

The Canadian Entomologist.

VOL. L.

LONDON, MARCH, 1918

No. 3

POPULAR AND PRACTICAL ENTOMOLOGY.

LIGHT TRAPS AS A MEANS OF CONTROLLING

INSECT PESTS.

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Collecting at light, as it is popularly termed, has been a favourite method of securing certain kinds of insects, almost since the time when collecting was in its infancy, and that insects were so attracted was probably known before entomology, as we know it, was even dreamed of. We might, in fact, suspect it of being as ancient as the knowledge of fire itself. While the collector, however, has used this knowledge to procure specimens for his cabinet; it is only within recent years that attention has been called to the possible use of light traps as a means of controlling certain insect pests. On the face of it, what seemed easier? Moths and beetles, too, were known to dash themselves against the light, at times, in vast numbers. All that had to be done, then, was to place light traps at convenient distances apart and provide means for the destruction of the attracted insects. Indeed, a bonfire occasionally replenished would answer every purpose. The method was, in fact, a repetition of the candle and the clothes moth on a large scale. Yes, on the face of it there was certainly promise of success, but, alas, even a casual investigation soon brought other things to light. It was seen at once that the advocates of light traps had overlooked several important details and one important fact which in itself was sufficient to make the whole idea abortive. To begin with, insects are only attracted to bright light in comparatively limited numbers even under the most favourable weather conditions, among which may be mentioned warmth and cloudiness. A perfect night must combine these at a time when the moon is below the horizon or not visible, and provide, in addition, a stormy atmosphere with preferably a light rain falling. Such conditions occur but rarely, so much so, in fact, that they have been absent during the last three years. Thus, meteorological conditions alone, will often materially affect the value of

such means of controlling insect pests. A far more important consideration has to do with the proportion of males and females secured by light traps. Take *Feltia venerabilis* for instance; this is one of our commonest cutworm moths which is freely attracted to light, yet of the 192 specimens so secured all were males. Other species, with few exceptions, show very similar results. The Red-backed cutworm (*Euxoa ochrogaster*), while enticed to light on favourable occasions, was entirely absent during the three years experiments were carried on, though examples were secured close at hand at the time and larvæ had previously been very destructive. The proportion of hymenopterous parasites taken at light is also an important factor to be reckoned with. Lastly, we have to take into consideration the fact that at least some of the female moths collected will have already deposited a proportion of their eggs.

Below is given a table showing the records of captures for August and September for three years past—ending 1917. The collections of individual nights have been lumped for convenience. Two traps were used in the work, one of the usual search-light pattern, and the other a trap devised by my brother Stuart in which three sides were exposed to the light. These traps were placed in different localities where cutworms were known to have occurred. They were put out on practically every suitable night during the three seasons. The July results were too small to make them worth recording.

Name of Species	August		September		Total
	Males	Females	Males	Females	
<i>Euxoa quadridentata</i> G. & R.	52		166	14	232
<i>ridingsiana</i> Grt.	70		23	95	188
<i>deterosa</i> race <i>personata</i> Morr.	74	4	60	16	154
<i>exculta</i> race <i>criddlei</i> Sm.			7	3	10
<i>velleripennis</i> Grt.	14		8		22
<i>tessellata</i> Harris	25	2	12	6	45
<i>albipennis</i> race <i>malis</i> Sm.	12		5	1	18
<i>redimicula</i> Morr.	18	3	1	1	23
<i>Feltia rubustior</i> Sm.	10		1		11
<i>venerabilis</i> Wlk.	23		169		192
<i>ducens</i> Wlk.	370	40	17		427
<i>Agrotis collaris</i> G. & R.	7		4	1	5
<i>Lycophotia scandens</i> Riley			16	1	24
<i>Sidemia deviator</i> Brace	13	6	1	1	21
Tipulid flies	2		5	3	10
Ichneumonid flies	281	6	692	27	1,006
Braconid flies	46		77	Sexes not ascertained	123
Other Hymenopterous parasites	29		4		34
Tachinid flies	2				6
Lace-winged flies			7		7
Total moths collected	688	55	490	139	1,372
Total useful insects	364		812		1,176

Micro-lepidoptera, comparatively harmless. Macros and numerous small insects of doubtful economic value are not included, though collected in considerable numbers.

Comparing the August catch with that of September it will be observed that there is generally an increase in the proportion of females in the latter month and a falling off in the males. This is doubtless due to the males being more active soon after emerging whereas the females become more so at the period of egg-laying. It will be noted further that the total number of moths collected only exceeds the number of useful insects taken by 196 specimens, or including the tipulid flies, 206.

Another point to be considered is that while the moths included in this table are all the parents of cutworm-like caterpillars by no means all are recognized as of economic importance. Thus we might reasonably leave out *Euxoa ridingsiana*, *quadridentata*, *criddelei*, *redimicula* and *Feltia robustior*.

Male insects seem to greatly exceed the females in nearly all orders attracted to lights, and the species of Ichneumonid flies are no exception to this rule. The Braconid flies, however, show a greater proportion of females attracted though males still predominate.

With reference to the destruction of June-beetles (*Lachnosterna* spp.) by means of light traps, the writer conducted a number of experiments relating to this subject in 1914, and it was found that while male beetles could be secured in considerable numbers, females were apparently only caught by accident, at least they did not constitute more than one per cent. of the total catch. As a matter of fact the females are far less active than the males and seem to be more concerned with feeding than flying about.

The facts brought out by this investigation seem to bear out very clearly the conclusions arrived at by other investigators, namely, that light traps are not a practical method of controlling insect pests, and that the number of noxious insects destroyed by this means is infinitesimal in any case. Moreover, when we take into consideration the useful insects secured at the same time we are left in doubt as to whether this method does not actually do more harm than good. There may be a time when certain pests, at present not thought of, may be controlled by means of artificial

lights. In the meantime, however, we must rely upon such remedies as tests have proved worthy of recommendation.*

A PARTIAL KEY TO SPECIES OF THE GENUS AGROMYZA (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

It is my intention to publish keys to species groups of the genus *Agromyza* as aids to the identification of the numerous forms which have been described or recorded from North America. Up to the present time I have seen nearly ninety species of the genus from the United States. In order to make it possible for a serial magazine to present keys to this large number of forms I have divided the genus into arbitrary groups, the characters used in these divisions being enumerated in each instalment on the key.

The present key includes all species which have the *scutellum conspicuously yellow* either entirely or in part, *contrasting strikingly with the disc of the thorax*. The halteres in all the species are pale

1. Antennæ with at least the entire third joint black (cf. *variata*).....2
 Antennæ entirely yellow or at most with the third joint partly infuscated.....5
2. Frons black, only frontal lunule yellow. Food-plant unknown. Mexico; New Mexico.....*xanthophora* Schiner.
 Orbits black, interfrontalia reddish yellow; very small species (.75 mm.); body with exception of scutellum black; legs black, only knees yellow. Food-plant unknown. Wash.; Ill.....*interfrontalis* Melander.
 Frons yellow, ocellar region and sometimes orbits partly black; body with more than scutellum yellow.....3
3. Palpi and legs black. Food-plant unknown.
 Texas.....*quadrisetosa* Malloch.
 Palpi and greater portion of legs yellow.....4
4. Wings clear. Food-plant unknown. Wash.; Alaska; B.C.; Ill.....(*longispinosa* Malloch) *pacifica* Melander.

*For further reference on this subject see Stingerland's "Trap-lanterns or Moth-catchers." Bull. No. 202, Ithaca, N.Y., 1902.
 March, 1918

- Wings with a conspicuous infuscation along costa from apex of first vein to apex of second. Food-plant unknown. Ill.....*fumicosta* Malloch.
5. Mesonotum with the disc broadly black, the yellow of the lateral margins not carried entirely across on posterior margin.....6
 Mesonotum with a large black or reddish mark on disc, the yellow of lateral margins connected along posterior margin, and usually a large subtriangular or subquadrate yellow mark on middle of posterior portion of disc.....10
6. Mesonotum with disc bare except for the dorso-central bristles.....7
 Mesonotum with numerous short setulose hairs on disc in addition to the dorso-central bristles.....8
7. Mesonotum with 2 pairs of dorso-central bristles; cheek nearly as high as eye; last section of fifth vein twice as long as penultimate section. Food-plant unknown. Idaho.....*lima* Melander.
 Mesonotum with 4 pairs of dorso-central bristles; cheek about one-third as high as eye; last section of fifth vein four times as long as penultimate section. Food-plant unknown. Arizona.....*discalis* Malloch.
8. Orbits glossy black; antennæ very small; pleuræ and abdomen almost entirely glossy black. Food-plant unknown. Ill.....*deceptiva*, sp. n.
 Orbits yellow; antennæ of moderate size; pleuræ and abdomen largely yellow.....9
9. Small species, .75-1.5 mm. in length; last section of fifth vein $2\frac{1}{2}$ -3 times as long as penultimate section. Larvæ in serpentine mines in leaves of various legumes, cabbage, cotton, nasturtium, etc. U. S.; Canada; Europe.....*pusilla* Meigen.
 Larger species, 2-2.5 mm. in length; last section of fifth vein $1\frac{1}{2}$ -2 times as long as penultimate section. Food-plant unknown. Cal.; Arizona; Europe.....*scutellata* Fallen.
10. Third antennal joint largely blackened; palpi blackened at apices. Food-plant unknown. Maine; Ill.....*variata* Malloch.

- Third antennal joint and palpi not blackened, rarely the former brownish at insertion of arista..... 11
11. At least 4 more or less regular rows of setulose hairs between the dorso-central bristles on mesonotum..... 12
- At most 2 irregular rows of setulose hairs between dorso-centrals on disc of mesonotum..... 16
12. Mesonotum with the discal black marking opaque. Food-plant unknown. B. C. *borealis* Malloch.
- Mesonotum with the discal mark either reddish or entirely glossy black..... 13
13. Cheek posteriorly about half as high as eye; arista almost bare. Food-plant unknown. N.M. *flavonigra* Coquillett
- Cheek posteriorly less than half as high as eye; arista pubescent..... 14
14. No posterior setulae on mid-tibiae; posterior margin of mesonotum with a broad, yellow band which is not anteriorly dilated centrally. Larvae mine leaves of walking-leaf fern. N. Y.; Ill. *felti* Malloch.
- Each mid-tibia with 2 distinct setulae; posterior margin of mesonotum with a large subquadrate yellow mark in center..... 15
15. Mesonotum with discal marks entirely black. Larvae mine leaves of *Plantago major*. U. S.; Canada; Europe..... *melampyga* Loew.
- Mesonotum with discal mark largely reddish, only posterior extremities and lateral margins black. Larvae mining in *Paspalum*. S. C.; Ill. *marginalis* Malloch*.
16. Third antennal joint larger than normal in this group, the upper margin sharply angulated at apex. Food-plant unknown. Ill. *angulicornis*, sp. n.
- Third antennal joint small, rounded at apex. Food-plant unknown. Ill. *assimilis*, sp. n.

***Agromyza deceptiva*, sp. n.**

Female.—Glossy black, with reddish yellow and lemon-yellow markings. Occiput, ocellar triangle, and frontal orbits glossy black; frontal stripe, antennae, and upper portion of face reddish yellow; cheeks yellow, with a narrow, black margin; proboscis

*Originally described as a variety of *melampyga* Loew.

and palpi yellow; arista blackish. Scutellum except at base on each side, and a large, subquadrate area on margin of mesonotum between base of wing and humerus lemon-yellow. Abdomen entirely glossy black. Legs black, femora lemon-yellow. Wings slightly brownish-tinged, especially on anterior half. Squamæ with margins and fringes blackish. Halteres cream-coloured.

Head large, viewed in profile the face is distinctly retracted below, orbits clearly differentiated from central stripe, each about half as wide as latter; orbital bristles 5 in number, long and slender; cheek twice as high posteriorly as anteriorly. Mesonotum with 4 pairs of dorso-centrals, the anterior 2 pairs very weak; discal thoracic setulæ numerous and rather long; scutellum with 4 long marginal bristles. Abdomen short and broad; ovipositor conical but not tubular. Legs stout; mid-tibia without posterior setulæ. Costa to apex of fourth vein, the latter ending in apex of wing; inner cross-vein below apex of first and at middle of discal cell; last section of fifth vein about 1.5 as long as preceding section.

Length 2 mm.

Type locality, Alto Pass, Ill., May 8, 1917 (J. R. Malloch).

This species bears a strong resemblance to *quadrisetosa* Malloch, but may be readily separated from that species by the colour of the legs, palpi and antennæ.

Agromyza angulicornis, sp. n.

Male.—Yellow, slightly shining, conspicuously marked with black. Head yellow; ocellar region, greater portion of occiput, clypeus, and arista black or blackish. Dorsum of mesonotum with a black mark similar to that on *melampyga*, the yellow pre-scutellar mark subquadrate; disc slightly pruinose; the following parts each with a black spot—humerus, propleura, mesopleura, pteropleura, sternopleura, and hypopleura; scutellum with a black spot on each side, postnotum black except on upper margin. Abdomen infuscated on dorsum; hypopygium glossy black. Legs yellow, tibiæ and tarsi black. Wings slightly grayish, veins dark brown. Halteres yellow.

Anterior ocellus situated further proximad of posterior pair than it is in *pusilla* and allied species, the sides of the triangle being unequal; frons narrowed anteriorly, its anterior width being distinctly less than half that of head; antennæ larger than usual

in the *melampyga* group, the third joint distinctly angulated above at apex; arista microscopically haired; cheek anteriorly as high as width of third antennal joint. Mesonotum with 4 pairs of dorso-centrals, the disc bare except for a few setulose hairs arranged in 2 irregular rows between the dorso-central series and another in line with the latter. Femora rather stout. Wing venation similar to that of *melampyga*, differing in having the third and fourth veins subparallel from middle of their last sections to apices; inner cross-vein one-third from apex of discal cell; last section of fifth vein nearly 3 times as long as preceding section.

Length 1 mm.

Type locality, Waukegan, Ill., August 25, 1917, (J. R. Malloch). Taken on shore of Lake Michigan. Food-plant unknown.

This species resembles *pusilla* Meigen, but differs from it in having fewer fine hairs on disc of mesonotum and in having the prescutellar yellow mark. From all species known to me it differs in having the third antennal joint angular at apex above.

Agromyza assimilis, sp. n.

Male.—In colour this differs from the preceding species in having the tibiae and tarsi yellow, indistinctly clouded with fuscous, and the yellow prescutellar mark on mesonotum triangular; its anterior extremity being pointed.

Structurally the principal differences lie in the shape of the third joint of the antennae, which is considerably smaller and disc-like, in the position of the ocelli, which are in an equilateral triangle, and in the venation, the third and fourth veins being gradually divergent throughout the entire length of their apical sections. The dorsum of the mesonotum has even fewer short hairs than that of *angulicornis*, but a single irregular series appearing between the dorso-centrals.

Length 1 mm.

Type locality, Freeport, Ill., July 4, 1917, (J. R. Malloch). Food-plant unknown.

This species strongly resembles *pusilla* Meigen, but differs in having the disc of mesonotum with fewer short hairs between the dorso-centrals, and a conspicuous, triangular yellow mark on posterior margin.

SUPPLEMENTARY NOTE ON THE ANTHOMYIID GENUS
PHYLLOGASTER (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

Since sending my paper, on the genus *Phyllogaster*, which appeared in *Can. Ent.*, XLIX, p. 227-228, 1917, I have read C. W. Johnson's paper in the April number of the same volume, in which he describes a new species of this genus under the name *robustus*. An examination of paratypes of *robustus* discloses the fact that in addition to the difference in size between the species and *cordyluroides* the male may readily be separated from the latter and also from *littoralis* by the presence of a large number of strong bristles on the basal dorsal segment of the hypopygium (two in the others) and the much larger pulvilli which exceed in length that of the apical tarsal joint, whereas in the others they are much shorter than it. The female of *robustus* has two thorns on apical abdominal segment, *littoralis* has four, the female of *cordyluroides* is unknown to me. As in *cordyluroides* the third vein of the wing is bare in *robustus*.

THE GENUS HADRONEMA UHL. (MIRIDÆ;
HETEROPTERA.)

BY EDMUND H. GIBSON, U. S. BUREAU OF ENTOMOLOGY.

The flower bugs of the genus *Hadronema* Uhl. constitute an interesting little group closely allied to the genus *Lopedia* Uhl. species of which are known to most collectors of insects, such as the common Phlox bug. Those of *Hadronema* may be distinguished from the species of *Lopedia* by the fact that the base of the vertex is strongly carinate across its whole width.

Most of the species are of western occurrence, though, *militaris* Uhl., the haplotype of the genus, is distributed over the entire United States and Southern Canada. Little is known of the economic importance of the species, and in all probability they are but little restricted in food preferences.

The genus belongs to the division *Lopediaria* Van D. of the tribe *Orthotylini* Van D. and was characterized by Uhler as follows: Aspect of *Lopus*, cranium somewhat convex, face almost vertical, eyes prominent, oval, almost vertical; occiput with a

high, transverse carina between the eyes; tylus a little prominent narrowing towards the tip; cheeks short and blunt; bucculae narrow, shorter than the basal joint of the rostrum; that joint sub-cylindrical, robust, a little longer than the head. Antennae short, about as long as the corium and cuneus united, stout; the third and fourth joints of nearly equal thickness, not tapering to a setaceous termination; the latter less than one-half the length of the preceding. Pronotum trapezoidal; the angles rounded; the collum forming an obtuse, narrow collar, and behind it is an arcuated carina abbreviated a little way from the lateral margins; the lateral edges prominently carinated. Costal margins of the hemelytra almost straight, parallel.

Hadronema was described by Uhler in 1872 in the Rep. of the U. S. Geol. Survey, page 412. The genus now contains 7 species, two of which are herein described as new.

KEY TO THE SPECIES.

1. Third joint of antennae distinctly shorter than second.....3
 Third joint equal to or longer than second.....2
2. Third joint of antennae slightly longer than
 second.....*festiva* Van D.
 Third joint about equal in length to the second.....*picta* Uhl.
3. Pronotum red or with red markings.....4
 Pronotum black or gray, devoid of any red markings.....*splendida* n. sp.
4. Costal margin of corium and cuneus broadly bordered with
 white or cream.....*militaris* Uhl.
 Costal margin of corium and cuneus very narrowly if at all,
 bordered with white or cream.....5
5. Basal joint of antennae comparatively long and slender, a distinct
 light spot at anterior margin of cuneus.....*princeps* Uhl.
 Basal joint of antennae comparatively short and stout, no distinct
 light spot on cuneus.....6
6. Anterior margin of pronotum slightly sinuate....*robustus* Uhl.
 Anterior margin of pronotum not at all
 sinuate.....*confraterna* n. sp.,

Hadronema militaris Uhl.

Hadronema militaris Uhler, Rept. U. S. Geol. Surv., p. 412
1872.

The largest member of the genus. Elytra black with wide, light coloured costal borders.

Distributed over the entire United States and Southern Canada.

Hadronema robusta Uhl.

Hadronema robusta Uhler, Proc. Cal. Acad. Sci., ser. 2, vol. IV, p. 250, 1894.

Distinguished by the bright red pronotum and scutellum and lack of colour marking on cuneus. Occurs from Kansas to Texas and west to the Pacific Coast.

Hadronema confraterna, n. sp.

General form of *robusta* Uhl., slightly shorter and more narrow. Head nearly vertical, strongly convex. First joint of antennæ comparatively short and stout, third joint distinctly shorter than the second. Antennæ black, head black except for border next to and under the eyes red, cheeks red, bucculae whitish, rostrum dark red. Pronotum red with large black callosities, deeply depressed anteriorly at the middle, anterior border of pronotum convex, posterior border sinuate at the middle. Pronotum much broader than long, and much wider posteriorly. Scutellum very dark wider than long. Elytra red becoming dark towards inner margins, no markings on cuneus. Membrane smoky. Legs dark red to black. Abdomen red along borders, whitish below. Plate dark red or black. Size 4.2 mm. long, 1.2 mm. wide.

Distinguished from *robusta* by the shape of the anterior margin of pronotum, the larger callosities, and colouring, especially of the elytra and scutellum.

Described from a single male specimen from Las Cruces, N.M. Taken on *Bigelovia*. Type in the U. S. National Museum.

Describing a species from a single specimen is here warranted, although it is diverging from good practice.

***Hadronema princeps* Uhl.**

Hadronema princeps Uhler, Proc. Calif. Acad. Sci., ser. 2, vol. IV, 1894.

A much narrower form than the other species with usually a distinct light mark on the cuneus. Occurs throughout the West.

***Hadronema picta* Uhl.**

Hadronema picta Uhler, Colo. Exp. Sta. Bull. No. 31, p. 31, 1895.

Separable from the other species in having the second and third joints of the antennæ equal in length. Recorded as occurring in Colorado and Dakota.

***Hadronema festiva* Van D.**

Hadronema festiva Van Duzee, Trans. Am. Ent. Soc., vol. XXXVI, No. 2, p. 80, 1910.

The only species of the genus having the third joint of the antennæ longer than the second. Also readily distinguishable by the radically different colour markings.

Mr. Van Duzee records its occurrence in New Mexico.

***Hadronema splendida*, n. sp.**

Resembles *festiva* Van D. Head small, vertical, black with light markings next to eyes, near base of head, on the centre of the face, and below the antennæ. Bucculæ bordered with white. Antennæ black, third joint noticeably shorter than second. Pronotum dark gray or black, callosities black, anterior border of pronotum light. Scutellum red. Elytra greenish white, smoky at middle of corium, clavus smoky along inner margin, cuneus white except smoky at apex. Costal border of elytra whitish. Membrane smoky. Abdomen dark beneath but light at the middle. Femora bright orange red, tibia and tarsi black. Size 3.8 mm. long, 1.2 mm. wide.

Described from a female collected at Albuquerque, N.M., Aug., 1909, now in the U. S. National Museum.

The peculiar colour markings readily separate this species from all others.

A NOTE ON THE OCCURRENCE OF ABDOMINAL SPIRACLES IN THE COCCIDÆ. (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

Abdominal spiracles have been noted in but a limited number of species of Coccidæ and when noted seem usually either to have been passed over as of no particular significance or to have been regarded as evidence that the forms possessing them are merely aberrant. Savage, (1) who has described the tracheal system of *Monophlebus stebbingi* var. *octocaudata* Green, seems to have believed that the abdominal spiracles in this species are an adaptation to meet the needs occasioned by the extraordinarily large size of this particular insect. In a few cases they have been regarded as of some taxonomic significance. The genus *Perissopneumon* Newstead was based partially upon the fact of their presence and they are noted among the generic characters of the genera *Stigmacoccus* Hempel and *Cryptokermes* Hempel, while Pergande based his sub-family *Xylococcinæ* partially upon them, stating (2) that, "In the true *Monophlebinæ* the abdominal stigmata are wanting or not observable; . . ."

Newstead (3) stated in 1901 that abdominal spiracles are present in *Stigmacoccus* and *Perissopneumon*, but that, . . . this peculiarity does not exist in any other Coccid," and Savage (ref. cit.) repeated this statement in 1914. As a matter of fact it was erroneous when first made for such spiracles had been recorded in the case of *Cryptokermes brasiliensis* Hempel, which was described in the same paper as was *Stigmacoccus*, in the case of *Xylococcus betulæ* Perg. and also in some of Maskell's species of *Celostomidia* (= *Celostoma*). In 1903 Newstead (4) recorded the discovery of abdominal spiracles in certain species of *Orthezia*, stating that, "The presence of abdominal spiracles in the three species of *Orthezia* hereafter described is a marked characteristic, and one which has not hitherto been observed in this sub-family of Coccidæ." Here he was again in error, for the abdominal

(1) Savage, R. E. The tracheal system of *Monophlebus stebbingi* var. *octocaudata*. In *Bul. Ent. Res.* 5: 45-7: pls. 5-9. (1914).

(2) Pergande, T. *Bul.* 18, u.s., U. S. Dept. Agric., Div. Ent., p. 26. (1898).

(3) Newstead, R. *Mon. Brit. Coccidæ*, vol. 1: 15. (1901).

(4) Newstead, R. *Mon. Brit. Coccidæ*, vol. 2: 227. (1903).

spiracles of *Orthezia cataphracta* (Shaw), one of the three species discussed by him, had been noted by List (5) in 1887 in an exhaustive paper dealing with the anatomy of this species. However, Newstead does, indeed, appear to have been the first to note their presence in any other species of this genus.

As far as I am at present able to determine the following list includes at least the genera in which abdominal spiracles have been noted, although it probably does not include all the species, some descriptions not being accessible. In the subfamily Monophlebinae there are recorded the genera *Stigmatococcus* with one species, *Perissopneumon* (perhaps not a synonym of *Stigmatococcus* as it has been regarded) with two species, and one species of *Monophlebus*. In the Margarodinae there are the genera *Xylococcus* with four species, *Steingelia* with two, *Stomacoccus* with one, some of the species of *Margarodes*, and at least two of *Cælostomidia*. In the Dactylopiinae there is but the monotypic genus *Cryptokermes*. In the Ortheziinae there are three species of *Orthezia*.

On the face of these records it would appear that the presence of abdominal spiracles has indeed but little significance and their occurrence might well be taken as evidence of aberrancy, the more so as most of the species in which they are recorded are curious enough in other respects as well. However, an examination of even the limited number of species available to me for study has shown that these records are extremely misleading. In short, abdominal spiracles are present in several forms in which they have not been noted and are in all probability present in many others.

The most surprising fact is that they appear to have been overlooked in such a well known species as *Icerya purchasi* Maskell, as well as in at least two other species of this genus. In *I. purchasi* Maskell two pairs are present, while in *I. seychellarum* (Westw.) and *I. aegyptiaca* (Dougl.) there are at least three. The original description of *I. jacobsoni* Green is not available and I do not know if they have been noted in this species, but in specimens from the Philippine Ids. (det. Cockerell) there are at least two pairs. In all these species the spiracles are situated toward the posterior

(5) List, J. H. *Orthezia cataphracta* Shaw. In *Arbeiten a. d. zool. Inst. zu Gratz*, 1 : 5 : 201-278 : pl. 1-6. (1887).

end of the abdomen. It is, perhaps, after all, not so surprising that they have not been observed for they are quite small and difficult to find among the many pores, spines and cicatrices, even in well stained preparations, but that they are really spiracles has been clearly demonstrated for it is possible to see the tracheæ proceeding from them.

Three other species belonging to the Monophlebinae are at hand, these including *Paleococcus plucheæ* (Ckll.), *Drosicha burmeisteri* (Westw.), (det. Kuwana) and *Drosicha corpulenta* (Kuwana), and in none of these have abdominal spiracles been recorded. My single specimen of *Paleococcus plucheæ* (Ckll.) shows at least one pair but is in too poor condition to decide whether or not there are more. Both the species of *Drosicha* show seven clearly distinguishable pairs.

Of the species of Margarodinae in which these spiracles have not been noted there are at hand specimens of *Kuwania quercus* (Kuwana) and *Kuwania* (?) *zeylanica* (Green). In the former there appear to be but four pairs, these being on the anterior segments, and in the latter there are eight, of which the posterior two are so much reduced as to amount to but little more than points of attachment for the tracheæ.

In the Ortheziinae abdominal spiracles have been seen only in the three species noted by Newstead, *O. insignis* (Dougl.), *O. cataphracta* (Shaw) and *O. urticae* (Linn) but they are present in *O. californica* Ehrh., *O. galapagoensis* Kuwana and in an undetermined species of which I have specimens. In *O. californica* I note seven pairs, but in the other two species examined by me the material is in too poor condition to permit conclusions as to the real number. Newstead apparently does not state the number in the species examined by him, but List has recorded seven pairs in *O. cataphracta* (Shaw). Newstead states that he has not been able to trace them in *Newsteadia floccosa* (De Geer), nor have I been able to find them in *Nipponorthezia ardisia* Kuwana.

The monotypic genus *Cryptokermes* Hempel, which possesses abdominal spiracles, forms an extremely discordant element even in such an aggregation of disharmonies as the subfamily Dactylopiinae (of the Fernald Catalogue) to which it is now referred. Specimens of *C. brasiliensis* Hempel, (Mexico, det. Cockerell) are

at hand and are sufficient to show that the species has been thoroughly misunderstood and that it cannot be referred to this subfamily. It is, in fact, a member of that group, whatever it may eventually be called, that includes the present subfamilies Monophlebinae and Margarodinae, although it cannot be referred to either of these groups as they are at present defined for it seems to combine the characters of both. I shall discuss the species at some length in a later note.

The facts here presented are too few to permit of any very sweeping generalities, yet they are suggestive enough and I present them at this time, in spite of their fragmentary character, in order to call attention to them and to their possible significance.

It will be noted that, with the exception of the species of *Orthezia*, all the forms in which these spiracles have been noted belong to the two subfamilies Monophlebinae and Margarodinae. Conversely, it is possible, if indeed not probable, that all the members of these groups will eventually be found to possess such organs. It, therefore, appears that we may have available a taxonomic element that has not been fully utilized and that may throw a considerable amount of light upon the relationships of these forms. Whether or not the presence of abdominal spiracles is any evidence of a close relationship between the Ortheziinae and the other two subfamilies remains to be seen, but there is some other evidence that the present division between the Monophlebinae and the Margarodinae is by no means as clear as it has been thought.

The Board of Regents of the University of Minnesota at their meeting on January 18th elected Dr. W. A. Riley, of Cornell, Professor of Parasitology and Chief of the Division of Economic Zoology. Associate Professor A. G. Ruggles was, at the same time, appointed Station Entomologist, which position carries with it the office of State Entomologist. At the December meeting of the Board Professor F. L. Washburn, who has held the position of State Entomologist in Minnesota for nearly sixteen years, asked and obtained permission to be relieved of that position and its attendant police duties, and the action of the Board on the 18th was necessary to fill the vacancy thus caused.

APHIS SALICETI (KALTENBACH), SIPHOCORYNE
PASTINACÆ (LINN.), AND ALLIED SPECIES.

BY C. P. GILLETTE AND L. C. BRAGG, FORT COLLINS, COL.

It is the object of the authors of this paper to give the results of their studies on a half dozen species of aphides that are quite similar in general appearance, and all but one of which have the willows for their winter hosts, in the hope that they will clear away some confusion and prevent further mixing of data. We believe we have the structural characteristics and food habits well enough worked out so that these species may be readily separated, whether from their winter or summer hosts, by use of the following simple key:

Cornicles cylindrical or slightly tapering.

Pre-caudal spine on dorsum of 8th abdominal segment.....*Aphis theobaldi*, n. sp.

No pre-caudal spine on 8th abdominal segment.....*Aphis saliceti*.

Cornicles distinctly clavate.

With pre-caudal spine on 8th abdominal segment,
Joints 4, 5, 6 and spur sub-equal.....*Siphocoryne capreae*.

Spur equal to joints 4, 5 and 6 combined.....*Siphocoryne essigi*, n. sp.

Without pre-caudal spine on 8th abdominal segment,
Antenna shorter than the body.....*Siphocoryne pastinacæ*.

Antenna longer than the body.....*Siphocoryne grabhami*.

In order that others interested in these species may look up the literature readily, we are giving references to the more important papers:

Aphis saliceti Kaltenbach.

Aphis saliceti, Monographie der Fam. der Pflanzenläuse, p. 103, 1843.

Koch, Die Pflanzenläuse, p. 118, 1857.

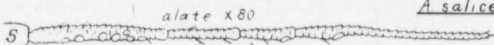
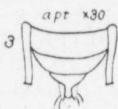
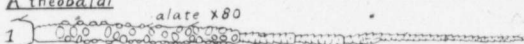
Buckton, Monograph of British Aphides, vol. II, p. 52, 1879.

Siphonophora salicicola, n. sp., Thomas, Bul. 2, III, St. Lab. Nat. Hist., p. 8, 1878.

Aphis salicicola, Monell, Bul. 5, U. S. Geol. Surv., p. 24, 1879.

Oestlund, Aphididæ of Minn., p. 63, 1887.

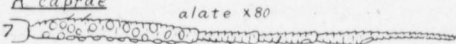
A theobaldi



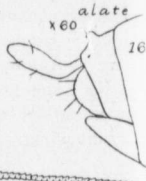
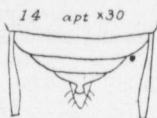
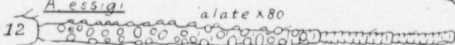
A saliceti



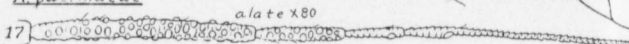
A caprae



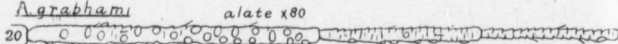
A essigi



A pastinacae



A grabhami



AP

Figure 1—4, *Aphis theobaldi*; 5—6, *A. saliceti*; 7—11, *Siphocoryne caprae*; 12—16, *S. essigi*, n. sp.; 17—18, *S. pastinacae*; 19—20, *S. grabhami*. Original, Miriam A. Palmer Delineator.

- Aphis salicola*, Cowen, Hemip. of Colo., Bul. 31, p. 121, 1895.
Morgan, Jour. Exp. Zool., vol. VII, p. 301, 1909.
- Aphis salicicola*, Davis, Jour. Ec. Ent., vol. 3, p. 490, 1910.
Williams, Aphididæ of Neb., Univ. Studies, vol. 10, No. 2,
p. 55, 1910.
- Aphis saliceti*, Theobald, Rep. on Ec. Ent. for 1912, p. 84 (*theobaldi*).
- Aphis salicicola*, Davidson, Jour. Ec. Ent., vol. 5, p. 408, 1912.
Patch, Bul. 213, Me. Exp. Sta., p. 81, 1912.
- Siphocoryne saliceti*, Börner, Blattlausstudien, in Abhand, Naturwiss.
Ver. Bremen, XXIII, pt. I, p. 164, 1914.
- Aphis saliceti*, Van der Goot, Beiträge zur Kenntnis der Holländischen Blattläuse, p. 225, 1915.

The *salicicola* of Thomas is undoubtedly a synonym of *saliceti* Kaltenbach, and the cases where the specific name is given as "*salicola*" are errors in spelling, Cowen being the first offender, and others following.

This species is of special interest because of the cytological work done upon it by Dr. N. M. Stevens and Dr. T. H. Morgan. We happen to know this is the species that was worked with as specimens were submitted to us by Dr. Morgan for identification. It differs from the others mentioned in this paper in its habit of remaining upon the willows throughout the year, and seems not to have an alternate summer host. It is also peculiar among the aphides, that deposit over-winter eggs, in that the sexual forms appear very early in the summer. We have taken the males and oviparous females at Fort Collins as early as June 20, and the eggs before the end of June. We know no other species approximating it in this respect. Our records for the capture of the sexual forms are as follows:

- Woods Hole, Mass., June 29, 1909, L. C. Bragg.
Geneva, N. Y., June 30, 1909, C. P. Gillette.
Fort Collins, Colo., July 14, 1910, L. C. Bragg.
" " " June 17, 1912, L. C. Bragg.
" " " June 20, 1912, L. C. Bragg.
Lansing, Mich., July 12, 1912, C. P. Gillette.
Fort Collins, Colo., July 30, 1912, L. C. Bragg.
Manitou, Colo., June 14, 1917, L. C. Bragg.

We also have viviparous lice in the collection taken as follows:

Russia, 1893, N. Cholodkovsky.

Mass., 1909, T. H. Morgan.

Webster, Mass., June 19, 1909, L. C. Bragg.

Lyons, Colo., June 11, 1916, L. C. Bragg.

Fort Collins, Colo., June 11, 1917, L. C. Bragg.

Dr. Stevens, in her paper, referred to above, states that Kyber, in his paper on "Einige Erfahrungen und Bemerkungen über Blattläuse in Germar's Magazin der Entomologie, 1815, records finding sexual forms of what was, undoubtedly, this species, on willow in June, and she also reports taking the sexuales on June 29 at Harpswell, Maine.

***Aphis theobaldi*, n. sp.**

Aphis saliceti Kalt., Theobald, Rep. on Ec. Ent. for 1912, p. 84.

The presence of the pre-caudal spine, or produced eighth abdominal tergite, and the cylindrical cornicles, are characters that readily separate this species from the others mentioned in this paper. It seems to be the species described and figured by Theobald in his Report on Economic Zoology for 1912, page 84, and Plate XIII, and Figure 24. The species is one having alternate food habits, and may be described from our material as follows:

Alate Viviparous Female.

From specimens mounted in Canada balsam. Head, thorax, antennæ, tarsi and distal ends of tibiæ, black or blackish; abdomen greenish or yellowish; cornicles cylindrical, .28 long, or about as long as the spur of the antennæ and yellowish in colour; cauda barely one-half as long as the cornicles; a short, blunt tubercle on the median line of the 8th abdominal tergite; antennæ nearly reaching the base of the cornicles; 1.13 long; joint III with about 40 strong tuberculate sensoria and longer than joint VI with the spur; spur as long as joints IV, V and VI combined; length of body, 1.50; wing venation normal.

Described from specimens taken at Geneva, N.Y., July 1, 1909.

Apterous Viviparous Female.

From specimens mounted in Canada balsam. Colour, a uniform yellowish brown, probably green or yellowish green in

life; legs, antennæ and cornicles yellow, with tips of antennæ and tarsi black; cornicles yellow and nearly cylindrical, slightly tapering and curved outward at the distal ends; .40 long, or fully as long as joint VI of the antenna with its spur; length of antenna, 1.20; joint III without sensoria; cauda rather broad and spatula-like; or pre-caudal tergite, a somewhat knobbed tubercle, fully half as long as the cauda, projecting directly above it and bearing two prominent hairs; antennæ and legs sparsely set with short, stout, blunt hairs that can hardly be said to be capitate; length of body, 1.60. See figures.

Described from specimens taken along with the alate viviparous females at Geneva, N.Y.

Both alate and apterous forms, in every respect like those described above, were taken at the same place and date on flower heads of *Heracleum* species, and we have also taken it from celery, Webster, Mass., 6, 19, 1909, so there can be little doubt but that this species also alternates between the willows and umbelliferous plants as in the cases of *caprea* and *essigi*.

Siphocoryne caprea (Fabricius).

Aphis caprea, Ent. Syst. Nat., IV, 221, Syst. Ent. 217; Syst. Rhyng., p. 294, 1803.

Kaltenbach, Monographie der Pflanzenläuse, p. 109, 1843.

Rhopalosiphum caprea, Koch, Die Pflanzenläuse Aphiden, p. 37, figs. 46-47, 1857 (not this species).

Rhopalosiphum cicutæ, Koch, Die Pflanzenläuse, p. 24, 1857.

Rhopalosiphum pastinacæ, Koch, Die Pflanzenläuse Aphiden, p. 41, figs. 52-54, 1857.

Siphocorynæ caprea, Passerini, Gli Afidi, 1860.

Siphocorynæ pastinacæ, Buckton, British Aphides, vol. II, p. 24, 1879.

Rhopalosiphum salicis, Monell, Bull. 5, U. S. Geol. Surv., p. 26, 1879.

Thomas, 8th Report St. Ent. III, p. 194, 1879.

Siphocoryne salicis, Weed, Trans. Am. Ent. Soc., vol. XX, p. 297, 1893.

- Siphocoryne angelica*, Östlund, Aphididæ of Minn., p. 70, 1887.
Rhopalosiphum caprea, Gillette, Jour. Ec. Ent., vol. IV, p. 320, 1911.
Siphocoryne caprea, Theobald, Rep. Ec. Zool. for 1912, p. 87.
Siphocoryne caprea, Essig, Univ. of Calif. Tech. Bull., vol. I, No. 7, p. 342, 1917.

***Siphocoryne essigi*, n. sp.**

- Hyadaphis pastinacæ*, Essig, Pomona Jour. of Ent. 1911, p. 534.
 This species which was well described and figured by Essig, differs from *pastinacæ* by having the pre-caudal spine, and from *caprea* by the long antennal spur and in other ways.

***Siphocoryne pastinacæ* (Linn.).**

- Aphis pastinacæ*, Fauna Suecica, p. 259, 1761.
Aphis xylostei, Schrank, Fauna Boica, p. 107, 1801.
Aphis pastinacæ, Fabricius, Systema Rhyngotorum, p. 269, 1803.
Siphonophora pastinacæ, Buckton, vol. II, p. 24, 1879 (*caprea*).
Hyadaphis pastinacæ, Schouteden, Mém. Soc. Ent. Belgique, p. 229, 1906.
Hyadaphis xylostei, Davis, Jour. Ec. Ent., p. 493, 1910.
Rhopalosiphum pastinacæ, Gillette, Jour. Ec. Ent., pp. 320-322, 1911.
Rhopalosiphum xylostei, Gillette, Jour. Ec. Ent., p. 320, 1911.
Hyadaphis pastinacæ, Essig, Pomona Jour. Ent., p. 534, 1911.
Rhopalosiphum xylostei, Murtfeldt, Jour. Ec. Ent., vol. 4, p. 226, 1911.
Siphocoryne pastinacæ, Theobald, Rep. on Ec. Zoology for 1912, p. 88.
Siphocoryne xylostei, Essig, Univ. of Cal. Tech. Bull., vol. I, No. 7, p. 324, 1917.

While Linnæus took his *pastinacæ* from *Pastinaca sativa*, and Schrank took his *xylostei* from the European honeysuckle, *Lonicera xylosteum*, we now know that the latter food plant is an overwinter host for *pastinacæ*, and, as the descriptions of these species do not differ in any important particular, we believe *xylostei* should be considered a synonym of *pastinacæ*.

***Siphocoryne grabhami*. Cockerell.**

- Canadian Entomologist, vol. XXXV, p. 342, 1903.

ODONATA OF THE RED DEER DISTRICT.

(Continued from page 103, Vol. XLIX).

BY F. C. WHITEHOUSE, RED DEER, ALTA.

In the introduction to my original publication I expressed the opinion that it would be slow work to lengthen the Odonata list in the vicinity of Red Deer to any extent. This has proved correct during the 1917 season, since I have succeeded in adding but one species. From 11th to 19th July, however, I devoted my time to collecting at Nordegg, Alta., the site of the Brazeau Collieries Ltd., situated 120 miles due west and, I should judge, just within the Hudsonian zone. The result of such collecting so far as the Odonata are concerned, was to add eight additional species to my list, and these of such special interest as to warrant a supplementary article.

Dr. Walker has kindly examined the material, and given the manuscript critical reading.

As in the prior list, the first numbers are my series, and the second refer to the pages of Muttkowski's catalogue.

Cœnagrionidæ.

CŒNAGRIONINÆ.

28-65. *Nehalennia irene* Hagen.

July 1st, north end Gaetz Lake, Red Deer, I saw a pair in coitu, but failed to take them. July 2nd, at the large slough north of the river, I captured a male and female. July 8th, 2 males at "run" of stagnant water west of Gaetz Lake.

All the insects were of adult colouration, and all were flying down among the slough grass. I was not previously familiar with this species, which probably accounts for my failure to note it last year. However, I am convinced that it is not common in this district—at least around waters where most of my collecting has been done. New to Alberta list.

29-66 *Cœnagrion interrogatum* Selys.

At Nordegg, 19th July, 30 couples of this rare insect were taken in probably less than half an hour and within a space of 50 feet. In the morning in question my friend Mr. K. Bowman, of Edmonton, was giving the Lepidoptera a short respite and me his kindly assistance. At one time we had five couples in our

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nets, i. e., more than all previous captures of *interrogatum* up to that time. All the insects were fully adult and flying in coitu.

Dr. Walker's descriptions and illustrations of this species are so thorough that little remains to be said. In the long series, however, one very obvious colour variation attracted attention, viz., that in several of the males, dorsal view, the black marking nearest the thorax (segment 3) is not pointed, but a plain black band.

For three seasons I have been on the lookout for *interrogatum*, and have made a practice wherever I noticed insects of the genus flying to capture a few for examination. At the slough in question I had examined both *resolutum* and *angulatum* before coming upon the prize. Now that I have located the spot where the insect may be described as *common*, it might be well to record it. It is the round slough north of the track, to be seen from the train just before pulling into Nordegg. The water is about eighteen inches deep and abounding with "suckers." The bottom is soft mud and free from weeds, though, at the margins, a slight fringe of reeds rises from the moss. A tamarack swamp adjoins the pond.

Of the specimens taken I placed 12 couples in alcohol and papered the balance in pairs. New to Alberta list, and most westerly record.

Libellulidæ.

CORDULINÆ.

30-129 *Somatochlora albicincta* Burmeister.

At Nordegg between 12th and 19th July I took some 18 males and 3 females of this species. Of these two or three were captured at the top of what is locally known as Coliseum Mountain, 6,500 feet, one or two at the camp 1,200 to 1,500 feet below, and the balance down in the valley, say 4,000 feet. On 19th July, 13 males and 1 female were captured at the round slough described above (see *C. interrogatum*) flying with *S. hudsonica* and *C. shurtleffi*. On that day I searched the mossy edges of the pond for nymphs and took a number of exuviae of *Æshna eremita*, which was in company with *A. juncea*, on the wing there and a series of what on circumstantial evidence should be *S. albicincta*.

With regard to the adults of *albicincta* that I captured, there was one feature in the general appearance that immediately

enabled me to distinguish them from *hudsonica*, quite apart from the appendages, viz., the impression that the white bands are interrupted dorsally.

31-129 *Somatochlora cingulata* Selys.

At the mountain camp at Nordegg on the evening of 14th July something flew by over the spring of water that looked like a huge *Somatochlora*, with pink bands. Next afternoon among the small spruce on the mountain top I was sweeping with my net at a female of *franklini* at rest on a spruce, when something large settled about a foot away. I diverted the sweep of the net to take the larger fly, for I had a good series of *franklini* and preferred to settle the identity of the insect. Then I put my arm in the net and drew out my captive, a large *Somatochlora* with pink bands. The July number of the Can. Ent., vol. XLIX, containing Mr. Kennedy's article on the cingulata group, had not arrived when I left Red Deer for Nordegg, and the insect was unknown to me. Of course, I realized that the pink bands were probably only general colouration, but that, and the identity of the insect could wait, what I must find was a male. But I saw no more *Somatochlora* of the required dimensions that day, nor the next. On the morning of July 17th July (to be my last on the mountain) I found three flying together on the top, close to where I had taken the female, but I seemed out of luck. One I took a risky flying shot at and struck with the rim of the net. It went off into the empyrean. Another I missed at rest on a spruce, at least it did not wait long enough, but thoroughly frightened, also went off into space. The third I stalked, on and off, for three or four hours. It would rest on the small spruce frequently, the long abdomen hanging quite perpendicularly, but never would it give me the chance I desired, and I dare not take a risky shot. At last the moment came. At rest on the extreme tip of a spruce bough and not too high. I crept nearer and nearer; then struck up with maximum speed. I had him at last—yes, a beautiful young male just at his prime.

During the next two days in the valley below, 4,000 feet, I saw no more of this species. The pair I took are in alcohol. New to Alberta list.

32-130 *Somatochlora franklini* Selys.

On the top of Coliseum 11th July I took 2 females of *franklini* flying with males of *S. minor*. It was not until the 14th that I captured any more, when I got 4 and also four males. On the 15th I took more females, the 16th more males and females, and the 17th again females only. I have a good pair in alcohol, but the insects were mostly but passing from the teneral stage, and among the papered specimens the percentage of casualties is regrettably high. I did not take, nor see, any of this species in the valley.

The wings of the females varied in the tinting considerably, due doubtless to some extent to the period since emerging. The darkest shade is best described a "smoky black." Like all the *Somatochlores* that I took on the mountain *franklini* rested frequently on spruce, etc., but the fact must not be overlooked that all the mountain specimens of this and the other species were young insects. New to Alberta list.

16-131 *Somatochlora hudsonica* Hagen.

At the round slough at Nordegg 19th July I took three males of *hudsonica* flying with *S. albicincta* and *C. shurtleffi*. Mr. Kennedy points out in his article (referred to above) that my 1916 captures at Red Deer are the only record for this insect, except the original three types taken 1861 at Ft. Resolution, Hudson Bay territory. The dates of my 1916 captures were given in my prior list, those of 1917 are as follows: Red Deer, 1st July, 3 males at the same "run" of still water north of Gaetz Lake; and the 3 males at Nordegg 19th July. In all I have, therefore, taken 13 specimens of *S. hudsonica*, of which only one was a female. The Red Deer and Nordegg insects were of about the same age, accountable, of course, to the change from Canadian to Hudsonian zone. Mr. Bowman, who has studied this point somewhat carefully in the Lepidoptera, informs me that he finds in the case of most species that occur both on the prairie and in the mountains there will be an average difference in appearance of two to three weeks.

33-131 *Somatochlora minor* Calvert.

July 11th on top of Coliseum, Nordegg, 2 females, flying among

the spruce. From that date to 18th July I took 12 more males and 12 females. The captures of 18th July, a male and female, were taken at the slough by the Forestry Station in the valley, 4,000 feet. The insects were all fresh and some damage occurred to the papered specimens. New to Alberta list.

34-132 *Somatochlora semicircularis* Selys.

At the camp, Coliseum Mountain, in the evening 16th July, I took a male at rest on a spruce. I immediately realized from the general appearance that the insect was distinct from the other somewhat similar species that I had been taking, i. e., *franklini*. Not only was it larger and had a relatively greater wing spread, but the abdomen, flattening to some extent in the process, attained its greatest girth at segments 6 and 7, and tapered again to segment 10, while in *franklini* the most robust segments are 7 and 8, and the reduction in 9 and 10 very slight. I have the specimen in alcohol. *Semicircularis* has previously been recorded from Banff and Laggan.

35-132 *Somatochlora septentrionalis* Hagen.

On the morning 15th July I had been collecting at the sloughs each side of the trail at the Forestry Station. At noon I was knee deep in slough when the Forestry Officer hailed me to come up to lunch. Dripping water, I climbed through the fence, and there in the enclosure I saw a *Somatochlora* flying in the shade of a Jack pine. If I had refrained from taking it from laziness, hunger or politeness, that fine male of *septentrionalis* would never have been captured, and I should not have taken eight different species of *Somatochlora* at Nordegg in nine days. The specimen is in alcohol. New to Alberta list.*

36-132 *Somatochlora walshii* Scudder.

A single female was taken on July 15th on the top of Coliseum. It was mistaken for *minor*, which it resembles very closely except in the form of the vulvar lamina.

Beside the 15 species of dragonflies dealt with, or indirectly

*A female evidently of this species, though differing from the published descriptions and figures of *septentrionalis* in the form of the vulvar lamina was also taken by Mr. Whitehouse on the top of Coliseum on July 12.—E. M. W.

mentioned, in the foregoing, it might be well to record others observed at Nordegg between 11th and 19th July, viz., *Lestes uncatus*; 1 female on top of mountain; *Æshna sitchensis*, 2 males on top of mountain, *Libellula quadrimaculata*, numbers at slough at Forestry Station; *Sympetrum rubicundulum decisum*, common on top of mountain and in the valley, *Leucorrhinia borealis* 2 males on top of mountain; *L. hudsonica*, common on mountain top and in the valley.

While the object of the collecting trip on the Coliseum Mountain was not solely dragonflies of the genus *Somatochlora*, the hopes of taking such insects was certainly one of the strong inducements. Just why I believed that I should find them on the top I do not know, and having found them another question presents itself. What are they doing there? It is not their true home as it is to the mountain-top butterflies *Colias nastes*, *Brenthis astarte*, etc., for these live there absolutely, and never descend to lower altitudes. In the case of dragonflies whether *Somatochlora* or any other genus this is clearly impossible, for there is no water. The insects must have passed the aquatic stages in the ponds, lakes, muskegs and creeks of the valley below, and with equal certainty they must return to the valley for ovipositing. I have already stated that all the insects taken on the mountain were young ones—many barely out of the teneral stage, and further that a male of *S. minor* would be found flying with females of *franklini*, and in the same way males of *albicincta* with females of *minor*. In other words they had not reached the stage when they must concern themselves with the next generation. My opinion, based on my observations, is as follows: that the teneral *Somatochlora* upon emerging aspires to higher altitudes and, judging from my captures at the camp, travels up the sheltering ravines in its journey to the top. Arriving there, it feeds; plays in the sun-lit glades of spruce or Jack pine; rests frequently and having reached the breeding stage once more returns to the valleys. This being the case it is clearly not *necessary* for the collector to work the mountain top at all. I think, however, that it may have one advantage, viz., that a representative variety of species, raised over a number of square miles of valley below, are conveniently assembled within a limited area.

LECTOTYPES OF HYMENOPTERA (EXCEPT APOIDEA)
DESCRIBED BY ABBÈ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from Vol. L, page 33.)

Mesoleptus variabilis. (Faun. 1883, p. 759, not Nat. Can. 7, p. 115). Type.—Female, yellow label 682. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus variabilis. (Nat. Can. 7, p. 115, not Fauna 1883, p. 795). Type.—Male, yellow label 1080, name label *Mesoleptus muliebris* Cress. 2nd Coll. Pub. Mus., Quebec. Apical joints of hind tarsi gone.

Mesostenus albicoxus. See *Phygadeuon*.

Mesostenus albifacies. Type.—Female, blue label 553; yellow label 1583. 2nd Coll. Pub. Mus., Quebec. Fair, somewhat oily.

Mesostenus apicalis. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon finitimus* Cress.

Mesostenus armatus. Type.—Female, Harrington Coll. Pink label "P. 416."

Mesostenus brevipennis. Type.—Not in Pub. Mus., Quebec, unless under *Mesostenus promptus* Cress. This synonymy indicated by Provancher's annotated copy of Fauna.

Mesostenus collinus. Type.—Not in Pub. Mus., Quebec, unless under *Cryptus eburneifrons* Prov.

Mesostenus flavipes. Type.—Male, yellow label 459. 2nd Coll. Pub. Mus., Quebec. Fair.

Mesostenus jocosus. Type.—Female, yellow label 304. 1st Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

Mesostenus latigaster. Type.—Female, Harrington Coll. Pink label "P. 407." Abdomen broken off and when glued on covered propodeum.

Mesostenus longicornis. Type.—Not in Pub. Mus., Quebec, unless under *Mesoleptus moveni* Prov.

Mesostenus nitidus. Not Grav. See *Phygadeuon nitidulus*.

Mesostenus nobilis. Type.—Female, yellow label 1049.

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2nd Coll. Pub. Mus., Quebec. Left antenna gone and apices of right wanting.

Mesostenus pallipes. Type.—Not in Pub. Mus., Quebec, unless under *Mesoleptus triangularis* Cress.

Mesostenus pluricinctus. Type.—Harrington Coll. Pink label "P. 462." Davis has labeled this *Diacritus muliebris* Cress.

Mesostenus ruficornis. Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon nitidulus* Prov.

Mesostenus ruficoxus. Type.—Not located. = *provancheri* D. T.

Mesostenus rufocinctus. Type.—Not located.

Mesostenus sagax. Type.—Female, yellow label 522. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna and apex of right.

Mesostenus saint-cyri. Type.—Not in Pub. Mus., Quebec, unless under *Echthrus abdominalis* Cress.

Mesostenus tarsatus. Type.—Not in Pub. Mus., Quebec, unless under *Cryptus americanus* Cress.

Metacolus conicus. Type.—Female, yellow label 1365. 2nd Coll. Pub. Mus., Quebec. Fair.

Meteorus gracilis. Type.—Female, yellow label 1264. 2nd Coll. Pub. Mus., Quebec. Poorly mounted on tag. Antennæ and right hind leg missing.

Meteorus incompletus. Type.—Male, yellow label 1283. 2nd Coll. Pub. Mus., Quebec. Poorly pinned. Antennæ broken.

Meteorus politus. Type.—Female, yellow label 1266. 2nd Coll. Pub. Mus., Quebec. Badly pinned.

Meteorus robustus. Type.—Female, yellow label 1265. 2nd Coll. Pub. Mus., Quebec. Poorly pinned, one antenna beyond middle and hind legs at coxæ, gone.

Microctonus laticeps. Type.—Female, yellow label 1286; blue label 616. 2nd Coll. Pub. Mus., Quebec. Right antenna at 4th joint, front legs, right hind leg missing.

Meteorus vigilax. Type.—Probably male, yellow label 565. 2nd Coll. Pub. Mus., Quebec. Abdomen gone. Allotype, female without labels.

Microdus bicolor. Type.—Female, yellow label 905. 2nd Coll. Pub. Mus., Quebec.

Microdus dispar. Type.—Female, yellow label 1256(s).
2nd Coll. Pub. Mus., Quebec. Poorly tag-mounted.

Microdus nigricoxus. Type.—Female, blue label 656; yellow label 1572. 2nd Coll. Pub. Mus., Quebec.

Microdus quebecensis. Type.—Female, yellow label 581.
2nd Coll. Pub. Mus., Quebec.

Microgaster auripes. Type.—Female, blue label 673; yellow label 590. 2nd Coll. Pub. Mus., Quebec. One antenna broken at middle.

Microgaster brevicaudus. Type.—Female, yellow label 1167. 2nd Coll. Pub. Mus., Quebec. One antenna broken at tip.

Microgaster crenulatus. Type.—Male, yellow label 1577.
2nd Coll. Pub. Mus., Quebec. Left fore leg and left hind leg missing.

Microgaster lateralis. Type.—Yellow label 1306. 2nd Coll. Pub. Mus., Quebec. Antennæ, wings on right side and abdomen missing.

Microgaster melligaster. Type.—Female, yellow label 1301.
2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

Microgaster 4-dentatus. Male, blue label 45, yellow label 1271. 2nd Coll. Pub. Mus., Quebec.

Microgaster rubricoxus. Type.—Male, yellow label 1576.
2nd Coll. Pub. Mus., Quebec. Antennæ and right hind leg broken.

Micromelus nigricornis. Type.—Yellow label 942. 2nd Coll. Pub. Mus., Quebec. Fair.

Mictropis nebulosa. Type.—Harrington Coll.

Monedula nigrifrons. Type.—Female, yellow label 1616.
2nd Coll. Pub. Mus., Quebec.

Monedula parata. Type.—Female, yellow label 1617. 2nd Coll. Pub. Mus., Quebec.

Monobia bicolor. Type.—Female, white label 61(s); yellow label 1629. 2nd Coll. Pub. Mus., Quebec.

Monodontomerus viridæneus. Type.—Not in Pub. Mus., Quebec, unless under *Oligostenus stigma* Fabr.

Monophadnus pallipes. Type.—Female, yellow label 1675.
2nd Coll. Pub. Mus., Quebec.

Mutilla canadensis. Type.—Not located.

Myrmica incompleta. Type.—Not located.

Nematopodius coxatus. Type.—Not in Pub. Mus., Quebec, unless under *Cryptus americanus* Cress.

Nematus decoratus. Yellow label 1541. 2nd Coll. Pub. Mus. Quebec.

Nematus fulvicrus. Type.—Yellow label 485. 2nd Coll. Pub. Mus., Quebec.

Nematus tetraopsis. Type.—Yellow label 1673. 2nd Coll. Mus. Parlement, Quebec.

Neuropenes ovalis. Type.—See Introduction. (Aphidiinae.)

Neuroterus crassitelus. Type.—White label "Cap Rouge, Canada;" yellow label 934. 2nd Coll. Pub. Mus., Quebec. Bad condition. *Cynips (Neuroterus) crassitelus*—under *Cynips* in Provancher's catalogue.

Neuroterus terminalis. Type.—White label 114; white label 72(s); yellow label 1593. 2nd Coll. Pub. Mus., Quebec.

Nomia compacta. Type.—Not in Pub. Mus., Quebec.

Nototrachis canadensis. Type.—Female, yellow label 275. 2nd Coll. Pub. Mus., Quebec. Antennæ at scape and front legs missing.

Nysson nigripes. Type.—Male, yellow label 1429. 2nd Coll. Pub. Mus., Quebec.

Odontomerus canadensis. Type.—Female, yellow label 426. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna. Male, allotype, without labels.

Odynerus antillarum. Type.—Not located.

Odynerus bimaculatus. Type.—Female, yellow label 1692. 2nd Coll. Pub. Mus., Quebec.

Odynerus robustus. Type.—Female, yellow label 1708. 2nd Coll. Pub. Mus., Quebec.

Odynerus tricolor. Type.—Male, white label 182, yellow label 1694. 2nd Coll. Pub. Mus., Quebec.

Odynerus truncatus. Type.—Male, yellow label 1693. 2nd Coll. Pub. Mus., Quebec.

Oenone sericea. Type.—Female. 2nd Coll. Pub. Mus., Quebec. Poorly tag mounted, right antenna broken at tip.

Oligostenus bimaculatus. Type.—Harrington Coll.

Ophion nigrovarius. Type.—Female, yellow label 273. 2nd Coll. Pub. Mus., Quebec. Antennæ, left hind leg beyond

femora, right hind tarsus in part gone; abdomen broken off but stuck on pin below label. Allotype—Male, yellow label 322. 1st Coll. Pub. Mus., Quebec.

Opius cinctus. Type.—See Introduction.

Opius macrocephalus. Type.—Not in Pub. Mus., Quebec, unless under *Alysia rudibunda* Say.

Opius mellipes. Type.—n. n. for *O. pallipes* Prov.

Opius nanus. Type.—See Introduction.

Opius niger. Type.—See Introduction.

Opius pallipes. See Introduction.

Opius ruficeps. Type.—See Introduction.

Opius variabilis. Type.—See Introduction.

Orgilus detectus. Type.—Female, blue label 680, yellow label 1573. 2nd Coll. Pub. Mus., Quebec.

Ormyrus bruneipes. Type.—Female, yellow label 1358. 2nd Coll. Pub. Mus., Quebec. Fair.

Orthocentrus abdominalis. Type.—Female, yellow label 357. 2nd Coll. Pub. Mus. Quebec.

Orthocentrus albofasciatus. Type.—Male, yellow label 935. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

Orthocentrus canadensis. Type.—Male, yellow label 356. 2nd Coll. Pub. Mus., Quebec.

Orthocentrus carinatus. Type.—Male, yellow label 518. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ gone.

Orthocentrus lucens. Type.—Not located.

Orthocentrus nigricoxus. Type.—Not located. Probably returned to collector.

Orthocentrus pilifrons. Type.—Yellow label 355. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ, some legs and abdomen.

Oxybelus brodiei. Type.—Female, yellow label 1041. 2nd Coll. Pub. Mus., Quebec. Double mounted and with fly as prey. Apex of right fore wing gone.

Oxylabis spinosus. Type.—Blue label 759; yellow label 943. 2nd Coll. Pub. Mus., Quebec.

Pachyprotasus delta. Type.—Female, yellow label 496. 2nd Coll. Pub. Mus., Quebec. Right flagellum gone.

- Pammegischia burquei.** Type.—Female, yellow label 507. 2nd Coll. Pub. Mus., Quebec.
- Paniscus albotarsatus.** Type.—Male, yellow label 288. 2nd Coll. Pub. Mus., Quebec.
- Paniscus albovariegatus.** Type.—Male, yellow label 287. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen at apex broken off.
- Paniscus appendiculatus.** Type.—Not in Pub. Mus., Quebec, unless under name, *Paniscus geminatus* Say.
- Paniscus quebecensis.** Type.—Not in Pub. Mus., Quebec, unless under name *Exetastes sucveolens* Walsh
- Pantoclis inermis.** Type.—Yellow label 1119. 2nd Coll. Pub. Mus., Quebec. Fair.
- Paphagus rugosus.** Type.—Yellow label 1383. 2nd Coll. Pub. Mus., Quebec. Badly mounted.
- Paramesius longicornis.** Type.—Yellow label 950. 2nd Coll. Pub. Mus., Quebec. Fair.
- Pelopæus argentipilis.** Type.—Not located.
- Periclistus obliquus.** Type.—White label 156; white label 74(s); yellow label 1594. 2nd Coll. Pub. Mus., Quebec.
- Perilampus aciculatus.** Type.—Blue label 767(s); yellow label 1359. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen gone.
- ***Perilampus lævis.** Type.—Harrington Coll. Paratype—Yellow label 932. 2nd Coll. Pub. Mus., Quebec. Badly mounted.
- Perilampus stygicus.** Type.—Yellow label 1599. 2nd Coll. Pub. Mus., Quebec. Fair.
- Perilitus incompletus.** See *Meteorus*.
- Perilitus mellinus.** Type.—Female, yellow label 727. 2nd Coll. Pub. Mus., Quebec. Antennæ, median tarsi, right hind leg at coxæ, left hind tarsi broken.
- Perilitus nigritus.** Type.—Male, yellow label 1579. 2nd Coll. Pub. Mus., Quebec. Tag mounted. Right antenna entirely, left beyond middle, left posterior wing, median and hind leg on left and right hind tarsi missing.
- Pezomachus niger.** Type.—Female, white label 34(s); yellow label 1492. 2nd Coll. Pub. Mus., Quebec. Fair.

(To be continued)

BOOK NOTICES.

PLANT MATERIALS OF DECORATIVE GARDENING—The Woody Plants, by William Trelease, Professor of Botany in the University of Illinois, Urbana. Published by the Author 1917, \$1.00 postpaid.

A good entomologist is necessarily more or less of a botanist. If he has not studied botany he is hampered in his work by his inability to name the food plants of his entomological captures. The modern entomology necessitates ecological study. Doctor Trelease has prepared a little handbook under the title given above, which is inexpensive and of a size to readily fit the pocket, and which, nevertheless, includes within its flexible covers more than two hundred pages of condensed information which will apparently make it possible for any careful observer to learn the generic and usually the specific name of any hardy tree, shrub, or woody climber that he is likely to find cultivated in the Eastern United States (not in the extreme South) or in Northern Europe. Of course, on the more pretentious estates, or in nurseries or botanical establishments, introduced forms will be found which are not included in this book; but it indicates 247 genera and 782 species, with some 375 minor forms, or over 1,150 distinct kinds belonging to 83 natural families. The author, in his introduction, states that for a few hopelessly complicated genera, such as the haws, the cotoneasters, mockoranges and roses, only a few of the most easily recognized species have been admitted. Except for these, an effort has been made to include all but the newer species; and, by way of compensation for omissions, the common trees and shrubs of the orchard may be traced to their species, and also the commoner native shrubs and cover plants.

I have not tried to use this book in the field, but I am struck with the choice of easily observed characteristics of differentiation and with the full glossary. It is a book which every field entomologist should possess.

L. O. HOWARD.

A PRELIMINARY LIST OF THE INSECTS OF THE PROVINCE OF QUEBEC, PART III—COLEOPTERA. By G. Chagnon, Montreal. Published as a supplement to Report of the Quebec Society for the Protection of Plants 1917.

It is gratifying to note the good progress made by the entomologists of the Province of Quebec in their arduous task of listing the insect fauna of their Province. With the appearance of the third part, three of the four largest orders have now been covered, and the work is, therefore, more than half-way towards completion.

The list of Coleoptera, numbering 1,810 species and varieties, is compiled from various published lists together with records of captures furnished by a number of collectors, of whom the author contributes a large majority. It is a very creditable list for a region of which but a small part has been explored from the entomological standpoint, and in which but few entomologists have made a specialty of the beetles. As the author remarks, the number of species which occur in the Province will be easily increased by over 500 by more assiduous collecting, particularly in the remoter districts.

STUDIES IN KANSAS INSECTS.—A Treatise of the More Common Species. Bulletin of the University of Kansas, Biological Series, vol. XVIII, No. 1, October, 1917.

This is a most useful report, which should find its way into every entomological library. It contains the following five articles: "The Grasshoppers of Kansas, Part I, The Melanopli of Kansas," by P. W. Claassen. This is divided into two parts, (1) Systematic, (2) Biologic and Economic. No fewer than 6 genera and 39 species are discussed. Part 2, "The Oedipodinæ of Kansas," by Raymond Beamer; a systematic account of this subfamily, which is richly represented in the State. It is abundantly illustrated, chiefly by photographs of actual specimens. "The Dragonflies of Kansas," by C. H. Kennedy, an annotated list with an analysis of the fauna from the standpoint of distribution, illustrated by 7 excellent plates. "Scale Insects Injurious to Shade and Fruit Trees, The Coccidæ of Kansas," by P. B. Lawson, a valuable descriptive account of the 75 species of this family known to occur in the State. All the species are well figured. "The Cankerworm—An Orchard and Shade Tree Pest," by Walter H. Wellhouse, a very full account of both species of cankerworm, describing their various stages, distribution, life-history, food, enemies, methods of control, etc. It is illustrated by 3 plates.

Mailed March 15th, 1918.