

5. METHOD OF ATTACK OF THE MEADOW RUE BORER.

NEW GORTYNAS.

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NEW GORTYNAS.

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The forms treated of in this paper would naturally fall in the group for which Dr. J. B. Smith proposed the name *Papaipema*,* and which Dr. Dyar in his catalogue accepted as a generic name, but as it was not so intended by the proposer, I do not know that it is necessary to accept it as such.

In 1902, while paying a brief visit to the White Mountains, from 6th to 10th August, I noticed that the plants of the Tall Meadow Rue (*Thalictrum Cornuti*, L.), growing by the side of the road which runs from Fabyan's to the base of Mt. Washington, gave evidence of having been attacked by some borer. I slit a number of the stems, but in every case the borer had gone down into the root. I therefore set to work to get up some of the roots, but as I had neglected to bring a trowel or spud, and had only a large jackknife, and as the rootlets were very fibrous and matted, the task was very laborious. With considerable difficulty I succeeded in getting up three roots, with which I contented myself, thinking that as the plant was so common the species boring in it must be almost as common, as almost every plant examined had been attacked.

One of the larvæ was injured in getting up the roots, but the two others seemed all right, and were carried home to Montreal, but one died almost immediately afterwards. These larvæ were white, with hardly any colour, and quite unlike any *Gortyna* larva which I had previously seen, so that I doubted their belonging to that genus. The one surviving larva duly pupated, and the moth emerged on 12th Sept. It was a ♀, and slightly deformed, but seemed to be distinct from anything that I had previously seen, but on showing it to Mr. Bird, of Rye, when on a visit to New York, he pronounced it to be undoubtedly a dwarf and slightly deformed specimen of *Cerussata*, and as he had frequently bred the latter, I accepted his dictum.

In 1903 several of the members of our Montreal Branch looked for it in this locality, and had no difficulty in finding it, almost every Meadow Rue plant seeming to be attacked. Moths were reared by Messrs. D. and

*Trans. Amer. Ent. Soc., XXVI, 2.

H. Brainerd, Winn, Norris, and the writer, the first named in some numbers, among which appeared an interesting variety in which the white markings were obsolete, but I secured only one, which was of the normal type.

This same species was found by Dr. Fletcher and Mr. Young at Ottawa in 1902 and 1903, the latter observer also breeding the unmarked variety, and these various breedings were duly recorded under the name *Cerussata* in Dr. Fletcher's valuable "Record" in the Annual Reports of the Ent. Soc. Ont. for 1902 and 1903.

In spite, however, of Mr. Bird's opinion, I had my doubts as to the status of the Meadow Rue form, and determined to clear the matter up if possible in 1904, Mr. Bird very kindly presenting me with an inflated larva of *Cerussata* for comparison. Search was accordingly made in company with Mr. Norris on 17th July, when ten Meadow Rue Borers were secured by me, some through the generosity of my companion.

These proved to be the most easily reared larvæ in this genus that I have ever had, one larva only dying a natural death, though one was kindly turned into an inflate for me by Mr. Arthur Gibson.

The root seemed to keep in good condition a long time, and did not have to be changed. The one that died was the last, and by that time the root had become a little mouldy, which probably accounted for the fatality. They were slow about pupating, but seemed quite happy in their burrows; they ate comparatively little, and the frass was in very minute grains like sand. They closed the openings to their burrows with a plug of silk and frass, and if I took this away to ascertain how they were getting on, and if pupation had taken place, it was renewed as soon as possible. On account of this secretive habit I failed to obtain exact data as to the length of the pupal period. These larvæ were at once seen to differ very markedly from the inflated specimen of *Cerussata* given me by Mr. Bird, but as I was anxious to compare the living larvæ, I appealed to that gentleman for larvæ of *Cerussata*, and he very kindly sent me four. I thus found that the species were absolutely distinct; indeed, the larva of the Meadow Rue Borer is much more like that of *Macronoctua Onusta* than that of *Cerussata*. Indeed, so like the former is it that Mr. Gibson, who had bred that species from the roots of Iris at Ottawa, at first thought it was the same. On account of what Mr. Gibson wrote, I went out with Mr. Norris on the 31st July to look for the larva of *Onusta* in the roots of Iris, and succeeded in finding three.

On comparing these at home with the larvæ of the Meadow Rue Borer, I found that while they resembled each other very closely, they were still easily distinguished by the following points :

In the Meadow Rue Borer the cervical shield is brown, though lighter than the head, while in *Onusta* it is almost of the same colour as the body. The anal plate is smaller than in *Onusta*, and is brown, while in *Onusta* it is pale yellowish. The warts are also more prominent in the Rue Borer, especially on the 8th abdominal segment.

As this species is unquestionably distinct from *Cerussata*, I describe it as follows, naming it after its food-plant :

Gortyna Thalidri, n. sp.—(The Meadow Rue Borer.)

Alar expanse, 34-40 mm. Very similar to *Cerussata*, but less brightly coloured. It is also a smaller species, and though size does not count for much in this group, there being dwarfs and giants in all the species, the average size is of some assistance in separating the forms. Primaries of a warm brown, with a slight purplish tinge within the t. a. line and beyond the t. p. line, or what Dr. Strecker designated the basal and limb areas. Markings similar to those of *Cerussata*, but the t. a. line is generally a little more distinct, from the fact that the yellowish costal mark where it starts is generally better defined, and the line is more bordered with yellowish. The orbicular is rounder than in *Cerussata*, and generally has a brown spot in it towards the apex of the wing, which frequently reaches the edge, and so gives the spot the shape of a rounded crescent.

The t. a. and t. p. lines are as nearly as possible alike in both species, but the median shade, which, however, varies considerably as to position in both species, is generally nearer the t. p. line in *Thalidri* than in *Cerussata*.

In *Cerussata* there is generally a bright, almost red, patch in the central area of the primaries extending forward from the inner margin to about half way between veins 1b and 1c of the diagram on page 16 of Dr. Holland's Moth Book, which *Thalidri* does not have, though occasionally that portion of the wing is a little brighter in colour than the rest.

But the chief distinction between the moths is in the reniform, which in *Cerussata* is, as stated by Grote,* slightly oblique, the angles which it

*This species is erroneously attributed by Dyar to Grote and Robinson, and in this error is followed by Smith in his check List of 1903, though correctly referred by him in his first check List of 1891.

makes with the costa not being equal, but slightly obtuse inwardly and slightly acute outwardly, and it also curves a little outwardly, and if produced would strike the outer margin about $1/6$ th of the distance between the apex and inner angle forward of the latter point, while in *Thalictri* it is almost invariably exactly at right angles with the costa, is generally broader in proportion to length, and if produced would exactly strike the inner angle.

In Grote's description of *Cerussata* there appears to be a curious error, as in describing the t. p. line he says "regularly dentate between the veins," while the teeth which point outwards are on the veins and the lunules in the interspaces. The apical patch is generally a little brighter in *Cerussata* than in *Thalictri*, and the subterminal line differs slightly in the two forms, but from its general obscurity and some tendency to variation, it is not easy to define the slight differences.

Secondaries: In *Thalictri* the tendency is to a more dusky hue, though some specimens of *Cerussata* are as dark, and there is frequently a well-marked exterior line as in Holland's Fig. 15 in *Thalictri*, but there is great variation in this as well as in the depth of the shade.

Below the wings are smoky, the primaries darker, with a well-marked median line crossing both wings, the course of it on the fore wings differing slightly from that in *Cerussata*, as it runs straighter towards the apex, and then turns rather sharply towards the costa. Discal marks generally present on all wings. In other points not differing noticeably from *Cerussata*.

Had we only the moths, however, I should not have ventured to describe the species, but the great difference in the larvæ renders the distinctness of these species absolutely certain. The larva of *Cerussata* has been well described by Bird, CAN. ENT., XXXII, 232, and the following is a description of that of *Thalictri*, taken 11th Sept, 1904:

Length in motion 15 lines, at rest 14 lines. Head rather small, smooth and shining, chestnut brown, mouth-parts darker, cervical shield as wide as head, covering most of 1st thoracic segment, slightly yellower brown than the head, narrowly edged at sides with darker brown. Body cream colour, with a transverse pinkish shade in the centre of each segment. No longitudinal stripes. Warts small to minute and inconspicuous. Anal plate small, almost smooth, shining, same colour as cervical shield, slightly edged above with darker brown. The two rear warts on the upper part of the anal segment are slightly united into a

small transverse plate, quite distinct, however, from the anal plate, instead of being united with it as in *Cerussata*. On the 8th abdominal segment tubercles I and II are practically round and quite distinct, forming a square, while in *Cerussata* they are greatly enlarged and practically united into a conspicuous quadrate patch. In *Cerussata* also Mr. Bird has pointed out that tubercle IV on the 7th abdominal segment is raised a little above the line of the spiracles, a feature which he says holds with all that are strictly root borers, but does not hold in *Thalictri*, in which it is placed below the line of spiracles.

Pupa: Length, 17-23 mm.; diam., 4-6 mm.; dark chestnut brown, but brighter and smoother than in *Cerussata*, cremaster with two short curved diverging spines.

I have already mentioned that in 1903 Mr. D. Brainerd secured specimens in which the white spots were entirely wanting, the spots being brown, of a deeper shade than the rest of the wing. This form was also reared in the same year at Ottawa by Mr. C. H. Young, and last year out of eight specimens reared by me two were of this form, which bears the same relation to the typical form as *Nitela*, Gn., does to *Nebris*, Gn., except that there are fewer of them in proportion. As this variety is so well marked, and as there do not appear to be any intergrades, it is well worthy of a name, and I therefore propose for it the name of Var. *Perobsoleta*, which was kindly suggested to me by Dr. Dyar. The dates of emergence of my specimens ranged from 9th to 26th Sept., the two extreme dates being the dates of emergence of the two specimens of Var. *Perobsoleta*. The moths emerged at different times, but two whose time of emergence was carefully noted emerged between 11 and 12 p.m. Seventeen specimens (7 ♂, 10 ♀) of the typical form and 5 specimens (1 ♂, 4 ♀) of the variety are before me.

Of *Thalictri*, Types No. 1-8 are in my collection; Type No. 9 has been deposited in the National Museum at Washington under No. 8468, the gift of Mr. D. Brainerd; Types 10-12 are in the collection of the Entomological Society of Ontario, at London, Ont., the gift of Mr. Young; Types 13 and 14 are in Mr. Young's collection; and Nos. 15, 16 and 17 are in the collections respectively of Messrs. Brainerd, Winn and Norris. Of Var. *Perobsoleta*, Types 1 and 2 are in my collection; Type 3 has been deposited in the National Museum at Washington under No. 8469, also the gift of Mr. D. Brainerd; Type 4 is in Mr. Brainerd's collection, and Type 5 in that of Mr. C. H. Young.

Mr. Young has kindly sent me a drawing illustrating his observations on the habits of the larva and the following notes :

"The young larvæ were first observed on the 11th May, and at that time they were thin and of a dark reddish-brown colour, and measured about half an inch in length. At this date the tips of the infested plants were bent downwards, and looked as if they had been injured by frost. In every instance the larva was found about 6 or 8 inches below the bend, having eaten its way down inside the stem. About the middle of June larvæ were found much further down the stem, about 3 or 4 inches from the ground, and soon after this date they reach the main root of the plant, where the larvæ feed until maturity. When mature the larva leaves its burrow and enters the previous year's stem, where it changes to a pupa. By the 27th July the larvæ under observation were full-grown, and shortly afterwards pupated. Pupæ were found from about the end of July, all through August, and in every case the pupæ were found inside the old stem of the plant."

In my rearing operations I had the larvæ in their roots singly in jelly tumblers, and in every case they pupated in their burrows, without leaving them or looking for any other refuge, but possibly this was because there was no other place where they could go.

Mr. Norris has examined many plants, but has never found any early drooping of the plant, but has seen this later in the season when the larva had been boring some time in the root.

In the White Mountains it was the drooping of the top of the plant which attracted my attention, but that was at the beginning of August, and the larvæ were mature.

Mr. Winn failed in 1903 and 1904 to find any young larvæ of this species in the Meadow Rue plants examined early in June, but this year, on the 18th June, he found four larvæ about $\frac{5}{8}$ inch long in the roots, and also several of larger size in the stems.

Mr. Winn informs me that since his attention was directed to this species he has not found an old Meadow Rue plant at Montreal, Biddeford, Me., or among the Laurentian Mountains that was not tenanted by one of these larvæ, and is of the opinion that the insect is of benefit to the plant in ridding it of excess of root-stock.

In 1903 Mr. Herbert Brainerd sent from Brownsburg, Q., to his brother, Mr. Dwight Brainerd, in Montreal, a number of larvæ which he

had found boring in various plants, and among them one from the Joe-Pye or Trumpet weed (*Eupatorium Purpureum*, L.).

When the moth emerged it was seen to be something quite different from anything known to our members. Mr. Brainerd lent it to me to show to Mr. Bird when I visited New York in January, 1904, but that gentleman did not care to assume the responsibility of describing it before he had an opportunity of seeing the types of *G. Nelita*, Streck.

On my trips to Montreal West in July, 1904, search was made for borers in the *Eupatorium*, which grows in great profusion in that locality, and some success achieved, though only a very small percentage of the plants were found to be attacked, which is not surprising considering their extreme abundance, and the attacked plants were difficult to detect, partly because the plant sometimes has a habit of growing with its head bent over, and apparently slightly drooping, and also because it is so very vigorous that it will stand a good deal of boring before showing its effects. About half a dozen, however, were secured, some of which were kindly given me by Mr. Norris. The larvæ were not closely examined, as they were supposed to be of only one species, and I was more concerned to secure imagoes to see if they would prove the same as Mr. Brainerd's specimen than to make critical studies on the preparatory stages. These larvæ proved rather difficult to rear, as the food-plant tends to dry out even when kept in tin-topped jelly jars, and I succeeded in bringing only three to imago, two of which proved to be identical with the form reared by Mr. Brainerd, except that they are not quite so strongly marked, are a shade lighter in colour, and are smaller, while the third proved to be a small example of *G. Cataphracta*, which was not previously known to occur in this locality. On my visit to New York in January last I again took Mr. Brainerd's specimen with me, and went out to New Brunswick to show it to Dr. J. B. Smith, and to see such of his types in this group as are preserved in the Rutgers College Collection, and as he admitted that he had never seen anything like it, and agreed that *Nelita*, Streck., was the same as the form I named *Ærata*, I had no hesitation in concluding that we have in it an undescribed species, and as Mr. Brainerd did not care to describe it himself, he has permitted me to incorporate the description in this paper.

Gortyna Eupatorii, n. sp.—(The Trumpet Weed Borer.)

Primaries dark brown, with a slight sprinkling of gray. The most conspicuous mark is the t. p. line, which is double, runs outwardly oblique to the subcostal nervure, then turns at a right angle and runs almost absolutely straight and parallel with the apical half of the outer margin to the inner margin. In Type No. 1 this line is as straight as if ruled with a ruler, but in the two specimens reared by me it is not quite so sharply defined. This line is bordered outwardly with ash-gray, with a grayish atmosphere extending outward to the submarginal line, which is irregularly waved and edged outwardly with creamy scales. The other markings are somewhat obscure, but the upper part of the basal line, the t. a. line, orbicular, median shade and reniform show as slightly darker markings on the ground colour. Fringes dark brown, with a few creamy specks.

Secondaries paler brown, with an obscure discal mark and veins slightly darker, fringes concolorous.

Head and thorax brown, heavily sprinkled, especially the latter, with ash-gray, dorsal tuft transverse, adze-shaped, erect.

Collar edged with ash-gray.

Antennæ grayish brown.

Beneath paler than above, but primaries darker than secondaries, with a dark median line on both wings, discal spots fairly defined, especially on secondaries. Primaries have a whitish, fairly straight submarginal line. Legs grayish brown.

Alar expanse, 34-39 mm.

Length of body, 17-18 mm.

Types: No. 1, ♀, reared by Mr. D. Brainerd, and in his collection; No. 2, ♂, and No. 3, ♀, reared by myself, and preserved in my collection.

EXPLANATION OF PLATE VII.

I am indebted to Mr. Norris for taking the photographs of the moths from which the half-tone was made.

No. 1 is a typical specimen of *G. Cerussata*, and may be compared with Grote's figure, Proc. Ent. Soc., Phil., II, Pl. IX, Fig. I.

No. 2.—*Gortyna Thalictri*, Lyman.

No. 3.—*Gortyna Eupatorii*, Lyman.

No. 4.—*Gortyna Thalictri*, var. *Perobsoleta*, Lyman.

No. 5 is a reproduction of the drawing made by Mr. Young to illustrate his notes on the larval habits.

SYNOPSIS OF BEES OF OREGON, WASHINGTON, BRITISH COLUMBIA AND VANCOUVER—IV.

BY H. L. VIERECK, ASSISTED BY T. D. A. COCKERELL, E. S. G. TITUS, J. C. CRAWFORD, JR., AND M. H. SWENK.

(Continued from page 287).*

ANTHOPHORIDÆ.

Anthophora, Latr., and *Emphoropsis*, Ashm.

- Clothed with cinereous pubescence, which on the dorsulum, face, second, third, fourth and fifth abdominal segments is thinly mixed with black; posterior tibiæ and metatarsi, the latter largely, covered with whitish hairs; metatarsus with a broad brush of brown hairs on the apical margin; length about 15 mm. *ignava*.
- Similar to *ignava* in size and pubescence, but the posterior tibiæ and tarsi with bright fulvous pubescence. *Emphoropsis cineraria*.
- Pubescence of face and vertex mixed with black; pubescence of thorax and of the first abdominal segment very bright orange fulvous, not at all mixed with black; hair on lower part of pleura black. *Emphoropsis floridana Pascoensis*.
- Face, dorsulum anteriorly and base of abdomen with ochraceous pubescence.
- Second and third segments of the abdomen with fulvous pubescence. *insularis*.
- Second and third segments of the abdomen with ochreous and black pubescence respectively, the first and second segments alone being covered with pale hair. *Stanfordiana*.
- Abdomen almost entirely black, only the apex of venter with pale hair. *Solitaria*.

Anthophora Washingtoni, Ckll., n. sp.

"♀.—Length about 14 mm.; nearly agreeing with the description of *A. Edwardsii*, Cresson, but conspicuously differing" by the white hair-bands on the hind margins of the abdominal segment; weak or rudimentary on the first, but very strong, white and entire, though rather narrow, on segments 2 to 4 (Mr. Vincent writes me that in *Edwardsii* "the hair bands are practically wanting"). "The pubescence is grayish-white, with a strong admixture of black on the vertex and dorsum of thorax; the third,

*The following correction should be made in the preceding part of this paper: Page 287, line 9 from bottom, for "*Nomada intercepta*, Sm., n. sp.—Hym. Brit. Mus.," read "*Nomada intercepta*, Sm.—New Spec. Hym. Brit. Mus." September, 1905.

fourth and fifth abdominal segments also have black hair on the disc; the basal joints of the tarsi are reddish-brown in the middle beneath, coarsely fringed with black hair. The eyes are light yellowish-green. The appearance of the bee is strongly suggestive of *A. urbana*, but it is a larger insect, the abdominal bands are narrower, and without any yellowish tint; the first abdominal segment is much less hairy, the tibial spurs are darker, and the third antennal joint is very long, I think quite twice as long as in *urbana*, obviously longer than the scape. Six from Pasco, Wash., May 25, 1896 (Kincaid)."

Type coll. T. D. A. Cockerell.

(This species is more like *ignava* than *Edwardsii*, but in *ignava* the abdominal bands are rather indistinct and incomplete.—H. L. V.)

Anthophora ignava, Cress.—Trans. Am. Ent. Soc., VII, 210, 1879, ♂ ♀.

Corvallis, Or., ♀ ♀, 15th May, 1899; 16th May, 1896; 8th June (Cordley). In these specimens the hairs of the dorsal aspect are hardly tinted with ochreous as in the type, and the white hairs on dorsum of abdomen are much more abundant. Beside the four co-types from Nevada, there are only two other specimens in the collection of the Am. Ent. Soc., and these are labelled Calif. and S. Calif. The specimen from S. Calif. is more like the Oregon examples than any of the others.

Anthophora Stanfordiana, Ckll.—Ent. News, XV, 32, 1894.

Corvallis, Or., ♀ 11th, March, 1899; ♂, 12th June, 1898; 21st May, 1899 (Cordley). Differs from the description of the types in having the pale pubescence ochreous instead of whitish. In the ♀ the pale pubescence on the second segment is inconspicuous, and on the third segment pale pubescence is entirely absent.

Anthophora solitaria, Ckll.

" *insularis*, Sm.—New Spec. Hym., Brit. Mus., 124, ♀.

Vanc. Not seen.

Emphoropsis cineraria, (Sm.).—Ibid, ♀ ♂.

Described as an *Anthophora*.

Vanc. Not seen.

Emphoropsis floridana Pascoensis, Ckll.—Proc. Acad. Nat. Sci., Phila., p. 54, 1898.

Pasco, Wash.

Clisodon, Patt.

♂

Structure like in *terminalis*, and like that species easily distinguished by the bidentate apex of mandibles and the deeply emarginate apical abdominal segment; differs from *terminalis* in having the pubescence of the dorsal segments 4-5 and 6 black, and in the legs which are almost entirely covered with black pubescence.....*syringæ*.

Clisodon Syringæ (Ckll.).

Podalirius syringæ, Ckll.—Proc. Acad. Nat. Sci., Phila., p. 54, 1898, ♂.

Olympia, Wash., 3rd July, 27th June, at flowers of *Syringa* (T. Kincaid).

Synhalonia, Patt.

♀

[For *nigricornis*, Prov., and *lata*, Prov., see *Melissodes*.]

The second, third and fourth abdominal segments with distinct fasciæ. 1.

The second, third and fourth abdominal segments with indistinct fasciæ, only the fourth segment with an entire fascia.....*Edwardsii*.

1. Apex of abdomen with fuscous pubescence..... 2.

2. Pubescence cinereous, mandibles entirely black.....*Fowleri*.

Pubescence largely ochreous, mandibles with a pale brownish mark.....*Cordleyi*.

♂

Sixth ventral segment with two stout teeth.....*actuosa*.

Sixth ventral segment without teeth..... 1.

1. Abdomen not uniformly pubescent; beyond the first two segments the abdomen is nearly bare; apical third of venter with some dark or black hairs.....*Edwardsii*.

Abdomen uniformly pubescent; venter with pubescence all

pale.....*Cordleyi*.

Synhalonia Edwardsii (Cress.) (*Melissodes*).—Proc. Acad. Nat. Sci., 195, 1878, ♂, ♀, redescribed as *S. Edwardsii angustior*, Ckll., *ibid*, 347, 1897, ♀ ♂.

This species, according to Prof. Cockerell, occurs in numbers at Olympia, Wash. Pasco, Wash., 5 ♂, 2 ♀, 25th May, 1896 (T. Kincaid). Corvallis, Or., ♀ ♀, 1st June, 1897; 5th, 6th, 26th May, 4th, 7th, 9th June, 6th July, 1896; 19th, 21st May, 2nd, 11th June, 1899; ♂ ♂, 13th May, 1896; 29th May, 1897; 9th 10th, 13th, 28th May, 1898; 7th, 8th June, 1898 (Cordley). Vernon, B. C., 24th May, 1903.

Prof. Cockerell's characterization of this form is quoted to aid in identifying the species.

"(b). Race *angustior*, ♂.—Face conspicuously longer than broad; sides of clypeal yellow above, squarely notched, distance between the yellow and eyes extremely small, pubescence somewhat paler. ♀ smaller, with pale pubescence, abdomen with the white bands on the fourth and fifth (instead of third and fourth) segments, that on the fifth fuscous in the middle, but brilliant white at the sides. Wings clearer."

Synhalonia Edwardsii, var. *laticor*, Ckll., *ibid.*, 347, ♂.

Olympia, Wash., ♂♂, 24th April, 2nd, 10th, 11th, 17th, 21st, 23rd, 25th May, 5th June; ♀♀, 1st, 5th, 11th, 18th, 19th, 21st, 24th, 25th, 29th June, 4th July. Seattle, Wash., ♂♂, 17th April, 3rd May; ♀♀, 19th May (Kincaid). Two specimens from Olympia on *Lupinus*. Corvallis, Or., ♂♂, 8th May, 1898; 15th, 21st, 28th May, 2nd June, 1899 (Cordley).

Prof. Cockerell designated this as a race, but since it is found in the same locality with the typical form it can rank only as a variety or form. The description is as follows:

"(a). Race *laticor*, ♂.—Facial quadrangle not far from square; sides of the clypeal yellow, gradually sloping above, distance between the yellow and the eyes quite considerable."

Synhalonia Fowleri, Ckll.

Synhalonia Californica, Fowler.—CAN. ENT., XXXI., p. 137, 1899, ♀, not Cresson.

Corvallis, Or., 1st May, 1899 (Cordley).

Synhalonia Cordleyi, Vier., n. sp.

♀ 14 mm. Head dullish, sculpture of the face, cheeks and occiput nearly or entirely hidden by rather long pale ochraceous pubescence; greater part of head finely roughened; clypeus with coarse shallow adjoining punctures; labrum apparently rugulose, the sculpture obscured by pubescence, the ocelli forming a low triangle nearly on the supraorbital line (*i. e.*, an imaginary line connecting the upper posterior margin of the eyes), the posterior ocelli as far from each other as the lateral ocellus is from the nearest eye margin; first joint of the flagellum a trifle shorter than the next two joints together, apical joint of antennæ as broad throughout as the preceding joint, the apex obliquely flattened beneath; mandibles slightly emarginate at tip, the emargination making two very short subequal teeth, the outermost tooth being longest.

Thorax dull, all but the postscutellum and metanotum covered with dense pubescence, that on the dorsum bright ochreous, on the pleura pale ochreous, almost whitish, dorsulum covered with shallow almost adjoining punctures; pleura finely sculptured or roughened; postscutellum rugulose; enclosure of metanotum finely granular excepting in the posterior lateral corners, where some rather coarse rugæ and impressions are visible; a fine median raised line bisects the enclosure; wings in structure and colour typical, *i. e.*, nearly exactly as in *Edwardsii*; legs with various shades of brownish pubescence, the anterior and middle legs with their tibiæ covered with a seal-brown pubescence, the femora with whitish pubescence, the tarsi externally with a pale brown pubescence, internally with a reddish-brown pubescence, posterior legs with whitish pubescence on the femora except at tip, where there is, as it were, an epaulet of dark brown pubescence to cover the joint, tibiæ and outer face of metatarsus with pale ochreous pubescence margined with reddish coarser hairs, the apical edge of the metatarsus provided with a broad thick brush of hairs, the brush reddish brown at base, fuscous on apical half.

Abdomen with very conspicuous whitish fasciæ, occupying from somewhat more than one-half the segment to nearly two-thirds on segments 2-3-4, the fasciæ occupying the apical portion of the segment, the basal portion being occupied by short black pubescence fringed with sparse long hairs; the penultimate segment has the pale fascia represented by a short bar on each side, the space between being covered with black pubescence; ventral segments fringed with pale, almost erect, pubescence, which is broadly interrupted in the middle by dark pubescence; the second ventral segment with a basal bilobed area that is transversely finely striate, and occupies somewhat more than one-third of the segment; the lobes of this area almost form semicircles.

Tegument black, tarsi more of a brownish hue, claws pale brown on basal half, dark brown on apical half, greater portion of apical half of the external aspect of the mandibles almost straw colour.

♂.—Tegument much as in the ♀; clypeus with shallow, nearly adjoining, not sharply defined punctures; first joint of the flagellum nearly as long as the second plus one-half the third; covered with a cinereous pubescence which is tinged with ochreous on the dorsum of the thorax, the third, fourth and fifth abdominal segments with whitish pubescence on the apical half forming bands, the bands not occupying all of the apical half of the segment, the penultimate segment with a broader

band of pale pubescence, the ultimate segment with an almost parallel-sided pygidial area that has rather distinct margins, the lateral margins notched near the apex, the apical margin slightly convex; apical ventral segment nearly smooth and polished, provided with a median, broad, longitudinal channel on the basal half; spurs of posterior tibiæ simple, not hooked as in *speciosa*, to which the ♀ bears a close resemblance. Tegument black; claws brown; mandibles and antennæ black; clypeus and labrum yellow, the clypeal yellow, almost forming a semicircle, the lateral portion distant from the eye for a space equal to the width of the first joint of the flagellum.

Type Acad. Nat. Sciences, Phila., Pa.

Type locality Corvallis, Oregon.

Taken in the type locality as follows: ♀ ♀, 16th May, 2nd, 10th June, 8th July, 1898; 2nd June, 1899. ♂ ♂, 4th June, 1898; 28th May, 8th June, 1899.

Synhalonia actuosa, Cress.

♂ 10 mm. Superficially like the ♂ of *Edwardsii*, but easily distinguished from that species, also from *fulvitaris*, *frater*, *honesta*, *intrudens*, *Californica*, *albata*, *speciosa* and *atriventris* by the strong teeth on the seventh abdominal segment.

Head nearly as long as in *Cordleyi*; first joint of the flagellum about one-half as long as the second.

Thorax dull, dorsulum minutely granular, not punctate; enclosure of metanotum in sculpture practically as in *Cordleyi*, but with rather abundant pubescence, so that the sculpture is nearly obscured; wings differing from *Edwardsii* in having the first recurrent nervure received by the second submarginal cell a little beyond the middle, and a little more distant from the second transverse cubitus than the space between the insertion of the second recurrent nervure and the third transverse cubitus; posterior tibiæ with simple spurs, the longest of which is about as long as the second tarsal joint.

Abdomen with long white pubescence on the first two segments, this pubescence being concolorous with that of the head and thorax, the succeeding segments, except the penultimate, with black pubescence; on the penultimate segment the pubescence is very pale golden brown, except at base, where there is a fringe of brown and black hairs; the first two ventral segments have whitish pubescence, the succeeding segments brownish pubescence, with whitish laterally; the seventh ventral segment is nearly

smooth, and has a longitudinal impression, which has a narrow longitudinal elevated portion; on each side of this segment, near the lateral margin, is a stout, short tooth shaped like a beak, and directed backward and downward; the pygidial area has converging sides, which are straight throughout; the apex is rounded, and has the appearance of being slightly emarginate. Black; antennæ and mandibles black, clypeus yellow, with a broad lateral and narrow anterior and posterior borders black, the yellow mark on the clypeus almost quadrate, the lower half being dilated somewhat beyond the limits of the upper half, labrum with a yellow spot occupying nearly all of the middle third of the basal two-thirds; tarsi and claws brown or brownish; nervures nearly black.

Type Acad. Nat. Sciences, Phila., Pa.

Type locality, Corvallis, Oregon.

Corvallis, 1st May, 1897; 10th May, 1898; 3rd June, 1899. One specimen has the pale pubescence tinted with ochreous.

Melissodes, Latr., and *Synhalonia*, Patt.

♀

Dorsum of thorax with ochreous hair, second abdominal segment entirely black, segments three and four with a distinct band of white pubescence, that of the third interrupted in the middle, the fifth segment with black pubescence, interrupted by white band at the edge..... *Synhalonia lata*.

Thorax and abdomen much as in the preceding, but the second abdominal segment with a broadly interrupted band, and the fifth segment without a pale mark, entirely dark brown..... *desponsiformis*, Ckll., n. sp.

Thorax with pale and dark hair, the abdomen with a distinct pale band across the second segment..... 1.

1. Pale hairs of the body ochreous, the dark hairs of the dorsum dark brown, and not very conspicuous..... *menuacha*.

Pale pubescence of the body white or whitish, the black hairs of the dorsum very numerous and conspicuous..... *menuacha Vernonensis*.

♂

Antennæ entirely black..... 1.

Antennæ reddish beneath..... 2.

1. 12 mm. long; black, with whitish pubescence; labrum yellow..... *nigricornis*.

8 mm. long; black, with whitish pubescence; labrum black..... *microsticta*, Ckll., n. sp.

2. Pubescence ochreous, mandibles with a yellow spot at base *menuacha*.
 Pubescence white, mandibles black *menuacha Vernoneensis*.
Synhalonia lata, Prov.—Faune Ent. Can. Add. to Vol. II, p. 302, 1889, ♀.

Vancouver (Taylor).—This may be the ♀ of *Synhalonia Edwardsii*. Prof. Cockerell is of the opinion that it is *Synhalonia Edwardsii*, v. *latior*.
Melissodes desponsa, Sm. race?

M. desponsa, Sm.—Brit. Mus. Cat. Hym., II, p. 310, 1854.

♀, Corvallis, Oregon, 11th March (Cordley). A form that may prove to be a new species.

Melissodes menuacha, Cress.—Trans. Am. Ent. Soc., I, p. 338, 1867-68, ♂.

Oregon (A. E. S. Coll.).

Melissodes menuacha Vernoneensis, n. subsp.

Type Acad. Nat. Sciences, Phila.

Type locality, Vernon, British Columbia.

Vernon, B. C., ♀ ♀, ♂ ♂, 11, 9th, 15th, 17th Aug., 1904 (Harvey).

Synhalonia nigricornis, Prov.—Faune Ent. Can. Add. to Vol. II, p. 302, 1889, ♂.

Vancouver (Taylor).

Melissodes desponsiformis, Ckll., n. sp.—“♀. Length about 14½ mm.; black, with black and yellowish-white pubescence; hair of legs black, yellowish-white on outer side of hind tibiae and base of their tarsi. Very closely allied to *M. mysops*, Ckll., from Maybell, Colorado, but differing as follows: Hair of face, cheeks and vertex sooty, palest on vertex; last joint of flagellum longer, being much longer than the penultimate; disc of scutellum duller and much more closely punctured; less of the anterior part of mesothorax covered by pubescence. From *M. cnici*, Rob., it differs by the abdomen having distinct but thin hair-bands, and also being narrower, with the hair on fifth segment a dark purplish-brown instead of pure black; also by the more sparsely and less strongly punctured disc of mesothorax.

“*Hab.*—Corvallis, Oregon, ‘11-3’ (Cordley). The following table separates four closely-allied species (♀):

- Cheeks with black or sooty hair 1.
 Cheeks with yellowish-white or grayish-white hair 2.
1. Abdomen without hair-bands; middle of mesothorax strongly and closely punctured (E. States) *nicci*, Rob.
 Abdomen with pale hair bands on segments 3 and 4, and a line on each side of 2; middle of mesothorax shining and rather sparsely punctured (Oregon) *desponsiformis*, Ckll.
2. Dorsum of thorax with a good deal of black hair; inner orbits parallel (Colorado) *mysops*, Ckll.
 Dorsum of thorax without black hair; inner orbits diverging above (Colorado) *Glenwoodensis*, Ckll."
- (Cockerell MS., April, 1905.)

Melissodes microsticta, Ckll., n. sp.—"♂. Length about $8\frac{1}{2}$ mm.; black, with abundant long and loose dull white hair, that of disc of thorax purplish-black, and some of the same on vertex; eyes light grayish green; inner orbits converging below; head not unusually broad; mandibles black, except a yellowish apical stripe; labrum black; clypeus light yellow, with the upper part black, the yellow area quite twice as broad as high; antennæ long (about $7\frac{1}{2}$ mm.); flagellum black above, the apical margins of the joints very narrowly white; below the flagellum is dark reddish-brown, with a ferruginous dot on each joint except the first and last; mesothorax and scutellum shining, rather sparsely punctured, the middle of mesothorax with an impunctate area, around which are scattered punctures very irregularly arrayed; tegulæ shining dark reddish; wings clear, nervures dark fuscous; second submarginal cell very broad, nearly as broad as first, receiving the first recurrent nervure near its end; third submarginal cell broader (longer) than first, narrowed rather more than one-half to marginal; legs black, with pale pubescence, claw-joints ferruginous; hair on inner side of tarsi light orange; hind spurs straight and simple, yellowish-white; abdomen small, black, hind margins of segments broadly brownish, the extreme margins whitish; hair of abdomen dull white, forming fairly distinct bands on hind margins of segments (style of *M. agilis*), that on sixth segment and apex pale orange; the usual four lateral spines present, but small. Allied to *M. confusa*, Cresson.

"*Hab.*—Vancouver I. (Cresson collection.)"

(Cockerell MS., April, 1905.)

OVIPOSITION OF *BIBIO FEMORATA*, WIED., AND OVIPOSITING FEMALES.

BY ALECANDRE ARSENE GIRAULT, WASHINGTON, D. C.

On the morning of March 24th, 1904, at 9 o'clock, in the town of Paris, Texas, many dark-coloured flies were noticed crawling over the trunks and lower limbs of two adjacent box-elder trees (*Negundo* species). They proved to be the above species.*

They were found in various positions. Some resting in crevices of the bark, or crawling about on the trunk, while others were resting in clumps of grass and weeds along the gutter and fences near the two trees. The latter were situated on the edge of a sandy sidewalk, about six feet apart, and about eighteen inches above the gutter, which was unstoned and abounding in patches of grass and weeds.

Both sexes were present, the females greatly predominating; a few pairs were in copula. They suddenly disappeared about forty-eight hours afterwards, but again on March 29th others appeared in numbers on the same trees. As formerly, these in turn remained several days, but gradually disappeared, many apparently killed by heavy rains which occurred at that time.

I. Adults and adult habits.

The females are dark reddish, with garnet thighs and black wings; they varied in length, in six specimens measured from 9 to 11.5 mm. Their abdomens are thick, cylindric and heavy, especially following copulation. The males are smaller, from 8 to 10 mm., with slenderer, tapering abdomens, more hairy bodies, and very much larger eyes. Their wings are transparent.

Copulation takes place about twelve hours after emergence from the soil. It was observed on the 24th and 25th of March. As the larvæ are gregarious, the eggs being deposited in a single mass, the descendants from a single female doubtless emerge simultaneously from the soil, as in this case, and crawl up any convenient object near-by. Here the sexes intermingle freely and mate.

The flight of the gravid female is heavy and slow, and apparently seldom resorted to. Crawling seems to be the natural mode of locomotion, although the adults are able to fly considerable distances. They

*Determined by Mr. Charles T. Brues.
September, 1905.

crawl quite fast and with regularity. Nothing of material importance was learned in regard to their food habits.

When confined in spacious glass jars containing fresh sod, the females wandered about a great deal through the grass at first, but soon commenced to enter the earth to oviposit. In confinement they were often unsuccessful in this, owing to improper conditions of the soil supplied; but under proper conditions they quickly became used to confinement, and naturally perform their functions.

The length of life in both sexes averages about three days. The males apparently die immediately after copulation is finished, and they take no part in the process of oviposition.

II. *Oviposition and ovipositing females.*

1. Laboratory methods.

Supposed fertilized females were confined in glass jars (10 cm. diameter by 15 cm.) containing eight centimetres of ordinary grass sod taken from moist sandy loam or other soils. The jars were covered with muslin, which overhung the sides, making it quite dark within. Four jars were thus started and kept in the laboratory. Oviposition was easily observed, as the females generally entered the earth at the sides, and thus every movement could be seen. In one jar males were present with the females.

2. Details of ovipositing females.

The method of oviposition in *Bibio* is highly interesting because of the peculiar habit of entering entirely within the soil, and also because the parent's life is at once given up for the sake of its progeny. The female literally buries itself within the earth, and after deposition dies there.

After wandering about for several hours amongst the grass, the insect commences to search for a suitable place at which to enter the soil. When confined as described, they almost invariably selected a spot near the side of the jar, and would always select, if present, a spot where the earth was cracked, or where a crevice of some kind existed. Here they begin to dig by using their stout anterior tibiae, described later, continuing until several centimetres below the surface. Oviposition then takes place as given in the following details:

A.—Nine females were taken from the trees when first observed, on the 24th of March, and confined at 10 p.m. in one of the large jars mentioned in foregoing. Some of these were known to be fertilized, while the

others were in all probability so, as the sexes were then freely copulating. Oviposition had taken place by the following morning (25th), in two cases the females having burrowed to a depth of two centimetres. They were still within the burrow, apparently going deeper into the earth.

By the afternoon of the 25th two other females were digging along the sides of the jar; one was on its back, a centimetre below the surface, the other going head first and about 7.5 millimetres beneath. Four females were thus below the surface; two of them had deposited, while the other two were still burrowing. Four others were then crawling restlessly about in the dense grass, making futile efforts to enter the ground. A fifth, or the ninth, was found on its back dead, its head buried in the earth.

By the morning of March 26th six females had deposited their eggs, four during the night just passed; the seventh died before finishing its burrow. The eighth had not as yet succeeded in penetrating the soil; after doing so it died in its burrow.

a.—This female oviposited in the early morning of March 25th, or less than eighteen hours after confinement. It was lying in a doubled-up position, in an apparently closed earthen cell, the egg-mass to one side. The body was nearly vertical, the head below, the insect lying on its back to one side of, and slightly beneath, the egg-mass. To all appearances it was dead. The entrance to the burrow at the surface of the ground was unnoticeable, filled as it was with loose soil particles. No movements of the body were afterwards observed, and it is evident that the insect died a few hours after deposition. By March 30th the body was decomposing, and very moist.

b.—Oviposited in the early morning of March 25th, or less than eighteen hours after confinement. After oviposition the female lay in a cramped position, in a cell similar to that of the preceding. The body was vertical, inclined somewhat, and with the head above. The insect was apparently dead. The entrance to the burrow was not noticeable.

No further movements of the body were detected, and six days later the body was covered with the spore-bodies of a fungus. By the 9th of April it was badly decomposed.

c.—On the afternoon of March 25th this female was found in an inclined burrow, on its back, about two centimetres beneath the surface. It was scooping the earth over its head by means of its fossorial anterior

tibiae, passing it over the venter, and from thence out of the burrow, with its slender posterior pairs of legs. Hence its head was at the bottom of the burrow, the body inclined upward.

Oviposition commenced very early in the morning of the 26th. The eggs were being massed across and around the tip of the abdomen, about 1.3 cm. down the burrow, and 1 cm. directly below the surface of the soil. The entrance to the burrow was unnoticeable.

At 9.30 a.m. the insect was in the same position, on her back, the body inclined upward, the abdomen highest, the anterior legs stretched out beyond and above the head in the position assumed while digging. Further extension of the burrow had probably been stopped by masses of intertwined rootlets. The eggs were then being placed quite irregularly, above and below the caudal half of the abdomen, sometimes in clusters of regular rows, mostly simply massed together. The individual eggs were placed methodically at the rate of from six to eight per minute, by simple movements of the tip of the abdomen. By this time she had effectually bottled herself within the burrow with eggs, which, as indicated, were then massed directly across the burrow, above, below and in front (caudad) of the abdomen. The burrow itself was not clearly defined, but filled with loose particles of earth, which were also mixed in with the egg-mass.

By 3 p.m. oviposition had apparently stopped, the period thus being about twelve hours. The position of the body had not changed, but the whole of the caudal half of the body was then nearly covered with eggs, while the wings extended beneath most of the mass, forming a good foundation. The female was thus actually pinned down. The mass itself was broadest at its bottom or base, and extended from one side of the burrow to the other; it measured approximately 3 mm. (apex), by 4 mm. (base), by 6 mm. (depth). The burrow measured at its greatest width 8 mm. The insect's posterior two pairs of legs were extended out and up, the caudal pair crossed.

The female remained perfectly motionless after oviposition ceased. Gradually moisture gathered about the egg-mass and body, until at last (April 1st) both were bathed in it. About April 9th the body commenced to sink, and was highly decomposed.

d.—This female was also found burrowing on the afternoon of the 1st of April. It was but 1.2 cm. directly below the surface, in a rather

long and irregular burrow, measuring in length 2.6 cm. It entered the earth, of course, head first, and burrowed in a direction slightly inclined from the horizontal for a distance of 1.5 cm. Then abruptly turning downwards in a direction perpendicular, it burrowed for a distance of a single centimetre. At this point she died, apparently from exhaustion. Another female was observed to enter the burrow while she worked, but retreated upon finding it occupied. On March 31st the body was extracted with a pair of forceps; it was decomposing, and readily fell to

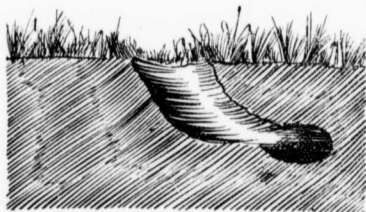


Fig. 15.

pieces. Above the bend the burrow was 6 mm. wide, and from thence down 4.2 mm. Its entrance was barely noticeable. It is shown in outline at figure 15.

e.—Entered the soil during the evening of March 25th, and eggs were found deposited on the morning of the 26th, about 2 cm. directly be-

low the surface. They were in a more or less regular mass, most of them placed in rows on end against the glass of the jar; a few were placed flat against the side of the jar. The mass was at the extreme bottom of the vertical burrow. The latter was 6 mm. wide.

The parent was directly above the egg-mass, the head, obviously, up, and but 5 mm. beneath the surface. The entrance to the burrow was inconspicuous, the upper half of the burrow itself being filled with loose earth pushed into that part of the burrow during excavation.

Finally the parent was disturbed with forceps, in order to find its relative position in regard to the egg-mass. Thirty minutes afterwards, evidently on account of this disturbance, it crawled from the burrow and made attempts to escape. It was perfectly fresh in appearance. After wandering through the grass for a while, it went to the entrance of its burrow and made long and persistent efforts to re-enter, but in vain. By the following morning it was resting in the grass, very weak; fifteen hours afterwards it died.

The eggs from this female were carefully removed from the soil and counted. They reached a total of 2,604.

f.—Began to burrow during the evening of March 25th, and eggs were found on the following morning, or about fifteen hours after starting to dig into the earth. The burrow was vertical.

g.—This female was crawling over the surface of the soil late in the afternoon of March 25th, searching for a suitable spot at which to enter. Accordingly a hole eight millimetres in diameter was made for her by pushing the blunt end of a pencil into the earth.

On the morning following eggs were found deposited in two masses, one at the bottom of the hole, and the other on the surface of the soil at its edge. The hole was eight millimetres deep. The parent was observed to crawl into the hole several times, but was apparently dissatisfied with it, and deposited no more eggs. Instead she made many efforts to enter the earth elsewhere, but failed. On the morning of March 28th she was very weak, and during the afternoon died.

No attempt to cover the eggs was made, though after they were dug up some were found to have been buried in the earth at the bottom of the pit. There were 3,007 eggs in the combined masses.

h.—Although not succeeding in getting into the earth, this individual scattered her eggs in small masses through the grass. It died on the morning of March 17th, in a position indicating a last effort to get beneath the soil. The eggs, exposed to the air, shriveled up in a very few hours.

i.—This female died soon after confinement. Made persistent attempts to enter the earth.

B.—At 1.30 p.m., 29th March, six females were taken from the two trees and confined as in foregoing, the jar containing compact loamy soil. They continued to wander through the whole of the next day, and by the morning of the 31st none had as yet succeeded in entering, though trying hard to do so. One was then found dead, in a slight depression, near several hundred of her eggs, in a mass on the surface of the soil. The remaining five were showing evident signs of weakening, and, as expected, were on their backs dead on the morning following. A few eggs were scattered here and there over the surface. They soon dried up.

Although these females freely entered loose earth present, getting some distance beneath, they refused to oviposit in such places, and always

returned to the surface. It is thus indicated that they are unable or unwilling to deposit in brittle, and unable to enter clayey soils.

C.—On March 29th, at 1 p.m., a single female was confined as usual in a much smaller glass jar (7.5 by 5.5 cm.), containing 3.5 c.m. of loamy sod. It began to crawl about at once, and frequently entered loose earth, only to return again to the surface. It was unable to enter the compact clayey loam, and soon died.

D.—On March 26th, in the afternoon, another female was confined as the preceding. She appeared to be rather weak, and not until about noon, 29th March, did she succeed in entering the earth (between these two dates there was quite a fall in temperature; the 29th was much milder).

Several hours afterwards oviposition began. The eggs were deposited beneath the body, the latter arched or curved upwards, and with one side against the jar. At 5 p.m. she was burrowing towards the centre of the jar; during this process the two posterior pairs of legs were held inert, and somewhat out of the way.

The eggs were placed irregularly against the glass, 1.6 cm. below the surface of the soil; the burrow was vertical, or nearly so. On March 30th the insect was lying in a confused heap on its back, about 3 mm. above the egg-mass, and with its head nearest the surface; loose particles of soil intervened between the eggs and her body. She was but 5 mm. from the surface, and could easily have broken through to the air. She died in the position described.

E.—At noon, 29th March, eight females and three males were confined in one of the larger jars, where they at once began to crawl about. Two pairs were then in copula.

Later in the afternoon, at 4 p.m., the females, excepting those in copula, were attempting to enter the earth, and were eagerly searching for likely crevices at which to start their burrows. While doing so, several crawled into a space between the glass and soil, full of loose particles, and worked quite a pathway through to the bottom of the jar. From this branches were started, but soon abandoned, and the insects finally always returned to the surface to renew their efforts elsewhere. This again indicates that loose soil is not to their liking.

However, two of the females again went into the channel, and began to wedge themselves into firmer soil, working through and up towards the surface, in continuation of the original burrow. They progressed solely by the use of the fossorial tibiae, moving them alternately like paddles.

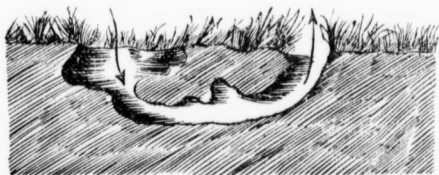


Fig. 16.

The path which they made through the soil, after digging through to the surface, is shown in figure 16.

Afterwards the insects were continually passing through this, apparently always in the direction indicated by the arrows in the figure, which was the direction taken when the burrow was formed. In but a single instance was a male observed to enter it. This occurred while following his mate, and had no significance.

All of the insects died within a few days, without having accomplished their purpose.

III.—*Eggs, description and number deposited.*

The eggs are of the usual dipterous type, flesh-coloured, sub-linear, and with the ends obtuse or rounded. One end is slightly curved and thickened. They are opaque, smooth, or very minutely punctate, showing no marked sculpture, and slightly variable in shape. Length 0.5-0.7 mm. minute, but visible to naked eye.

They are deposited in numbers varying from two to three thousand, in compact, irregular masses, in sandy soil. If exposed to the atmosphere they shrivel up and die. No marked external signs of embryonic development are present.

The length of the egg stage is about two weeks or longer.

September, 1905.

IV.—*The fossorial anterior tibiæ.*

The digging apparatus of the female consists of rather short, depressed, anterior tibiæ, more or less hollowed ventrad, and bearing at the distal end two conspicuous stout *spurs*, the outer of which is depressed and much longer than the inner (mesal). They are admirably fitted for the purpose used. (Fig 17 : Portion of anterior leg, ventral view, showing the fossorial tibiæ; *a* and *b*, mesal and lateral spurs; *c*, portion of basal tarsal joint; *d*, distal three-fourths of tibia. Greatly enlarged.) When thrown forward and forced into the earth, and then drawn back, they hold the earth like a shovel. The males possess the same structure, though relatively more slender. As would be expected, the anterior femora are much stouter than the others.



Fig. 17.

The two posterior legs are assistants to the anterior, and for that reason they are much slenderer and longer. Their tibiæ bear short, slender spines; those of the anterior tibiæ are true spurs or chitinous prolongations of the part, wholly immovable. The legs are well clothed with hairs.

There are very few references to this species in our literature, practically none bearing on its habits and life. This is apparently the first published record of the method of oviposition of a *Bibio*.

The figures were kindly drawn by Mr. John F. Strauss; the writer is also indebted to Prof. A. L. Quaintance, Washington, D. C., for timely suggestions.

MR. FRANKLIN SHERMAN, Entomologist of the North Carolina Department of Agriculture at Raleigh, has been appointed Professor of Entomology and Zoology at the Ontario Agricultural College, Guelph, Canada, and enters upon his new duties this month.

MR. O. W. BARRETT, Entomologist and Botanist of the Porto Rico Experiment Station, has been appointed to the new office of "Plant Introducer" in the Bureau of Plant Industry at Washington, and will have charge of the distribution of tropical and sub-tropical plant stock and the inspection and quarantine of both imports and exports of plant shipments.

WHOM SHALL WE FOLLOW?

BY RICHARD F. PEARSALL, BROOKLYN, N. Y.

The recently-published article from the pen of Rev. Geo. W. Taylor, giving a rearrangement of the species now included under the genus *Venusia*, Curtis, under the same caption used by me in a previous paper, gives me, I think, a right to protest. He refuses to accept the separation of *12-lineata*, Pack.? under a new genus, as given by me; but if the two male specimens, which were sent through the kindness of Mr. Geo. Franck, reached him safely, I think he will be satisfied on this point. *12-lineata*, Pack., was described from specimens taken in California by Mr. Hy. Edwards, and eastern specimens credited with this name were really the species I described as *Euchæca salienta*. I grouped with this latter the western species mentioned by Mr. Taylor, not having at hand enough material upon which to base a separation, yet as more of it comes to me, I am tending toward the conclusion that it is worthy of a specific name, but this can wait. Now, as to *perlineata*, Pack., if the plate published of it (Boston Soc. of Nat. Hist., Vol. 16) is to be relied upon (I have not seen the type), then it is clearly the species we have been calling *comptaria*, Walk., as determined by Dr. Hulst. But *comptaria* is not *comptaria* any longer, according to Mr. Prout, and so, vide Mr. Taylor, it becomes *perlineata*, Pack., and my *salienta* becomes *comptaria*, Walk. It is, then, a question of whose authority we shall accept, that of Dr. Hulst or Mr. Prout. Until some one well drilled in the various American geometrid forms, carrying abundant material with him, shall go to Europe, and compare the types there with it, Mr. Taylor, for instance, I am not ready to change the decisions arrived at by Dr. Hulst. He had studied this group many years before he journeyed across twice, carrying material with him, for the sole purpose of establishing the types, and his decisions are entitled to stand, unless they go down before the weightiest authority. He may have made mistakes in determinations, and *did*, in naming off hand, later on in his life, but I claim that having an object clearly before him, the sole performance of which took him abroad, he would be less likely to fall into error, knowing also that his was pioneer work, and so much depended upon its correctness as a basis for the future worker. I can show to Mr. Prout specimens of *E. comptaria*, Walk., from this region (Catskill Mts.) which almost anyone would call *E. lucata*, yet in all the fifteen years of my collecting here I have never taken the latter species. I make this statement, not to discredit Mr. Prout's judgment, but to point out how easily one may be misled unless thoroughly familiar with the range in variation in each species, and the appearance which such variations present when rubbed, suffused or melanistic. This year I have

had two of Mr. Merrick's trap lanterns running nightly, and among hundreds of specimens have found neither *lucata* nor *salienta*. Walker's type of *comptaria* came from Nova Scotia, and I do not believe that *salienta* is found there. If, only one hundred miles above New York City, which I consider about its northern range, I am unable to find it, then it is unlikely that it ranges coastwise so far above this latitude, into a region so boreal. Yet if I am wrong I will be glad to receive specimens taken there in proof of it. Meanwhile I cannot accept the outcome of Mr. Taylor's revision, and contend that *comptaria* is still *comptaria*.

NOTES ON THE LARVA OF THE PITCHER-PLANT MOSQUITO.

BY EVELYN GROESBEECK MITCHELL, WASHINGTON, D. C.

Since the discovery of *Wyeomyia Smithii* in the leaves of Pitcher-plants in New Jersey, by Dr. J. B. Smith, it has been reported from Massachusetts and Florida.

On June 16th of the present year, the writer found a larva of the second stage in a Pitcher-plant in a greenhouse in the Botanical Gardens, Washington, D. C. July 8th, three more specimens were taken there. The plants had been brought from South Carolina, and had been in the greenhouse for several years. As there are now no wild Pitcher-plants in the District, the mosquitoes were probably imported in an early stage with the plants.

The larva of this species has hitherto been described as having but two anal gills. Examination of the living specimens revealed two more, making up the normal number of four. These two gills are small, being only about one-third as long as the two large inflated ones, tracheated, pointed and situated dorsad of the larger pair. (See fig. 18.) In alcoholic specimens they are difficult to detect, as they shrink between the larger two, and it is necessary to remove one of the latter to see the small gills plainly.

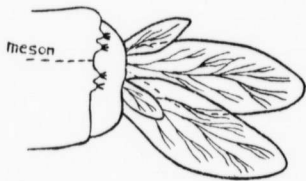


Fig. 18.

The larva, during the three days before pupation, comes frequently to the surface, before that time remaining mostly at the bottom. The favourite feeding posture seems to be with back downward, lying on the bottom of the jar.

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PRACTICAL AND POPULAR ENTOMOLOGY.—No. 9.

THE BUFFALO CARPET BEETLE,

(Anthrenus scrophularie, L.)

BY JAMES FLETCHER, OTTAWA.

This destructive enemy of the housekeeper is evidently rapidly widening the area in Canada within which it occurs as a household pest. Strange

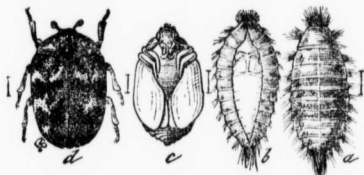


Fig. 19.

to say, the species has been found abundantly on flowers out of doors in some localities where it has never been noticed inside houses. Twenty-five years ago many specimens were sent to me by a collector from Fort Mc-

Leod, N.-W. T., and specimens are found in entomological collections in all parts of the Dominion.

The Buffalo Carpet Beetle, however, has proved destructive to woolen goods and furs only in certain districts, as in Western Ontario, the Eastern Townships of Quebec, and the Annapolis Valley in Nova Scotia. Unfortunately, every year fresh localities are added to those where it has assumed the troublesome habit of injuring wearing apparel, carpets, etc.; and demands for remedies are very frequent during the spring months, when the prettily marked beetles are found in windows of houses or on garden flowers. The life-history is briefly as follows :

Winter may be passed either as larva, pupa or perfect beetle; when out of doors, it is probably, as a rule, in the larval form, although I have found a perfect beetle in April in the folds of an old sack hanging on an apple tree. The beetles, which are black, marked across the back with three indistinct white bands and with a bright scarlet irregular stripe down the middle, are about $\frac{1}{8}$ of an inch long and oval in shape. They are oftenest noticed in spring, when they sometimes swarm in the flowers of tulips, particularly those of red and yellow colours, and upon some kinds of Spiræas. At this time of the year they frequently fly into houses, where eggs are laid and the larvæ hatch in a few days. The larva is black and oval in shape, covered with short, stiff bristles, with longer tufts of bristles in front and behind. It is rather active, crawling with short, jerky movements. The

length of the larval condition is very uncertain; with plenty of food, development is rapid; but with lack of food, the larval period is extended to many months. Under normal conditions there are about six moults, and not more than two annual broods in Canada. When full-grown the larval skin splits down the back, showing the waxy white pupa inside, from which, in time, the perfect beetle emerges. (Fig. 19: *a*, larva, upper surface; *b*, under surface; *c*, pupa; *d*, beetle—all greatly magnified.)

Remedies.—When once established, this is a very hard pest to get free of. A few individuals will soon re-stock a whole house; so, thorough work is very necessary. As the beetles enter houses by windows, probably at night, fine mosquito netting should be put on early in the season. At house-cleaning time all carpets should be taken up regularly and thoroughly beaten out of doors. The floors, after thorough sweeping, should be scalded with hot water. When dry, benzine or gasoline should be driven into all crevices with an atomizer. Before replacing the carpets, the crevices of the floors should be well brushed out and the floors dusted with a mixture of equal parts of pyrethrum insect powder and ground cloves. If the odour is not objectionable, strips of tarred building paper may be put round the edges of the rooms beneath the carpets. In chests of drawers, etc., the contents should be frequently examined and small bags containing ground cloves should be packed away in them. The remarkable preference of this insect for articles of red colour has led some to lay rolls of red flannel in drawers to act as traps. These must be taken out and scalded at short intervals.

BEES COLLECTED BY THE REV. G. BIRKMANN IN TEXAS.

BY T. D. A. COCKERELL, BOULDER, COLO.

(Continued from page 267).

Melissodes grandissima, n. sp.

♀.—Length nearly 19 mm.; length of anterior wing about 13 mm.; breadth of abdomen in middle 7 mm.; in all respects like *M. Comanche*, Cresson (co-type compared), except as follows: Abdomen broader; fourth segment without a bare median area, the broad grayish-white band continued right across; fifth and sixth segments with the hair purplish-black, except the long hair at sides, which is paler and redder; hair of venter not so red; hair of inner side of basal joint of hind tarsi reddish-black, ferruginous basally; wings hardly so dark; black hair-patch on mesothorax

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shorter, so that it is conspicuously broader than long; flagellum dark, with only a faint red tinge beneath; hair on outer side of basal joint of middle tarsi brownish-black (rufo-fulvous in *Comanche*). From *M. helianthelli*, Ckll., it differs in the colour of the hair on the hind tarsi and apex of abdomen, etc.

Hab.—Fedor, Texas (*Birkmann*). This may be a race of *M. Comanche*, but in the absence of intermediates I leave it as a species. It runs in my tables next to *M. Coloradensis*, Cress., from which it is easily known by its larger size and other characters.

Mr. Birkmann also took at Fedor *M. atripes*, Cr. (June 8), *M. obliqua*, Say (May 29), and *M. intorta*, Cr.

Entechnia fulvifrons (Smith).

Fedor, in August. The bees of this genus seem quite unable to fold away their long mouth-parts; they always carry them, when at rest, underneath the body, like the beak of an hemipteron. The present species extends to the Argentine and Bolivia, whence it was described by Schrottky as *Meliphila ipomææ*.

Xenoglossodes eriocarpi (Ckll.).

Fedor, June 11. New to Texas. *X. albata* (Cr.) was also taken at Fedor, June 22.

Anthophora Texana, Cresson.

Fedor, the ♂ June 12, the ♀ June 17. The ♂ (hitherto unknown) has the face-marks bright yellow, and is in all respects (including the armature of the hind legs) extremely close to *A. Californica*, Cr. The hair of the thorax above is pale ochreous, and is without the intermixture of black seen in the ♀. *A. tarsata subtarsata*, Ckll., is also very closely allied, but is readily distinguishable from *Texana*, in the female by the rapid narrowing of the face below, and in the male by the admixture of black hair on the thorax above. All these insects have the same peculiar structure of the hind legs, and are evidently local representatives of a single wide-spread type. Whether we call them species or subspecies will depend upon the existence or otherwise of intergrading forms in localities not yet explored. A ♀ having the characters of *Texana* has been taken by Snow in Arizona.

BOOK NOTICE.

AMERICAN INSECTS—By Vernon L. Kellogg, Professor of Entomology in Leland Stanford Jr. University. New York: Henry Holt & Co., 29 West 23rd Street. 604 pages.

Ten years have gone by since the publication of Prof. Comstock's "Manual for the Study of Insects," which during that time has become the recognized text-book for students of North American Entomology. There hardly seemed to be any need for another work of a similar kind, and we took up this new book by Prof. Kellogg with the feeling that there was no "long-felt want" demanding to be filled. However, on examination, "American Insects" proves to be an excellent work, and we can heartily recommend it to all who are interested in the classification and natural history of insects. It is written in an agreeable and attractive style and can be referred to anywhere by the ordinary reader without fear of being disheartened by purely technical language. There are, of course, many pages on anatomical structure, development and metamorphosis, which must necessarily be scientific and somewhat difficult for the unlearned, but the greater part of the large volume is clear and simple and most interesting to every Nature Student.

The first three chapters present the scientific introduction to the study of Entomology and will well repay a careful perusal; the next twelve treat of the seventeen orders of insects, proceeding from the Aptera to the Hymenoptera. Keys are given to the families, and a large number of species are figured and described. The concluding chapters are most interesting, dealing with the inter relation of flowers and insects; the significance of the colours and patterns in which insects are arrayed, including "mimicry" and protective resemblance, and up-to-date information on disease bearing insects. An appendix furnishes concise directions for collecting and rearing specimens. The book is profusely illustrated with thirteen coloured plates and over 800 figures in the text—a large number of these are excellent drawings made expressly for the work by Miss Mary Wellman.

The author states that the book is written "in the endeavour to foster an interest in insect biology on the part of students of natural history, of nature observers, and of general readers." He has certainly well fulfilled his task, for no one can take up the book and open it anywhere without becoming deeply interested in the subject treated of, whatever it may be, provided, that is, that he has any love at all for living creatures, any interest in the myriad forms and modes of life of these wonderful beings that are everywhere about us.