mexico.
- marginata*, Say.
1825. *Cicada*, Say, Journ. Acad. Nat. Sci. Philad. IV., 330.
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pl. IX., 17.
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1890. *Cicada*, Walker, Cat. Brit. Mus. Homop. I., 105.
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literata, Walk.
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figurata, Walk.
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1892. = *marginata* Say, Uhler, Trans. Md. Acad. Sci., 150.
Habitat—New York to Northern Florida, Gulf States, Texas,
Arkansas, Missouri, Colorado, Utah.
- Montezuma*, Dist.
1881. *Cicada*, Distant, Biol. Cent. Amer. Homop., 8 ; pl. II., 2.
1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 154.
Habitat—Texas, New Mexico, Arizona, California, Mexico.
- pallida*, Dist.
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1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 153.
Habitat—Texas, Mexico.
- reperta*, Uhl.
1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 177.
Habitat—Florida, North Carolina, Louisiana.

rudis, Walk.

1858. *Fidicina*, Walker, Cat. Brit. Mus. Homop., Suppl., 13.
 1881. *Cicada*, Distant, Biol. Cent. Amer. Homop., 8; pl. II., 20.
 1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 154.

Habitat—Eastern Mexico, ? Arizona.

sordidata, Uhl.

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Habitat—Florida.

superba, Fitch.

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 1869. *Cicada*, Stal, Hemip. Fabr. II., 6.
lyricen, DeG.
 1778. *Cicada*, DeGeer, Ins. III., 212; pl. XXII., 23.
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variegata, Fabr.
 1794. *Cicada*, Fabricius, Ent. Syst. IV., 19.
 1803. *Tettigonia*, Fabricius, Syst. Rhyng., 37.
 1830. *Cicada*, Germar, Thon. Ent. Archiv. II., 4.
 1869. *Cicada*, Stal, Hemip. Fabr. II., 116.
 1892. = *tibicen* Linn. Uhler, Trans. Md. Acad. Sci., 149.

opercularis, Oliv.

1790. *Cicada*, Oliver, Enc. Meth., 749.
 1869. = *tibicen* Linn., Stal, Hemip. Fabr. II., 6.
pruinosa, Say.
 1825. *Cicada*, Say, Journ. Acad. Nat. Sci., Philad. IV., 330.
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 1889. *Cicada*, Provancher, Petite Faun. Ent. Canad. III., 211.

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Habitat—North America.

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Habitat—Texas, Mexico.

viripennis, Say.1830. *Cicada*, Say, Journ. Acad. Nat. Sci. Philad. VI., 236.1851. *Cicada*, LeConte, Comp. Writ. Say, II., 372.1892. *Cicada*, Uhler, Trans. Md. Acad. Sci., 153.‡*albipennis*, Worth.1888. *Cicada*, Woodworth, Psyche, V., 68.

Habitat—Arkansas, Arizona, New Mexico, Texas, Louisiana, Florida.

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Habitat—Pennsylvania, New Jersey to Florida, Alabama, Mississippi, Louisiana, Texas.

ZAMMARA, A. & S.

1843. *Amyot et Serville*, Hist. Nat. Hemip., 468.

smaragdina, Walk.

1850. *Zammar*a, Walker, Cat. Brit. Mus. Homop. I., 33.

1881. *Zammar*a, Distant, Biol. Cent. Amer. Homop. 3; pl. I., 1.

1888. *Zammar*a, Woodworth, Psyche, V., 67.

1892. *Zammar*a, Uhler, Trans. Md. Acad. Sci., 174.

angulosa, Walk.

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Habitat—California, Mexico.

PRACTICAL ENTOMOLOGY.

A CONTRIBUTION TO THE STUDY OF THE INSECT FAUNA OF HUMAN EXCREMENT (with especial reference to the Spread of Typhoid Fever by Flies). By L. O. Howard, Ph.D. Proc. Washington Acad. Sciences, December 28, 1900. Royal 8vo., pp. 60, fig. 22, plates 2.

This paper, just issued by Dr. L. O. Howard, the United States Entomologist, is of enormous and far-reaching importance. The subject is, undoubtedly, at first sight an unpleasant one; but it is of such intense interest to all, that it becomes the duty of anyone who appreciates the bearing of this paper to draw public attention to it, as a source of authoritative and definite information on a subject which may affect the health of every individual in every community, especially where many human beings are gathered together, as in military camps and large cities. Moreover, this paper indicates a ready means, always available, by which the spread of typhoid fever, cholera and other kindred diseases may be to a large extent prevented. It has for some time been recognized by advanced physicians and some few others, that "flies" are the direct agents in the distribution of some diseases; but Dr. Howard, by the investigations which are here summarized, proves what kinds of flies are responsible for this evil, shows the way in which they do it, and points out how it may be prevented. The present contribution is a record of actual observations by Dr. Howard and his assistants at Washington, aided by correspondents in many parts of the United States. Dr. George M. Sternberg, Surgeon-General of the U. S. Army, and other high medical authorities are cited, showing the importance of the careful and regular treatment of fecal matters in large encampments, and instances are given of the fatal results of neglecting the precautions recommended.

Dr. H. A. Veeder, in a paper entitled "Flies as Spreaders of Disease in Camps," published in the New York Medical Record of September 17, 1898, brought together a series of instances and strong arguments in favour of his conclusion that flies are prolific conveyers of typhoid under improper camp conditions.

In Dr. G. M. Sternberg's circular No. 1, published April 25, 1898, explicit directions were given to army surgeons regarding sinks, which, if explicitly followed, would have prevented the spread of typhoid by flies. Two sentences may be quoted from this circular: "Sinks should be dug before a camp is occupied, or as soon after as practicable. The surface of faecal matter should be covered with fresh earth or quicklime or ashes three times a day. No doubt typhoid fever, camp diarrhoea, and probably yellow fever, are frequently communicated to soldiers in camp through the agency of flies, which swarm about faecal matter and filth of all kinds deposited upon the ground or in shallow pits, and directly convey infectious material, attached to their feet or contained in their excreta, to the food which is exposed while being prepared at the common kitchen or while being served in the mess tent." Thus the Surgeon-General not only gave sound instructions, but stated his reasons for these instructions:

"In 1898 an epidemic occurred in the camp of the Eighth Cavalry at Puerto Principe, Cuba, in which 250 cases of the fever occurred. The disease was imported by the regiment into its Cuban camp, and Dr. Walter Reed, U. S. A., upon investigation, reported to the Surgeon-General that the epidemic 'was clearly not due to water infection, but was transferred from the infected stools of the patients to the food by means of flies, the conditions being especially favorable for this manner of dissemination.'

"The agency of flies in the transmission of Asiatic cholera was convincingly shown at an early date by the observations of Tizzoni and Cattani, Sawtchanko, Simmonds, Uffelmann, Flugge and Macrae, while Celli had shown as early as 1888 that flies fed on the pure cultures of *Bacillus typhi abdominalis* were able to transmit virulent bacilli into their excrement."

Owing to the prevalence of typhoid in the United States Army during the summer of 1898, an Army Typhoid Commission was appointed in that year, at the request of the Surgeon-General. The report of this Commission has not yet been published, but one of the members, Dr. Victor M. Vaughan, U. S. V., read before the annual meeting of the

American Medical Association, at Atlantic City, New Jersey, June 6, 1900, a paper entitled "Conclusions Reached After a Study of Typhoid Fever Among American Soldiers in 1898." This paper, which is one of the most important contributions to the study of enteric fevers published, comprises 53 categorical conclusions. The one relating to flies is as follows:

"27. Flies undoubtedly served as carriers of the infection.

"My reasons for believing that flies were active in the dissemination of typhoid may be stated as follows:

"*a.* Flies swarmed over infected faecal matter in the pits and then visited and fed upon the food prepared for the soldiers at the mess tents. In some instances, where lime had recently been sprinkled over the contents of the pits, flies with their feet whitened with lime were seen walking over the food.

"*b.* Officers whose mess tents were protected by means of screens, suffered proportionately less from typhoid fever than did those whose tents were not so protected.

"*c.* Typhoid fever gradually disappeared in the fall of 1898, with the approach of cold weather and the consequent disabling of the fly.

"It is possible for the fly to carry the typhoid bacillus in two ways. In the first place, faecal matter containing the typhoid germ may adhere to the fly and be mechanically transported. In the second place, it is possible that the typhoid bacillus may be carried in the digestive organs of the fly and may be deposited with its excrement."

The miasmatic theory of the origin of typhoid fever was not supported by the investigations of the Commission, and it was found that infected water was not an important factor in the spread of typhoid in the national encampments of 1898. The conclusion was reached that the fever is disseminated by the transference of the excretions of an infected individual to the alimentary canals of others, and that a man infected with typhoid fever may scatter the infection in every latrine, or regiment, before the disease is recognized in himself, while germs may be found in the excrement for a long time after the apparent complete recovery of the patient. The remarkable statement is made that in the encampments of 1898 about one-fifth of the soldiers developed typhoid, and that more than 80 per cent. of the total deaths were caused by this fever.

In all medical and newspaper literature on this subject the expression used in connection with insects has been simply "flies." It occurred to

Dr. Howard, in 1898, that from the scientific and practical points of view there was a distinct necessity for careful investigation of the insects which breed in human fæces, or are attracted to them; such an investigation was consequently begun in 1898 and carried on through 1899 and part of 1900. It is the results of this investigation which Dr. Howard now presents.

In summing up, Dr. Howard states that the number of insects found breeding in or frequenting human excrement was very large. There were many coprophagous beetles—44 species in all—and many hymenopterous parasites of beetles and flies, but these were not thought to have any importance from the disease-transfer standpoint. Of flies there were studied in all 77 species, of which 36 were found to breed in human fæces, while 41 were captured upon them.

The practical bearing of the work is brought out when we consider which of the forms are likely from their habits to actually carry disease germs from excrement, in which they have bred or which they have frequented, to food substances upon which human beings feed. Therefore, extensive collections of flies were made in pantries, kitchens, etc., by means of sticky fly-papers. No less than 23,087 flies were examined, of which 22,808 were the ordinary house fly, *Musca domestica*. A complete list is given of all species bred on or taken during the investigation, including a full account of the common house fly and its habits. There are excellent figures of many species, together with a great deal of information which will be of interest to scientific readers.

Dr. Howard points out that, although the most abundant species found breeding in or attracted to human excrement do not occur in kitchens and dining-rooms, yet the common house fly, notwithstanding the fact that it prefers horse manure as a breeding place, does, under some circumstances, as in army camps, where human excrement is left exposed, breed in that substance in large numbers, and, as it also is much attracted to food supplies, it may transfer to these the germs of typhoid or other epidemic diseases from the places where it has bred or to which it has been attracted. On account of these facts, it is recommended that box privies should be abolished from every community, that the depositing of excrement in the open within town limits should be considered a punishable misdemeanour, and every breach of this law should be brought to the notice of the police, so that the nuisance may be removed. Boards of Health in all communities are urged to look after the proper

treatment of horse manure, so as to reduce to a minimum the number of house flies. Practical inferences to be drawn from this important investigation are that house flies, which occur everywhere and have a remarkable capacity for flying or being carried long distances in railway trains or other conveyances, are capable of carrying the germs of fatal diseases from place to place, and are therefore a source of great danger. In view of this, steps should be taken to restrict as much as possible their opportunities for breeding, by rendering their favourite habitats unsuitable for the purpose. To this end all such exposed matter in which they could breed should be removed or covered up as quickly as possible. Ashes, lime, or even dried earth, are usually easily obtainable, and will answer well for this last-mentioned purpose. Steps should be taken to prevent as much as possible the entry of flies into hospitals, houses, kitchens and pantries, by means of screens on doors and windows, and all flies found inside such protected buildings should be destroyed by a constant use of fly-papers or pyrethrum insect powder.

J. FLETCHER.

FOUR NEW SPECIES OF HIPPISCUS.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Since the publication, in *Psyche* for 1892, of my study of the Orthopteran genus *Hippiscus*, a few additional species have come to light, and they are herewith described. The first species belongs to the subgenus *Hippiscus*, the others to the subgenus *Xanthippus*.

Hippiscus citrinus, sp. nov.—A compact and stout though rather small form. Head rather stout and full, broad above, luteo-testaceous, more or less infuscated above, dark fuscous in a stripe behind the eyes, the carinae more or less infuscated; summit of head obscurely punctate, the vertical scutellum obscure and, with the foveolæ, much as in *H. compactus*; frontal costa broad, flat, punctate, depressed at the ocellus, where it is slightly enlarged, but otherwise subequal; antennæ ferruginous in basal, blackish in apical half. Pronotum stout, somewhat constricted mesially and considerably expanded on the metazona, the disc nearly plane with rather heavy rugæ forming the scutellum of the prozona, the metazona nearly smooth, but with a few slight rugæ and granulations; median carina very uniform and not prominent, but on the metazona slightly arcuate as seen laterally; lateral canthi tolerably distinct on the metazona (but rounded posteriorly), considerably surpassing the median

sulcus; process of metazona feebly obtusangulate. Tegmina blackish fuscous with a heavy testaceous sutural stripe, and crossed at middle and beyond by a narrow pallid stripe, and at end of basal third by a cinereous patch, the apical fifth vitreous, crossed by a couple of blackish fuscous stripes; wings pale citron at base, hyaline apically, the sutural line luteous, with a broad, blackish fuliginous mesial band curving broadly around the outer margin to the anal angle, and in the humeral area sending a narrowing tænia half way to the base; it leaves the four upper lobes free at the margin, but the two upper are clouded apically; the last forked branch of the discoidal vein arises at the outer edge of the mesial band; hind legs much as in *H. compactus*.

Length of body, 25 mm.; tegmina, 25 mm.

1 ♂. Alabama; C. F. Baker; No. 1912.

The species is separated from *H. compactus* Scudd., to which it is most nearly allied, by the markings of the tegmina (in which the darker parts are much more extended) and in the surface structure of the pronotal disc.

Hippiscus glaucipes, sp. nov.—Dark fuscous, sometimes more or less ferruginous, of slender form and small size. Head not very large, dull fuscous above, elsewhere pale fusco-cinereous, occasionally pale ferruginous, dotted with obscure fuscous, the summit feebly granulate behind the fastigium, which is distinct, with sharply defined but not greatly elevated walls, almost as broad as long, divided in anterior half by a median carina, open posteriorly; lateral foveolæ distinct, subtriangular, longer than broad, the inferior margin arcuate, the superior straight, embracing with their tips a median foveola of similar size and depth, its margins arcuate above, straight beneath when clearly distinguished from the frontal costa, as especially in the male; frontal costa moderately broad, subequal but slightly contracted at the summit and below the ocellus, somewhat sulcate throughout. Pronotum compressed, a little expanded on the metazona, especially in the female, nearly plane above, but the metazona feebly convex in the female, the process rectangulate, the median carina slight, equal, straight, uninterrupted between the sulci, the lateral canthi distinct but confined to the metazona, the dorsal surface, especially of metazona, marked with short, slightly obliquely longitudinal, distinct rugæ, the prozona with a slight scutellum, the lateral lobes with a broad, distinctly retroarcuate curve posteriorly. Tegmina dark fuscous, darkest in basal third and at the middle, with a distinct and generally

broad testaceous sutural stripe, a testaceous or pallid patch beyond the middle, a cinereous patch midway between it and the base, and the outer third mostly pellucid with fuscous veins and more or less flecked with fuscous; wings pale citron on basal half, except where the humeral vitta runs in nearly to the base, blackish fuliginous beyond except for a pallid sutural stripe almost invariably present, the apex of the two uppermost lobes often more or less vitreous, generally not so dark as the rest of the outer half of the wing, the dark portion following the outer border to the anal angle. Hind femora cinereo-testaceous, the inferior carina and sulcus luteous, but otherwise often twice obliquely striped rather narrowly with fuscous; hind tibiæ glaucous or uto-glaucous, the spines black-tipped.

Length of body, ♂ 19 mm., ♀ 28.5 mm.; tegmina, ♂ 20.5 mm., ♀ 25 mm.

5 ♂, 3 ♀. Yosemite Valley, Cal., Aug. 11; between Nevada Falls and Cloud's Rest, Yosemite Valley, Cal., Aug. 12; A. P. Morse.

This species is most nearly related to *H. obscurus* Scudd., differing from it chiefly by the structure of the surface of the pronotal disc, the less prominent median carina, the narrower tegmina, the presence of a sutural stripe on tegmina and wings, and the colour of the hind tibiæ.

Hippiscus validus, sp. nov.—Fusco-griseous, rather robust and somewhat below the medium size. Head rather large, more or less cinereous, rather broad and not very tumid above, the summit subrugulose, carinulate throughout; fastigium of vertex moderately deep, polygonal, with sharp but not very high walls, the frontal fastigium deeply impressed, constricted anteriorly, margined in front and behind as distinctly as at the sides; frontal costa moderately broad, strongly constricted above, slightly narrowed below the ocellus, somewhat sulcate or at least depressed at the ocellus; antennæ shorter than the head and pronotum, apically blunt and in no way attenuate in the female, castaneous, more or less infuscated apically. Pronotum expanding considerably on the metazona, which is nearly plane but rugulose, the anterior portion without signs of transverse plications, the process rectangulate with crenulate margin, the median carina slight, not altogether obliterated between the sulci, the lateral canthi sharp and distinct on the metazona, obscure or wanting on the prozona excepting on extreme front, the posterior margin of the lateral lobes vertical and not retroarcuate. Tegmina broad and rather short, but little surpassing the abdomen, griseo-cinereous, with

profuse irregular fuscous mottlings irregularly distributed, the anal line of the lighter colour, but sometimes obscure, the intercalary vein arcuate only at extreme apex, subequidistant throughout (and not very distant) from the median vein, the lower intercalary area broad and rather densely filled with anastomosing nervules, but not more densely than the area beneath it, the axillary vein united apically with the anal. Wings bright red (or occasionally citron?) at base, vitreous at apex, with heavily infuscated veins, and an extramesial, strongly arcuate, transverse fuscous band, about half as broad as the tegmina, tapering a little along the hinder margin, failing to reach the anal angle and leaving three marginal lobes free at the apex; it sends a stout humeral vitta to the very base. Hind femora cinereous, twice banded very obliquely and not very broadly with fuscous, very broad, the inferior carina rather high and rather strongly arcuate, the inferior sulcus red; hind tibiæ red, paling basally, or luteous.

Length of body, 36 mm.; antennæ, 9 mm.; tegmina, 29 mm.; hind femora, 16 mm.

4 ♀. Blaine Co., Idaho, July 23; Mus. Leland Stanford Univ.

This species is closely related to *H. calthulus* (Sauss.), but differs from it in the sharper median carina and lateral canthi of the pronotum, the disc of which is less coarsely rugose; the transverse fuscous band of the hind wings is also narrower.

Hippiscus croceus, sp. nov.—Fusco-griseous, rather robust, and considerably below the medium size. Head moderate, pale cinereous excepting above, the summit gently tumid, transversely rugulose, feebly carinate throughout; fastigium of vertex not deeply impressed, but with distinct walls, hexagonal, open behind, as broad as long, the front portion separated off by a low transverse ridge to form a divided frontal fastigium; frontal costa moderately broad, subequal, scarcely contracted either above or below the ocellus, moderately sulcate at and below the ocellus, punctate above; antennæ a little shorter than head and pronotum, apically blunt and scarcely attenuate on last two joints in the female, testaceous, apically infuscated. Pronotum expanding moderately on the metazona, the disc of which is faintly tumid with not very frequent short longitudinal rugæ throughout, the process rectangular with rounded angle and subcrenulate margin, the prozona posteriorly impressed, transversely plicate, the median carina slight, percurrent, the lateral canthi distinct but not sharp, the posterior margin of the lateral lobes

vertical above, but faintly retroarcuate below. Tegmina broad and rather short, though surpassing considerably the abdomen, cinereous, thrice rather narrowly banded with clustered fuscous maculations, the apical third mostly obscurely hyaline, the intercalary vein straight, sub-equidistant between the median and ulnar veins, the lower intercalary area not very broad, similar in density of anastomosing veins to the area beneath it, the axillary vein free. Wings citron at base, vitreous at apex, with fuscous veins, crossed at and beyond the middle by a dark fusco-fuliginous band, as broad as the tegmina, including the hind margin and following it broadly to the anal angle; its outer margin on the spread wing is straight and a broad tænia in the humeral lobe runs almost to the base of the wing. Hind femora testaceous, thrice banded very obliquely and not very broadly with fuscous, broad, the inferior carina rather high and rather strongly arcuate, the inferior sulcus luteous; hind tibiæ luteous throughout.

Length of body, 25 mm.; antennæ, 9 mm.; tegmina, 27 mm.; hind femora, 14.5 mm.

2 ♀. Blaine Co., Idaho, July 23; Mus. Leland Stanford Univ.

This species belongs near the preceding species from the same district, and was collected on the same day. It differs in the sculpturing of the metazona and in the markings of the tegmina and wings. In the latter point it agrees fairly well with *H. montanus* (Thom.).

THE PROTECTIVE COLORATION AND ATTITUDE OF *LIBYTHEA CELTIS*, Esp., are described and figured in an article in a Russian magazine (*Horæ Societatis Entomologicæ Rossicæ*, Vol. XXXV., Nov., 1900), of which the writer gives the following English abstract: "The observations were made on the Southern coast of the Crimea. The butterfly in repose exactly resembles a dead leaf, just as many tropical Rhopalocera, with the famous *Killima* at their head. The circumstance that *Libythea celtis* makes use of its palpi and antennæ for the simulation of a stalk of a leaf is very singular, as no tropical 'leaf-shaped' butterfly does it. The coloration also completely conforms to the habits of the insect. The form of the folded wings, and the presence on the under side of the hind wings of a dark median vein, makes the resemblance to a leaf still more complete. We have thus in this species a unique example of a European butterfly which mimics the dead leaf as perfectly as several celebrated tropical species."—NICHOLAS KUSNEZOW, St. Petersburg.

[The photogravure plate shows three specimens of the butterfly in repose. The resemblance to a dead leaf is complete.]

ERRATUM.—On page 79, third line from bottom, read 1850, instead of 18—.

Mailed March 5th, 1901.