

The Canadian Entomologist.

Vol. XLIX.

LONDON, DECEMBER, 1917

No. 12

POPULAR AND PRACTICAL ENTOMOLOGY.

A LITTLE KNOWN CUTWORM, *Euxoa excellens* Grt.*

BY ARTHUR GIBSON, CHIEF ASSISTANT ENTOMOLOGIST, IN CHARGE
OF FIELD CROP INSECT INVESTIGATIONS, DOMINION
DEPARTMENT OF AGRICULTURE.

In the Province of British Columbia the caterpillars of *Euxoa excellens* Grt. have been abundant enough during certain years to effect important damage to vegetables of several kinds.

HABITS AND LIFE-HISTORY

The first year of which we have record of this species as an economic pest is 1885. In Fletcher's report for 1903,† it is stated that in 1885, the cutworm was a perfect plague in market gardens around Victoria. Larvæ from British Columbia were also received at Ottawa in 1888, and referred to in Fletcher's report for that year under the name of *Agrotis obeliscoides* Gn. In 1903,‡ the species was again troublesome on Vancouver Island. Since this latter year we have received no reports of injury by this cutworm until 1916, when under date of May 30, the late Mr. Tom Wilson, a valued officer of the Entomological Branch, reported an outbreak in the neighbourhood of Sechart, which is a short distance north of Vancouver. The caterpillars had cut off various kinds of garden plants and apparently their feeding habits are similar to those of the better known surface-feeding species of the genus *Euxoa*. In some gardens three sowings of spinach, lettuce, onion, etc., had been made before the end of May.

Larvæ received at Ottawa in June, 1916, pupated early in July. Three specimens which changed to pupæ on July 2, produced the moths on July 29 and 30. Other moths emerged in

*Contribution from the Entomological Branch.

†Rept. Ent. & Bot., Exp. Farms, Ottawa, 1904.

‡Idem, p. 183, under *Paragrotis perexcellens*.

August. In the collections at Ottawa there are three specimens which were reared by Fletcher in 1885 from larvæ collected in May, the dates of emergence being Aug. 15, 18 and 22, respectively. From our records of captured specimens, the moths of *Euxoa excellens* are on the wing in British Columbia in the latter half of the month of August and during September. The species is widespread in distribution, being known to occur in the United States, in the States of Oregon, Colorado (in September), and California (in September and October). The species was described from Vancouver Island specimens.

Nothing definite is known regarding the early life-history of the insect. From our present knowledge it would appear as if the winter is passed in the egg stage. Possibly during certain seasons hibernation may also occur in a young larval condition.

DESCRIPTIONS.

Mature Larva. Length 40 mm. Head 3.0 to 3.2 mm. wide, rounded, pale brown, conspicuously spotted with dark brown; ocelli black. General colour of body, dull grayish-white. Thoracic shield pale brown spotted and blotched with darker brown and divided by dorsal and subdorsal stripes. Dorsal, subdorsal and lateral stripes whitish, all uneven but distinct. Stigmatal band also whitish, uneven, and broken in places. Ventral surface paler than dorsal surface. Tubercles brown, conspicuous, setæ pale. Spiracles black. Anal flap pale brown, blotched with darker brown. Feet pale; the thoracic feet tipped and spotted with brown. Before pupating the markings on the body become faint.

Pupa. Length 18-19 mm., width 6.0-6.5 mm., at widest part; colour chestnut brown, shining. Posterior half of abdominal segments mostly finely pitted. The cremaster bears two stout spines in addition to which there are nearby four other smaller spines. The two stout spines and two of the other smaller ones are in a line; the remaining anterior two which are dorsal spines are strongly reclinate.

The earthen cell is similar to that made by other cutworms of the genus. It varies in size from about 20-22 mm. in length, to about 10-11 mm. in width, inside measurements.

The Moth.—The moth is a rather striking species. With the wings spread it measures from about 37 to 45 mm. in width. The fore wings of the male are dark purplish brown shaded along the lower edge, and in the space about midway between the reniform and outer edge with dull red. The costal area is similarly coloured. In the female all such areas are of a grayish-white colour. The orbicular and reniform spots are conspicuous in both sexes, being whitish with brown centre. A pale, apical spot is also present, as well as a short, pale dash adjoining the dark claviform. The transverse lines are pale. The hind wings in both sexes are whitish tinged with brown. The moth is figured by Hampson, Plate LXVI, 8 (Lep. B.M., Vol. IV).

NATURAL ENEMIES.

From the larvæ received in 1916 we reared at Ottawa several specimens of ichneumonid parasites of two species, namely, *Amblyteles subfuscus* Cress., and *Amblyteles nuncius* Cress.,* both species of which emerged in August.

In addition to these parasites an important percentage of the larvæ were destroyed by the fungus known as *Sorospora uvella*, the disease being so determined by Dr. Roland Thaxter.

CONTROL.

At the time of Mr. Wilson's visit to Sechelt at the end of May the efficacy of the well-known poisoned bran remedy was explained and its immediate use was urged. Reporting further under date of June 19, Mr. Wilson stated, "I am glad to report that where my instructions were carried out the cutworms were destroyed to the extent of 95 to 100 per cent. I asked the Sister Superior at the school to have the mixture of bran, Paris green and molasses, applied and to leave a certain number of check rows without any treatment. The untreated check rows have been eaten as bare as the road, not a vestige of plant life remaining, while the other rows have not lost a plant since the mixture was applied."

*Both species determined by Mr. W. H. Harrington.

NEW NORTH AMERICAN PHYCITINÆ.

BY WM. BARNES, S.B., M.D., AND J. McDUNNOUGH, PH.D.,
DECATUR, ILL.

Rhodophæa bicolorella, sp. nov.

Palpi collar and patagia blue-black, thorax and abdomen ochreous; primaries with the costo-basal half blue-black, streaked with pale gray; median area of wing and inner margin broadly to t. p. line ochreous, shading into ruddy-brown before t. p. line; terminal area blue-black, sprinkled with pale gray; t. p. line indicated in costal portion as the outer border of dark area, obsolete in lower half, reniform faintly visible as a large oval filled with paler shading; t. p. line distinct, black, bordered outwardly by white line, rigid to vein 5, then slightly bulging and a little irregular to vein 2, with slight inward angle in fold, preceded by slight dark shading in costal and central areas; terminal dark line; fringes smoky. Secondaries hyaline with slight smoky outer border. Expanse 22 mm.

Habitat.—Christmas, Gila Co., Ariz.; Redington, Ariz. 4 ♂'s.
Types, Coll. Barnes.

The type of maculation is essentially that of *hystriculella*, but the ochreous and ruddy central and inner areas render the species easily recognizable.

Genus **Acroncosa**, nov. gen. (Type *A. albiflavella*, sp. nov.)

Fore tibia with long inner and short outer claw, ♂ antennæ ciliate, without scale-tuft but with row of minute scale-ridges on upper side in basal portion; labial palpi somewhat ascending, moderate, smoothly scaled; maxillary palpi scaly, appressed, slightly fan-shaped; primaries 11-veined, 2 and 3 well separated and sub-parallel, 4 and 5 from a point; 8 and 9 stalked, 10 separate; secondaries 8-veined, discal vein strongly outcurved, the lower angle of cell being produced to a point, vein 2 well before this angle, 3 from angle, 4 and 5 long stalked, 4 in line with discocellular, 8 distinct, shortly stalked from 7.

This genus is, as far as we know, the first instance of a Phycid with clawed fore-tibiæ, and should be readily recognizable by this feature.

A. albiflavella, sp. nov.

Palpi, head and thorax white, patagia orange with a tinge of this colour on front and on metathorax; primaries white with sparse black sprinkling; inner margin at base orange; t. a. line a broad, oblique band of orange with a small, black spot on its inner side above inner margin; discal spot distinct, black; t. p. line orange close to outer margin and subparallel to same, with small, black costal patch beyond it and faint, black shade preceding it; secondaries hyaline smoky; fringes white; abdomen ochreous. Expanse 20 mm.

Habitat.—Loma Linda, S. Bern. Co., Calif. (July, Aug.) 6 ♂'s, 5 ♀'s. Types, Coll. Barnes.

We have a number of specimens from Ft. Wingate, N. M., very similar in maculation, but with the primaries much more heavily sprinkled with gray-black scales; for this apparently good racial form from the Rocky Mt. region we propose the name *castrella*, our types being 3 ♂'s, 4 ♀'s captured in July-August.

Acroncosa similella, sp. nov.

Very similar to the race *castrella* of the preceding species but larger, with longer primaries which are still more heavily suffused with blue-black than in *castrella*; the orange t. a. band is not continued to costa but stops at median vein, and is followed by a whitish, curved line starting from a similar coloured costal blotch beyond which is a dark, oblique streak; median area heavily shaded with a very prominent black, elongate discal spot; orange t. p. line much reduced, defined inwardly by white line preceded by heavy dark shading; distinct, dark apical dash; secondaries smoky hyaline with a darker marginal border and white fringes. Expanse 22 mm.

Habitat.—Pyramid Lake, Nevada (May). 5 ♂'s, 2 ♀'s. Types, Coll. Barnes.

We also possess the species from Eureka, Utah, (June 2).

Pyla fasciella, sp. nov.

Head, thorax and primaries deep blue-black with considerable bluish iridescence, but with only a trace of the bronze or green metallic scaling found in *scintillans* or *rainieri*; the median portion of the wing is crossed by a broad, darker band, showing

less iridescence, the inner edge of which (t. a. line) is a little less than half way from base of wing and is rather rigidly oblique outwardly, the outer edge (t. p. line) is gently rounded outwardly opposite cell from a point three-quarters from base to apex of wing; secondaries deep brown with darker fringes. Beneath unicolorous black-brown, rather shiny. Expanse 21 mm.

Habitat.—Mt. Shasta, Calif. (July 24-31) (McDunnough)
4 ♂'s, 1 ♀. Types, Coll. Barnes.

This species is the darkest of its group, the lack of bronze or green scaling and the presence of the darker median band rendering it readily distinguishable from its allies; the type specimens were captured at an altitude of about 7,500 feet in very fresh condition, so that the general lack of metallic scaling may be considered normal.

***Pyla viridisuffusella*, sp. nov.**

Head, thorax and primaries heavily suffused with metallic green scaling, the latter with the cross lines broadly marked in blackish, t. a. line outwardly oblique, a little irregular, t. p. line bent somewhat outward beyond cell; at times a faint discal streak is visible. Secondaries deep black-brown; beneath unicolorous black-brown. Abdomen and legs with metallic green scaling. Expanse ♂ 18 mm., ♀ 17 mm.

Habitat.—Tuolumne Meadows, Calif. (Aug. 1-7) 7 ♂'s,
4 ♀'s. Types, Coll. Barnes.

Readily separated from *scintillans* by its smaller size and brilliant, green scaling without any of the bronze shades found in this latter species; it is apparently common at high altitudes throughout the Southern Sierras, as we have a series of it from Mineral King, Tulare Co., as well as our type lot from the Yosemite region.

KEY TO THE SUBFAMILIES OF ANTHOMYIIDÆ

BY J. R. MALLOCH, URBANA, ILL.

I present herewith a key to the imagines of the subfamilies of the dipterous family Anthomyiidae. The divisions I have adopted differ very considerably from those of European authors, as one may gather from either the names or a study of specimens with

the key as a basis. I have in manuscript keys to the genera of these subfamilies, which I hope soon to publish.

The subfamily divisions here adopted are based upon larval and pupal as well as imaginal characters.

MALES.

1. Sixth vein very short, seventh bent abruptly forward round apex of sixth.....*Fanniinæ*
- Sixth vein complete or incomplete, seventh never bent abruptly forward as above.....2
2. Sixth vein complete; under surface of scutellum usually with soft, upright hairs at apex; hind metatarsus with a strong bristle at base ventrally.....*Anthomyiinæ*
- Sixth vein complete or incomplete; under surface of scutellum never with hairs at apex; if hind metatarsus has basal bristle the eyes are widely separated and the frons is parallel-sided.....3
3. Centre of pteropleura with a conspicuous group of long hairs; eyes widely separated; palpi conspicuously dilated...*Lispinæ*
- Centre of pteropleura without a conspicuous group of hairs...4
4. Eyes usually contiguous or subcontiguous, rarely separated by nearly one-third the width of head, if the latter then the cruciate frontal bristles are absent; sternopleurals 2 to 4 in number, when 3 are present they are not arranged in a nearly equilateral triangle.....5
- Eyes separated by at least the width of head, cruciate frontal bristles present only when the sternopleurals are not arranged in a nearly equilateral triangle.....6
5. Fore femora simple; sternopleural bristles almost invariably 3 (1:2) or 4 (2:2) in number; if only 2 (1:1) are present the prealar bristle is clearly distinguishable.....*Phaoniinæ*
- Fore femora excavated on under surface near apex and with 1 or more stout thorns basad of the excavation, or if the fore femora are simple the prealar bristle is absent and, as in the previous group, there are only 2 (1:1) sternopleurals present.....*Hydrotæinæ*

- Cruciate frontal bristles present; sternopleurals not in a nearly equilateral triangle; hind metatarsus with basal ventral bristle.....*Fucellinae*
- Cruciate frontal bristles absent; sternopleurals in a nearly equilateral triangle; hind metatarsus without basal ventral bristle.....*Cænosiinae*

FEMALES

1. Sixth vein very short, seventh abruptly bent forward round apex of sixth; lower orbital bristle directed outward over eye.....*Fanniinae*
- Sixth vein complete or incomplete, seventh not abruptly bent forward round apex of sixth; lower orbital either directed forward or inward..... 2
2. Sixth vein complete; under surface of scutellum usually with soft, upright hairs at apex; hind metatarsus with basal ventral bristle.....*Anthomyiinae*
- Sixth vein complete or incomplete; under surface of scutellum never with soft, upright hairs at apex..... 3
3. Cruciate frontal bristles absent..... 4
- Cruciate frontal bristles present..... 6
4. Pteropleura with a conspicuous group of setulose hairs in centre; palpi much dilated apically.....*Lispinae*
- Pteropleura without a conspicuous group of setulose hairs in centre..... 5
5. Sternopleural bristles 2 to 4 in number, if 3 are present they are never arranged in a nearly equilateral triangle.....*Phaoniinae, pt.*
- Sternopleural bristles almost invariably 3 in number, arranged in a nearly equilateral triangle.....*Coenosiinae*
6. Sixth vein complete; hind metatarsus with strong, basal, ventral bristle.....*Fucellinae*
- Sixth vein incomplete; hind metatarsus without distinct basal ventral bristle..... 7
7. Sternopleural bristles 2 (1:1) in number; dorso-centrals always 4 in number.....*Hydrotaeninae*
- Sternopleural bristles 3 (1:2) or 4 (2:2) in number; dorso-centrals 3 or 4 in number.....*Phaoniinae, pt.*

THE KNOWN NYMPHS OF THE NORTH AMERICAN SPECIES OF SYMPETRUM (ODONATA).

BY E. M. WALKER, TORONTO.

Of the eleven North American species of *Sympetrum*, generally recognized, the nymphs of all but two have been reared or determined with practical certainty. These two are *S. ambiguum* (Ramb.) and *S. madidum* (Hag.). Of the nine others I have examined nymphs of all except *S. corruptum* (Hag.) and *S. illotum* (Hag.). These, however, have been sufficiently described and figured by Needham¹ to make possible their inclusion in the key given below.

In addition to material collected by myself I have examined a considerable number of specimens kindly lent me by Prof. Needham, and also an exuvia of *S. scoticum* Donovan, with the imago which emerged from it, found at Red Deer, Alta., by Mr. F. C. Whitehouse, who kindly gave the specimens to me.

The study of these *Sympetrum* nymphs has been unusually difficult, and the results are far from satisfactory. Variation within the limits of the species is generally so great that it is seemingly impossible, in most cases, to find any constant character by which a particular species may be recognized with certainty. For this reason the key which is given here must be used with a great deal of caution.

I have not included in the key the form which I consider to be typical *S. rubicundulum*, as I have not reared it nor seen nymphs which I could safely assign to this race. I have, however, several specimens of the nymph of *S. rubicundulum decisum* (Hag.) from Prince Albert, Sask., but they differ from Needham's description of *rubicundulum*² in the extreme reduction of the dorsal hooks and are readily separated from my nymphs of *obtrusum*. Needham reared both of these species and found no differences between them. This matter will be more fully discussed later.

The nymph of *Sympetrum* may be characterized as follows: Head rather large, the width across the eyes being little less than that of the abdomen, not more than twice as broad as long; eyes

1 Bull. 68, N. Y. State Mus., 1903, pp. 271-273, No. 16, 17; Bull. 47, N. Y. State Mus., 1901, pl. 25, fig. 1.

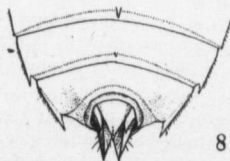
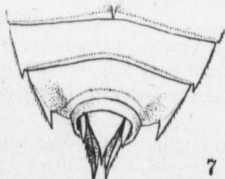
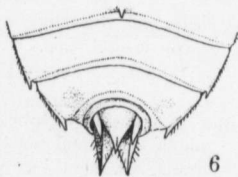
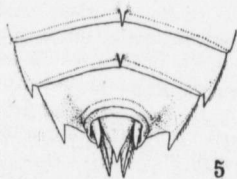
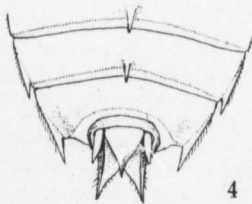
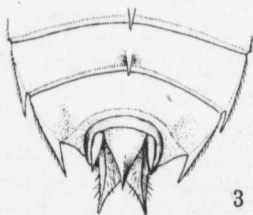
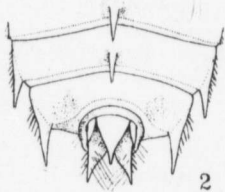
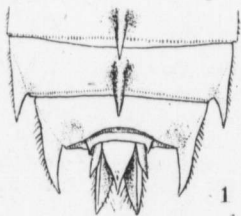
2 Bull. 47, N. Y. State Mus., 1901, p. 525.

moderately to decidedly prominent; lateral margins very oblique, curving into the straight, posterior margin with no indication of an angle. Labium reaching caudad to the middle coxæ, scarcely longer than broad, the middle lobe obtusangulate, mental setæ usually 13 to 15, lateral setæ usually 9-11 but sometimes more, inner margins of lateral lobes with very low crenulations, the marginal spirules in groups of 2 to 4, of which one is much the longest, movable hook slender, rarely more than half the length of the lateral margin. Abdomen ovate, but little depressed, broadest at segment 6, narrowed more abruptly caudad than cephalad; dorsal hooks never present on segs. 1 to 3 nor on 9 and 10, usually shorter than the segments which bear them; lateral spines on segments 8 and 9 or on 9 only, generally shorter than their respective segments; superior appendage triangular, but little longer than broad, acuminate, with a very slender pointed apex, lateral appendages about half as long as inferior appendages, the latter generally acuminate, fine-pointed and decidedly longer than the superior appendage.

The nymphs of *Sympetrum* are very like those of *Leucorrhinia*, and there seem to be no good characters for separating them generically. (See Can. Ent., 1916, vol. XLVIII, p. 414.)

KEY TO THE NYMPHS OF NORTH AMERICAN SPECIES OF
SYMPETRUM.

1. Segs. 8 and 9 with lateral spines, dorsal hooks present (except in some individuals of *S. rubicundulum decisum*).....2
 Seg. 8 without lateral spines, those of seg. 9 vestigial, dorsal hooks entirely absent.....8
2. Dorsal hooks on segs 6-8 as long as the segments which bear them, lateral spines of segs. 8 and 9 subparallel, those of seg. 9 as long as the lateral margins of the segment (not including spine) and reaching back as far as tip of superior appendage; eyes prominent.....3
 Dorsal hooks shorter than the segments which bear them; lateral spines more or less convergent, their outer margins continuing the general curve of the abdominal margins; those of seg. 9 shorter than the lateral margins of the seg-



NYPHAL STRUCTURES OF SYMPETRUM.

(See p. 418.)

- ment and not reaching as far back as tip of superior appendage; eyes moderately prominent.....4
3. Lateral spines of seg. 8 scarcely twice, those of seg. 9 $2\frac{1}{2}$ times, as long as their basal breadth, outer margins of latter distinctly incurvate; lateral appendages half as long as the inferiors, the latter not acuminate.....*semicinctum*
- Lateral spines of seg. 8 more than twice, those of 9 three times, as long as basal breadth, outer margins of latter nearly straight, lateral appendages less than half as long as the inferiors, the latter apically acuminate.....*vicinum*
4. Lateral spines of seg. 9 not less than two-fifths as long as the lateral margin of the segment, dorsal hooks well developed, slender and very acute, that of seg. 7 nearly as long as the mid-dorsal line of the segment, that of 8 usually more than half as long as the segment.....5
- Lateral spines of seg. 9 not more than one-third as long as the lateral margin of the segment, dorsal hooks smaller and when well developed somewhat stouter and distinctly curved, that of seg. 9 distinctly shorter than the segment, that of seg. 8 rarely half as long as the segment.....6
5. Base of mentum of labium distinctly broader than middle coxæ and somewhat more than one-fourth the greatest width; lateral spines of seg. 9 usually at least half as long as lateral margins of the segment; lateral setæ typically 11.....*costiferum*
- Base of mentum of labium scarcely, if at all, broader than middle coxæ and about one-fourth of the greatest width, lateral spines of seg. 9 two-fifths to one-half as long as lateral margins of the segment; lateral setæ typically 10.....*pallipes*
6. Dorsal hooks present on segs. 4 to 7 or 8, sometimes absent from seg. 4 or 8, lateral spines of seg. 9 about one-third as long as the lateral margins of the segment, lateral setæ 9 to 11.....7
- Dorsal hooks present on segs. 5 to 7 only, vestigial, or absent altogether, lateral spines of seg. 9 about one-fifth as long as lateral margins of the segment, lateral setæ usually 11.....*rubicundulum decisum*

7. Lateral setæ 11, dorsal hooks vestigial or absent from segs. 4 and 8.....*scoticum*
 Lateral setæ 9 or 10, dorsal hooks somewhat larger, generally present, though small, on segs. 4 and 8.....*obtrusum*
8. Lateral setæ 9, mental setæ about 13, 7 in the stronger, outer series.....*illotum*
9. Lateral setæ 13-14, mental setæ about 17, 9 in the outer series.....*corruptum*

***Sympetrum semicinctum* (Say).**

I have seen but one specimen of this species, received from Prof. Needham. Its characters seem quite distinctive. The comparatively blunt, inferior appendages distinguish it from all other species I have seen. It was described and figured by Needham in Bull. 47, N. Y. State Mus., p. 523, pl. 25, f. 2.

***Sympetrum vicinum* (Hagen).**

The prominent eyes, large, dorsal hooks and long, slender lateral spines render this an easily recognized species. I have examined a considerable number of specimens from various localities and have reared it several times, both in Ontario and on Vancouver Island. It has been described by Needham (l. c., p. 522).

***Sympetrum costiferum* (Hagen).**

This species was described by Needham from a single, somewhat collapsed exuvia. The dorsal hooks on segments 6-8 are described as being about as long as their respective segments. They are usually somewhat shorter.

I have not actually reared this species, but I found a freshly-emerged male with its exuvia in a shallow reed-bed at the edge of a lake on Gabriola Island, B.C., Aug. 12, 1913. I also found a number of exuviae on small reeds in a shallow, sand-bottomed lagoon on the Giant's Tomb Island, Georgian Bay, Ont., July 29, 1908. Adults of *S. costiferum* were flying here in abundance. I have also a few nymphs dredged from several localities in Georgian Bay.

The nymph is easily distinguished from that of *S. obtrusum* by the larger size and longer lateral spines and dorsal hooks, the

latter being also straighter and more slender. The lateral setæ vary from 10 to 12, but are 11 in the great majority of cases. The mental setæ vary from 13 to 18 but are usually 14 or 15, with 8 to 10 in the stronger, outer series.



Fig. 40.—*Sympetrum pallipes*, labium of nymph from below.

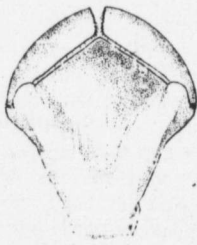
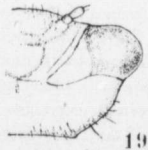
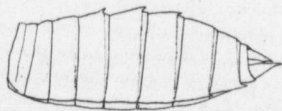
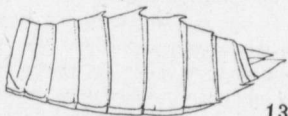
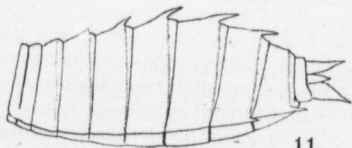


Fig. 41.—*Sympetrum costiferum*, labium of nymph from below.

Sympetrum pallipes (Hagen).

This species, which I reared in 1913 from nymphs taken from small pools near Rock City, Vancouver Island, is extremely like *S. costiferum*, though the adults are not closely related. It was described in *Can. Ent.*, 1914, vol. XLVI, p. 373, pl. XXV, Figs. 6-8. The lateral spines of segment 9 are usually, but by no means always, shorter than in *costiferum*, and the lateral lobes of the labium tend to be somewhat more spinulose, the main spinules of the inner margin being accompanied by two or three smaller ones forming a graded series. In *costiferum* these accessory spinules are generally fewer and shorter, some of the larger ones being single. (See *Can. Ent.*, loc. cit., pl. XXV, Figs. 8 and 12) but this character is too variable to be of much value as a differential. The labium is somewhat more slender and more narrowed at base, being similar in form to that of *obtrusum*. This character is apparently a good one but is difficult to appreciate without examining good series of both species. The lateral setæ are usually 10, sometimes 11; the mental setæ vary from 12 to 15.

Judging from my limited experience in collecting the nymphs of these two species, it would appear that they are ecologically distinct, *costiferum* being an inhabitant of shallow, marshy bays



NYPHAL STRUCTURES OF SYMPETRUM.

(See p. 418.)

and lagoons, while *pallipes*, like its near relative *obtrusum*, prefers small, semi-permanent ponds and puddles.

Sympetrum obtrusum (Hagen).

The nymph of *obtrusum*, of which I have bred several specimens of both sexes, is very like that of *pallipes* but is somewhat smaller and the shorter dorsal hooks and lateral spines seem to be good characters, though the opposite extremes in the two species approach one another closely. The lateral setæ are normally 10, the basal one being, however, very small and sometimes absent. The mental setæ are usually 12 or 13, occasionally 14.

Sympetrum rubicundulum (Say).

As already mentioned, the nymph of this species has been described by Needham³ and the characters as given in his description apply equally well to *S. obtrusum*, from which he was unable to distinguish it. Specimens of nymphs and exuviae from a puddle at Prince Albert, Sask., where I found *S. rubicundulum decisum* (Hag.) emerging, differ from *obtrusum* in the great reduction or even absence of the dorsal hooks, and in the smaller lateral spines. These characters appear to be good but I have only seven specimens, and the variation among them is considerable.

During early July, 1917, I found a number of *Sympetrum* nymphs in several small puddles at De Grassi Point, Ont., and before any of them had emerged, teneral of *S. rubicundulum* were found flying in the vicinity of the puddles. Unfortunately I was unable to attend properly to the nymphs and only two emerged, both females. One of them has an exuvia with extremely vestigial dorsal hooks like the Prince Albert specimens, and the imago seems to differ in no way from *decisum*, while the exuvia of the other is like *obtrusum* and the adult is very similar to the former specimen, but may be *obtrusum*, for I find it sometimes impossible to distinguish between the females of these two species.

These difficulties with the nymphs led me to a closer study of the imagos, with unexpected results. There seem to be two forms of what we have been calling *rubicundulum* in Canada and the Eastern United States. One of these is apparently the same species as the western *decisum*, and this is the form of which I found tenerals emerging at De Grassi Point. It occurs across Canada from Prince Edward Island to British Columbia. The

³ Loc. cit., p. 525.

other I have from De Grassi Point and Toronto only among Canadian localities and also from Bluffton, Ind., and Cedar Rapids, Iowa. It may be only a southern race of the same species, but it appears to me to be distinct in both sexes from *decisum*. The latter is, in some respects, intermediate between the southern form and *obtrusum*, but certainly does not intergrade with the latter. The question of the characteristics and status of these forms of so-called *rubicundulum* will be more fully discussed in a future paper.

Sympetrum scoticum (Donovan).

The exuvia from Red Deer, Alta., already mentioned as having been taken by Mr. Whitehouse with the imago is all I have from North America to represent the nymph of *S. scoticum*, but I found this species emerging from a pond in the Harz Mountains, Germany, in 1906, and have several of the exuviae, though they are, for the most part, in fragments. In most of these there is a minute denticle to represent the dorsal hook of segment 8, but in one of them and in the Red Deer specimen there is no indication whatever of this structure. There is some variation also in the length of the lateral spines, one of them having them scarcely longer than in the Prince Albert specimens of *decisum*. It is very probable that no external characters exist by which *scoticum* and *decisum* can be separated with certainty. The number of lateral setae is normally 11, sometimes 12, and the menta' setae vary from 13 to 15, with 7 to 9 in the outer series.

The colour pattern, as in most species of *Sympetrum* is very indistinct and offers no characters of any value.

Sympetrum illotum (Hagen).

The nymph of this western species has not been fully described, but a figure is given by Needham,⁴ who has also noted⁵ the chief characters by which it may be distinguished from its nearest relative, *S. corruptum*.

Sympetrum corruptum (Hagen).

The nymphal characters of this species have been described by Needham⁶ from specimens taken in transformation by Prof. T. D. A. Cockerell at Tempe, Ariz., and Las Vegas, N. M.

⁴ Loc. cit., pl. 25, fig. 1.

⁵ Bull. 68, N. Y. State Mus., p. 272, 1903.

⁶ Loc. cit., p. 271, fig. 16.

EXPLANATION OF PLATES XIX AND XX.

- Fig. 1—8.—Apical abdominal segments of *Sympetrum* nymphs dorsal view. 1, *S. semicinatum*; 2, *S. vicinum*; 3, *S. costiferum*; 4, *S. pallipes*; 5, *S. obtrusum*; 6, *S. rubicundulum decisum*; 7, *S. scoticum*; (Red Deer, Alta.); 8, *S. scoticum* (Harz Mts., Germany).
- Fig. 9—14.—Left lateral view of abdomen of *Sympetrum* nymphs. 9, *S. vicinum*; 10, *S. costiferum*; 11, *S. pallipes*; 12, *S. obtrusum*; 13, *S. scoticum*; 14, *S. rubicundulum decisum*.
- Figs. 15—19.—Dorsal view of head of *Sympetrum* nymphs. 15, *S. semicinatum*; 16, *S. vicinum*; 17, *S. pallipes*; 18, *S. scoticum*; 19, *S. rubicundulum decisum*.

OBSERVATIONS ON *CHIRONOMUS DECORUS*
JOHANNSEN.*

BY CHI PING, ITHACA, N. Y.

Chironomus decorus Johannsen is a common species found about Ithaca. The larva, pupa, and imago have been described† but its egg stage was missing, and its habits and development were hitherto unknown. The present work records my observations made in the summer of 1915.

Flying and mating.—The adults begin to swarm at sunset and continue into the twilight. At first one or two come out from the grasses, rushes and sedges growing along the shores of pools or ponds where they spent the day. They fly very slowly at first. Later on, as more and more come out and join them, they become more active. As the nightfall commences they can only be seen outlined against the sky. A swarm is often found overhead, from 10 to 15 feet above the ground. The swarm continues to increase in size, until a column may be formed about 5 feet in height and 1 foot in diameter, with its base about 5 feet above the ground.

While engaged in dancing, all the midges have their heads pointing in the same direction, with their bodies moving back and forth and up and down, sometimes with great rapidity. The

*Contribution from the Limnological Laboratory of Cornell University, Ithaca, N. Y.

†Johannsen, O. A., Bull. 86, N. Y. State Mus., p. 239.
December, 1917

colour of the insects is much lighter than that of other species of the same size so they may be easily recognized upon the wing. From time to time females appear in the swarm. The male chases the female in a spiral course, the two together appear like a single individual. Instead of dropping down, as some species do, they mate in their spiral course toward the summit of the column where they are lost to sight. From the beginning of mating till they disappear in the darkness it requires about 3 minutes.

Oviposition and eggs.—Observations were made during the night of July 30, 1915, on some captured individuals. Oviposition took place about 5.45 a.m. The female alighted on a leaf of *Elodea*, raising her abdomen by drawing the hind legs close to each other, then flexed her abdomen with its tip pointing downward. On touching the leaf surface several times with the tip of the abdomen, some transparent globules were exuded. This was repeated after short intervals, and finally the abdomen was bent in a greater degree and its tip was pointing forward so as to touch the hind legs. The space between the abdomen and femora was about .5 to 1 mm. Suddenly a brown egg-mass was extruded and deposited on the hind femora. This mass was much condensed. The femora remain together to hold the mass on the dorsal side for 2 or 3 minutes after oviposition was accomplished; then by spreading the legs apart the egg-mass was thrown down on the side of the glass container. The mass gradually expanded, becoming fully distended upon touching the water. Later another egg-mass was found that had been dropped on an *Elodea* leaf by another female kept under similar conditions. The egg clusters collected at the shores of pools and ponds were found resting on the bottom in shallow water, floating below the surface or attached to some aquatic plants, depending on how the female throws the mass from her hind legs.

Each egg measures about .33 mm. long, and .12 mm. broad. It is more or less cylindrical at the middle and round at both ends. Its colour is pale brown, lighter than the eggs of other species, which I have observed, and hardly changes at all from the time when it is first laid until hatched. It has been estimated that there are about 700 eggs on the average in the whole cluster. The cluster averages 9 mm. in length and 5 mm. in width, slightly

elongated in an oval shape and a little arcuated. At one end of the cluster the gelatinous structure extends into a handle-like projection which is supposed the last portion of the egg-mass. Usually this cord is found to be much twisted and coiled. The unfertilized eggs remain undeveloped (Pl. XXI, fig. 1).

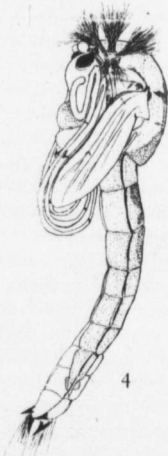
It was often noted that before the fertilized eggs begin to develop, 3 or 4 of them in the cluster were attacked by fungus. The fungous filaments growing on them look like the tentacles of hydra and sometimes become extremely elongated, branching out to connect other eggs nearby in the gelatinous mass. They resemble a network, but are irregularly arranged. This growth checks the development of the eggs and destroys all the substance of them. The fungous disease generally starts from one or two eggs, gradually affecting more eggs and finally destroying the whole mass.

Larva.—When newly hatched, the pale, gray larva measures .8 mm. in length, with its head disproportionately large. The anterior and anal prolegs are short and stout, the claws of the latter pale and transparent. The body segments are not distinct. At this stage there are no appendages at all on the ventral surface of the eleventh segment, while on the caudal end of the twelfth segment there are but two gills. A median tuft of hairs occurs on the dorso-caudal portion of the twelfth segment (Fig. 4).

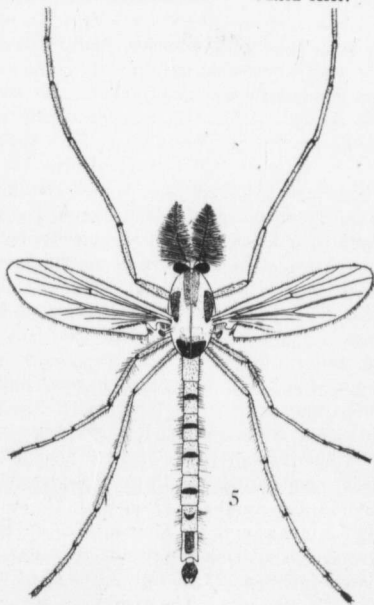
Later when the larva has attained the size of 1 to 1.5 mm. in length the head is more or less reduced in proportion, the body segments are more distinct and two more blood gills have grown out on the last segment.

When 3 mm. in length, the larva has assumed the general form of a fully grown individual. The body is now much larger in proportion to the head; the mandibles are slightly blackened at their tips, the eye-spots are black instead of red and the head darker. The curved hairs and claws on the prolegs are well developed and more distinct. One of the most noticeable changes in the young larva now is that the blood gills on the ventral surface of the eleventh segment are just budding out. The colour of the larva has now become pink.

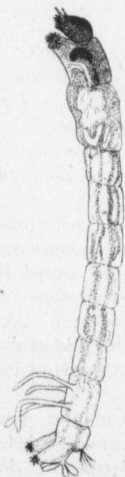
The colour of the larva becomes red when it is about 5 mm. long. Excepting for the short gills curled together on the eleventh



4



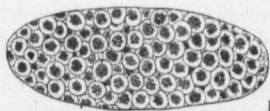
5



3



2



1

CHIRONOMUS DECORUS JOHANNSEN. (See p. 418.)

segment, the larva resembles a fully grown one in every respect. The head is brownish, and when the larva attains a length of 8 mm., setæ have developed on it. There are a few setæ found on the first thoracic segment and the blood gills now hang straight down on the ventral side (Fig. 5).

At maturity the larva measures 11 to 12 mm. in length. The ventral blood gills are about 2 mm. long and longer than the anal legs or any of the body segments. Just prior to pupation the first and second thoracic segments become much swollen.

Growth of Larvæ.—The young larvæ emerged from eggs were placed in the individual test-tubes containing about 4 or 5 cm. of water. These test-tubes were placed obliquely in a dish immersed in water for about half their length to insure uniformity of temperature. They were exposed to sunlight during several hours of the day. Fresh food material and fresh water were added from time to time. A larva which had hatched on August 11, measured .8 mm. in length. On Aug. 19, it was 4 mm.; Sept. 7, 6 mm.; Sept. 11, 7 to 7.5 mm.; Sept. 16, 9.5 mm. The average room temperature was 18 to 19 degrees C. A second larva from another egg was hatched on Aug. 15; on Sept. 11 it measured 7 to 7.5 mm.; Sept. 16, 11 mm.; five days later it pupated. The average room temperature was the same as above. A third one hatched on Sept. 23; on Oct. 1 it reached 1.5 mm.; Oct. 11, 6 mm.; Oct. 23, 10.5 mm. The average room temperature was 10 to 11 degrees C. A fourth one hatched on Oct. 1; on Oct. 8 it measured 1 to 1.5 mm.; Nov. 21, 10.5 mm. The average room temperature was 7 to 8 degrees C.

The larval stage under the conditions stated lasts from 32 to 53 or more days. It is evident from the above that low temperature retards development. In the laboratory the reared larvæ were fed upon the finely ground leaves of *Potamogetons* and of leaves and stems of *Elodea*. Under the microscope I have observed a young larva of about 3.5 to 4 mm. long that had swallowed a piece of *Spirogyra* which filled up almost two-thirds of its alimentary canal.

Larvæ Living Outside of Water.—The larvæ of *C. riparius* have been found to be able to live in mud for a considerable length of time after the water is gone. Similarly the larvæ of *C. decorus*

can subsist without water, provided the condition is not too dry. In the laboratory I have some fully grown larvæ which had made their cases with their secretion and plant materials on the wall of glass containers when the water was present. Upon removal of the water they continue to live in their cases for almost a month until entirely dry.

Pupa.—Upon pupation the larval skin splits along the mid-dorsal line of the thorax, a part of the pupal thorax will emerge first, and the horn-shaped processes on the top of the head, the compound eyes, a part of the antennæ, and the tracheal filaments are now outside the skin. As the development advances, the skin splits further along the dorsal surface, a part of the pupa's body emerges, the compound eyes soon appear in a perfect shape, the tracheal filaments longer, and the legs of the imago have their claws, hairs and segments all visible through the transparent pupal sheath (Fig. 4).

Finally matured, its tracheal filaments are very bushy and white, and its antennæ brownish black. The abdomen is contracted within the pupal skin, leaving the last two segments empty. The genitalia of the adult are visible through the transparent skin. The mature pupa measures about 7 mm. in length and now becomes very active, swimming tadpole-like under the surface of water and moving its depressed abdomen very rapidly back and forth. The thorax closely touches the surface film with the respiratory filaments slightly indenting it. The anal appendages are much flattened and have matted hairs well developed for locomotion. While floating against the surface film it resembles in habit the mosquito wriggler. Sometimes it lies stationary beneath the surface.

Emergence of Adult.—The pupal skin splits longitudinally down the dorsum of the thorax. The head of the adult is pulled backwards and upward, and the mouth-parts, palpi and antennæ gradually emerge. The base of the wings and the legs soon appear. When the front and middle pairs of legs are freed, or almost so, the fly, in trying to raise its body, has its wings immediately straightened out. At this time a greater portion of the posterior legs and the entire abdomen are still retained within the pupal covering. The posterior extremity of the abdomen is always

freed last. The time required for a fly to free itself usually does not exceed one-quarter of a minute, and frequently it has been found that the extrication is accomplished within 4 or 5 seconds. It may even further be hastened if the water is suddenly jarred. In that case the adult can cast off the pupal skin in one second. Sometimes the fly fails to get out of the pupal covering, on account of pulling out the tip of the abdomen too soon. There is a natural order for the extrication of the different parts of the insect's body as mentioned above, any departure from which will result fatally.

Experiments Upon the Longevity of the Adults.—The following experiments were performed on the imagines reared in the laboratory. The imagines were confined immediately after their escape from the pupal skin. Their confinement was near a window where they were exposed to the sunlight during several hours of the day and care had been taken against excessive heat:

I. An imago was kept in a bell jar under which some lumps of CaCl_2 were placed. The humidity inside was reduced practically to zero. The fly lived therein for only 24 hours. (Sept. 23-24).

II. An imago was kept in a jar in which the moisture was maintained in a moderate condition through the evaporation of the water in a small dish placed underneath. It lived for 45 hours. (Sept. 23-25.)

III. An imago was kept in a jar in which the moisture was maintained to saturation by keeping Elodea and Sphagnum, underneath by sticking a few pieces of fully saturated blotting paper to the inner surface of the glass and by wetting the cheese-cloth that covered the top from time to time. The fly favoured by such condition lived for six days. (Sept. 23-29).

Under natural conditions, in the day time they are found in the grasses, rushes and sedges growing on the shore in moist situations, and consequently, there is every reason to believe that the imagines may survive much longer in such places than in confinement.

Effect of Low Temperature, Wind and Smoke upon C. decorus.—The imagines behave themselves very much like other insects with regard to their activity under varying conditions of temperature. In the summer season, if it has been a clear, hot day, they are

always found swarming actively above pools, streams, lake-shores, and also above roadsides during sunset, but in cold weather the swarm is not likely to be seen and their activities have evidently been checked by the low temperature. On Aug. 27, at 5.30 a.m., when the temperature was about 5 degrees C., I observed imagines torpid and unable to fly even when disturbed. On slightly windy evenings, the swarm either does not occur or has a very short duration. Smoke has the same effect on a swarm. It has been found several times that in the Cascadilla Gorge the swarm was often dispelled by smoke from camp-fires even when at a considerable distance.

Number of Generations.—My observations made in the summer and fall of 1915 indicate that probably five generations may be developed in this locality. The number of generations was determined by the finding of egg-masses in ponds and dishes from time to time. The first appearance of egg-masses was in May and the first two weeks of June, the second in the last part of July, the third in the second week of August, the fourth in the first two weeks of September and the fifth in the middle of October.

Enemies.—The midge is apt to be attacked by enemies throughout all the stages in its life-history. The eggs are attacked by the fungous disease as already mentioned. I have observed a young larva preyed upon by a Cyclops. The crustacean held up the thorax of the little larva with its mouth-parts and gnathopods, sucking out the body fluids. After a while, the Cyclops shifted its mouth-parts toward the caudal end. By so doing, within ten minutes, the entire body of the larva was emptied of its contents. At this point another Cyclops came to participate in this work and wrested the prize away from the original possessor.

I have occasionally witnessed bats which preyed upon the adults by flying across the swarm.

BIBLIOGRAPHY.

1. Burrill, A. C.
1913. Economic and Biologic Notes on the Giant Midge (*Chironomus plumosus* Meigen). Bull. of the Wis. Nat. Hist. Soc., Vol. X, Nos. 3-4, pp. 124-163.

2. Johannsen, O. A.
1903. Aquatic Nematoceros Diptera. N. Y. State Museum, Bull. 68.
3. Malloch, J. R.
1915. The Chironomidae of Illinois. Bull. of Ill. State Lab. of Nat. Hist., Vol. X, pp. 472-474.
4. Miall, L. C., and Hammond, A. R.
1900. The Structure and Life-history of the Harlequin Fly (*Chironomus dorsalis*).
5. Moore, E.
1915. The Potamogetons in Relation to Pond Culture, Bull. Bur. of Fisheries. Vol. XXXIII, pp. 284-285.
6. Needham, J. G.; Morton, K. J., and Johannsen, O. A.
1905. Mayflies and Midges in New York State. N. Y. State Museum Bull. 86, pp. 239-241, pl. 23, fig. 7-13; pl. 29, fig. 12.
7. Needham, J. G.
1908. Aquatic Insects of Walnut Lake. A Biological Survey of Walnut Lake, Mich. Rept. of Biol. Sur. of State of Mich., pp. 252-262.
8. Needham, J. G., and Lloyd, J. T.
1916. Life of Inland Waters, pp. 227-230.
9. Tilbury, M. R.
1913. Notes on Feeding and Rearing of the Midge, *Chironomus cayugæ* Johannsen. Jour. New York Ent. Soc., Vol. XXI, pp., 305-309.

EXPLANATION OF PLATE XXI.

- Fig. 1.—Fertilized egg beginning to develop.
- Fig. 2.—Young larva just hatched with only two anal gills.
- Fig. 3.—Mature larva.
- Fig. 4.—Pupa.
- Fig. 5.—Adult male.

LECTOTYPES OF THE SPECIES OF HYMENOPTERA
(EXCEPT APOIDEA) DESCRIBED BY ABBÉ
PROVANCHER.BY A. B. GAHAN AND S. A. ROHWER, BUREAU OF ENTOMOLOGY,
WASHINGTON, D. C.

(Continued from page 400.)

Figites inermis. Type.—Female, yellow label 619. 2nd Coll. Pub. Mus. Quebec.

Formica pallitarsis. Type.—Yellow label 925. 2nd Coll. Pub. Mus., Quebec. Fair.

Galesus quebecensis. Type.—Yellow label 912. 2nd Coll. Pub. Mus., Quebec.

Glypta californica. Type.—Female, white label 8, yellow label 1292. 2nd Coll. Pub. Mus., Quebec.

Glypta ruficornis. Type.—Male, yellow label 490. 1st Coll. Pub. Mus., Quebec. Bears name label *Glypta macra* Cress.

Glypta rugulosa. Type.—Yellow label 986. 2nd Coll. Pub. Mus., Quebec. Thorax and wings present.

Glypta tricincta. Type.—Not located.

Gonatopus decipiens. Type.—Yellow label 1332. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Gorytes armatus. Type.—Male, old rose label 256(s), blue label 845(s), yellow label 1434. 2nd Coll. Pub. Mus., Quebec.

Gorytes eximius. Type.—Male, white label 29(s), yellow label 1436. 2nd Coll. Pub. Mus., Quebec.

Gorytes laticinctus. Type.—Not located. Probably returned to collector.

Gorytes maculatus. Type.—Male, yellow label 1726. 2nd Coll. Pub. Mus., Quebec.

Gorytes ruficornis. Type.—Female, white label 36(s), yellow label 1435. 2nd Coll. Pub. Mus., Quebec.

Haltichella viridis. Type.—Blue label 110(s); yellow, 1394. 2nd Coll. Pub. Mus., Quebec.

Hedylus politus. Type.—See Introduction (Opiinae).

Helorus paradoxus. Type.—Female, yellow label 971.

2nd Coll. Pub. Mus., Quebec. Lacks head. Paratype in good condition.

Hemiteles aciculatus. Type.—Male, Harrington Coll. Pink label "P. 426." Lacks right antenna and apex of left.

Hemiteles caudatus. Type.—Female, yellow label 306. 1st Coll. Pub. Mus., Quebec. Lacks abdomen.

Hemiteles crassus. Type.—Male, yellow label 720. 2nd Coll. Pub. Mus., Quebec. Some tarsi gone.

Hemiteles debilis. Type.—Harrington Coll. One antennæ gone, other broken at apex.

Hemiteles declivus. Type.—Female, Harrington Coll. Antennæ gone. Paratype.—Old rose label 33, yellow label 1199. 2nd Coll. Pub. Mus., Quebec.

Hemiteles depressus. Type.—Not located.

Hemiteles gigas. Type.—Male, Harrington Coll. Pink label "P. 411."

Hemiteles humeralis. Type.—Female, yellow label 233. 2nd Coll. Pub. Mus., Quebec.

Hemiteles longicornis. Type.—Female, yellow label 671. 2nd Coll. Pub. Mus., Quebec.

Hemiteles mandibularis. Type.—Female, yellow label 307. 1st Coll. Pub. Mus., Quebec.

Hemiteles mucronatus. Type.—Male, blue label 213, yellow label 1198. 2nd Coll. Pub. Mus., Quebec. Lacks left fore wing.

Hemiteles nigricans. Type.—Male, yellow label 673. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ gone, wings crumpled.

Hemiteles orbicularis. Type.—Not in Pub. Mus., Quebec, unless under *Stilpnus americanus* Prov.

Hemiteles ovalis. Type.—Female, yellow label 316. 1st Coll. Pub. Mus., Quebec. Lacks right and apex of left antenna. Allotype.—Not located.

Hemiteles pallipennis. Type.—Female, yellow label 672. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna and apex of right. Allotype.—In good condition, without labels. 2nd Coll. Pub. Mus., Quebec.

Hemiteles parvus. Type.—Male, yellow label 226. 2nd Coll. Pub. Mus., Quebec. *Fair.

- Hemiteles ruficoxus.** Type.—Female, yellow label 228. 2nd Coll. Pub. Mus., Quebec. Some verdigris.
- Hemiteles scabrosus.** Type.—Female, yellow label 225. 2nd Coll. Pub. Mus., Quebec. Lacks apex of right flagellum.
- Hemiteles semifurus.** Type.—Female, yellow label 314. 1st Coll. Pub. Mus., Quebec. Without head.
- Hemiteles sessilis.** Type.—Female, yellow label 309. 1st Coll. Pub. Mus., Quebec.
- Hemiteles subspinosus.** Type.—Female, Yellow label 232. 2nd Coll. Pub. Mus., Quebec. Lacks antennae.
- Hemiteles tener.** Type.—Male, yellow label 311. 1st Coll. Pub. Mus., Quebec. Somewhat damaged.
- Hemiteles utilis.** Type.—See *H. depressus* Prov.
- Herpestomus pyriformis.** Type.—Female, yellow label 200. 2nd Coll. Pub. Mus., Quebec.
- Heteropelma longipes.** Type.—Cat. No. 1966, U. S. Nat. Mus.
- Holcopelte albipes.** Type.—Yellow label 1378; blue 774(s). 2nd Coll. Pub. Mus., Quebec. Fair.
- Hoplismenus impar.** Type.—Pub. Mus., Quebec. Data not obtained.
- Hoplismenus scutellatus.** See *Ichneumon*.
- Hoplismenus stygicus.** Type.—Not located, probably returned to collector.
- Hoplisus angustus.** Type.—Male, yellow label 1688. 2nd Coll. Pub. Mus., Quebec.
- Hoplocampa canadensis.** See *Selandria*.
- Ichneumon absconditus.** Type.—Male, yellow label 1210. Mus. Pub. Instruction, Quebec. Right antenna broken, left fore wing missing, thorax crushed but complete, hind tarsi broken, 3 basal joints of right present.
- Ichneumon adjunctus.** Type.—Female, blue label 93, yellow label 1189? (or one hundred and eighty-nine). 2nd Coll. Pub. Mus., Quebec.
- Ichneumon æqualis.** Type.—Not in Pub. Mus., Quebec, unless under *Amblyteles nubivagus* Cress.
- Ichneumon annulatus.** Type.—Male, yellow label 211. 1st Coll. Pub. Mus., Quebec. Right antenna broken off at scape.

Ichneumon approximans. Type.—Male, old rose label 31, yellow label 1193. 2nd Coll. Pub. Mus., Quebec.

Ichneumon aterrimus. Type.—Not in Quebec or Ottawa. Probably returned to collector.

Ichneumon bimaculatus. Type.—Male, blue label 380, yellow label 1580. 2nd Coll. Pub. Mus., Quebec. Right antenna, front legs, left middle leg and left hind wing missing.

Ichneumon bimembris. Type.—Female, yellow label 99. Pub. Mus., Quebec.

Ichneumon calcaratus. Type.—Not in Pub. Mus., Quebec, unless under *Hoplismenus morulus* Say.

Ichneumon caudatus. Type.—Female, yellow label 139. 2nd Coll. Pub. Mus., Quebec. Verdigris.

Ichneumon cervulus. Type.—Male, yellow label 134. 2nd Coll. Pub. Mus., Quebec.

Ichneumon cinctipes. Type.—Not in Pub. Mus., Quebec, unless under *I. navus*. One specimen female, yellow label 161. 1st Coll. Pub. Mus., Quebec.

Ichneumon cinctitarsis. Type.—Male, yellow label 112. Pub. Mus., Quebec. Right antenna missing.

Ichneumon citatus. Type.—Male, yellow label 162. 1st Coll. Pub. Mus., Quebec. Lacks right antenna.

Ichneumon citrinus. Type.—Female, Harrington Coll. Antennæ and wings on one side gone, abdomen broken off, mounted on label.

Ichneumon clapini. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon milvus*.

Ichneumon cressoni. Type.—Not in Pub. Mus., Quebec, unless under *I. velox* Cress.

Ichneumon decoratus. Type.—Male, yellow label 135. 2nd Coll. Pub. Mus., Quebec. Right antenna broken.

Ichneumon erythropygus. Type.—Not in Pub. Mus., Quebec, unless under *Platylabus thoracicus* Cress.

Ichneumon fortis. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon centrator* Say.

Ichneumon hæsitans. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon funestus* Cress.

- Ichneumon humilis.** Type.—Female, yellow label 138.
2nd Coll. Pub. Mus., Quebec. Antennae gone.
- Ichneumon lachrymans.** Type.—Male, yellow label 136.
2nd Coll. Pub. Mus., Quebec.
- Ichneumon lividulus.** Type.—Female, yellow label 144.
2nd Coll. Pub. Mus., Quebec.
- Ichneumon lobatus.** Type.—Not in Pub. Mus., Quebec,
unless under *Ichneumon duplicatus* Say.
- Ichneumon magdalenensis.** Type.—Not located.
- Ichneumon marianopolitanensis.** Type.—Not in Pub.
Mus., Quebec, unless under *Amblyteles rufizonatus* Cress.
- Ichneumon mellicoxus.** Type.—Not in Pub. Mus.,
Quebec, unless under *Ichneumon puerilis* Cress.
- Ichneumon mucronatus.** Type.—Male, yellow label 214.
1st Coll. Pub. Mus., Quebec. Antennae, left front wing, hind legs,
median tarsus on right leg, left anterior tibiae and tarsi missing.
- Ichneumon nigripes.** Type.—Male, yellow label 987. 2nd
Coll. Pub. Mus., Quebec. Antennae broken near middle.
- Ichneumon nigrovariegatus.** Type.—Female yellow label
137. 2nd Coll. Pub. Mus., Quebec. Right antenna except scape
gone, left antenna broken off near middle, abdomen glued on.
- Ichneumon nitidus.** Type.—Not in Pub. Mus., Quebec,
unless under *Amblyteles electus* Cress.
- Ichneumon ontariensis.** Type.—Male, yellow label 1191,
pink label 30. Pub. Mus., Quebec.
- Ichneumon paradoxus.** Type.—Not located.
- Ichneumon pilosulus.** Type.—Female, yellow label 168.
1st Coll. Pub. Mus., Quebec. Antennae broken (one at 4th joint
and one at middle) and left hind leg gone.
- Ichneumon placidus.** Type.—Male, yellow label 142. 2nd
Coll. Pub. Mus., Quebec.
- Ichneumon pomilius.** Type.—Male, yellow label 123.
2nd Coll. Pub. Mus., Quebec.
- Ichneumon proximus.** Type.—Female, yellow label 163.
2nd Coll. Pub. Mus., Quebec.
- Ichneumon quadripunctatus.** Type.—Not located. Prob-
ably overlooked in Harrington Coll.
- Ichneumon saguenayensis.** Type.—Not located.

- Ichneumon scutellatus.** Type.—Male, yellow label 167. 2nd Coll. Pub. Mus., Quebec. Right antenna and right hind tarsus gone.
- Ichneumon similaris.** Type.—Male, yellow label 113. 2nd Coll. Pub. Mus., Quebec.
- Ichneumon stygicus.** Type.—Yellow label 167. 1st Coll. Pub. Mus., Quebec.
- Ichneumon trizonatus.** Type.—Male, yellow label 118. 2nd Coll. Pub. Mus., Quebec.
- Ichneumon ustus.** Allotype.—Male, yellow label 510. 2nd Coll. Pub. Mus., Quebec.
- Ichneumon vagans.** Type.—Yellow label 170. 1st Coll. Pub. Mus., Quebec. Apex of right antenna gone.
- Ichneumon vancouverensis.** Type.—Ent. Branch, Dept. Agr., Ottawa.
- Ichneumon varipes.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon w-album* Cress.
- Ichneumon vesicus.** Type.—Male, yellow label 122. 2nd Coll. Pub. Mus., Quebec.
- Iphiaulax americanus.** Type.—Female, yellow label 1566. 2nd Coll. Pub. Mus., Quebec. Left fore wing loose.
- Iphiaulax ornatus.** Type.—Female, yellow label 542. 2nd Coll. Pub. Mus., Quebec.
- Ischnus impressus.** See *Phygadeuon*.
- Ischnus lentus.** Type.—Not in Pub. Mus. of Quebec unless under *Cryptus limatus* Cress.
- Ischnus parvus.** See *Hemiteles*.
- Ischnus placidus.** Type.—Not in Coll. Pub. Mus., Quebec, unless under *Phygadeuon rectus* Prov.
- Ischnus pyriformis.** See *Herpestomus*.
- Ischnus ruficornis.** See *Phygadeuon*.
- Ischnus scutellatus.** See *Platylabus*.
- Ischnus variegatus.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon w-album* Cress.
- Isostasius canadensis.** Type.—Not located.
- Joppa canadensis.** Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon insolens* Cress.

Labidia columbiana. Type.—Pin with yellow label 1152. 2nd Coll. Pub. Mus., Quebec. Specimen has been destroyed.

Lampronota albifacies. Type.—Yellow label 409. Name label *Lampronota pleuralis*. Cress. 2nd Coll. Pub. Mus., Quebec. Proved by Prov. catalogue.

Lampronota humeralis. Type.—Male, yellow label 417. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ.

Lampronota marginata. Type.—Female, yellow label 954. 2nd Coll. Pub. Mus., Quebec.

Lampronota nigricornis. Type.—Female, yellow label 501. 1st Coll. Pub. Mus., Quebec. Lacks apical half of right antenna.

Lampronota nigripes. Type.—Not in Pub. Mus., Quebec. Probably returned to collector.

Lampronota rufipes. Type.—Provancher did not describe this as a new species. Two females, Pub. Mus., Quebec. One, yellow label 503, 1st Coll.; other, yellow label 532, 2nd Coll. Both under name label *Lampronota rufipes* Cress.

Larra minor. Type.—Male, blue label 77(s), yellow label 1430. 2nd Coll. Pub. Mus., Quebec.

Larra quebecensis. Type.—Not located.

Larra rufipes. Type.—Female, white label 99(s); yellow label 1715. 2nd Coll. Pub. Mus., Quebec.

Leptobates canadensis. Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon signatus* Prov.

Leptothorax canadensis. Type.—Not located.

Limneria argentea. Type.—Female, yellow label 471. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip, median and hind legs on left gone at coxæ.

Limneria basilaris. Type.—Male, yellow label 449. 2nd Coll. Pub. Mus., Quebec. Right antenna and left median leg missing.

Limneria brevicauda. Type.—Female, blue label 252 (apparently, blotted), yellow label 1221. 2nd Coll. Pub. Mus., Quebec. Left antenna gone at scape.

Limneria clavata. Type.—Female, yellow label 301. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna at scape, right at apex, anterior and median legs on left.

(To be continued)

THE SECONDARY HOST OF MYZUS CERASI.

BY W. A. ROSS, DOMINION ENTOMOLOGICAL LABORATORY, VINELAND STATION, ONT.

On looking over some of the recent literature dealing with *Myzus cerasi*, the well known cherry aphid, we find that a difference of opinion exists among entomologists as to whether the species is migratory. Crosby (1) considers that the question is unsettled. Sanderson (2) and O'Kane (3) say that so far as known the cherry aphid has only one food plant. Gillette (4) states definitely that *M. cerasi* lacks the alternating food habit. On the other hand, Quaintance and Baker (5) claim that the species is migratory. How are we to account for these apparently conflicting statements? Is it possible that the species is partially monophagous and partially migratory? Our observations lead us to believe that it is. Apterous forms reside throughout the season on the primary host—cherry—and in addition alatae, produced during the summer, migrate to and establish colonies on a secondary host. In Ontario, according to our observations, the favourite alternate host is wild peppergrass, *Lepidium apetalum*. We have made several collections of *cerasi* from this weed and in migratory tests we have repeatedly been successful in transferring the louse from the cherry to the wild peppergrass. No doubt other crucifers serve as summer hosts. In our insectary experiments we have succeeded in establishing colonies of *cerasi* on *Capsella bursa-pastoris*, *Brassica arvensis*, and *Erysimum cheiranthoides*, but so far these results have not been verified in the field.

LITERATURE CITED.

1. Slingerland and Crosby. Manual of Fruit Insects, p. 312.
2. Sanderson, E. D. Insect Pests of Farm, Garden and Orchard, p. 666.
3. O'Kane, W. C. Injurious Insects, p. 318
4. Gillette, C. P. The Monthly Bulletin of State Commission of Horticulture, California, Vol. VI, No. 2, p. 63.
5. Quaintance and Baker. Farmers' Bulletin 804, U. S. Dept. of Agr., p. 24.

December, 1917

Index to Volume XLIX.

- Acantholyda ferruginea*, n. sp., 192.
Achrysocharella albitibia, n. sp., 356.
Acroncosa, n. gen., 404.
 " *albiflavella*, n. sp., 405.
 " *similella*, n. sp., 405.
Aeshna, Red Deer species of, 99.
Agonoderus indistinctus, 138.
Agrilus burkei, n. sp., 287.
AINSLIE, C. N., article by, 93.
ALEXANDER, C. P., articles by, 22, 61, 199.
Allopora arizonica, n. sp., 359.
 " *californica*, n. sp., 359.
 " *lutea*, 359.
Amphibolips nigra, 348.
Amphrophora cicale, n. sp., 51.
Anchonus duryi, 279.
Andricus castanopsidis, n. sp., 345.
 " *dugesi*, n. sp., 347.
 " *gemmiformis*, n. sp., 346.
 " *myrtifolia*, n. sp., 346.
Anthidium chubuti, 252.
 " *rubripes*, 252.
Anthomyid, a new maritime, 148.
Anthomyiidae, key to subfamilies of, 406.
Antocha monticola, n. sp., 23.
Aphid genera, two new, 193.
Aphididae, sensory structures in, 378.
Apple leaf mites, 185.
Apple maggot in British Columbia, 329
Araoncus patellatus, n. sp., 262.
Argynnis, species in America of, 342.
Arhipis lanieri, 239.
Arrhenoplita ferruginea, 276.
Arthmius gracilior, 139.
Aspidaphis, n. gen., 196.
 " *polygona*, n. sp., 196.
Bactridium californicum, n. sp., 169.
BAKER, A. C., articles by, 1, 378.
BARNES, W., and McDUNNOUGH, J., articles by, 320, 371, 404.
Bees, collecting, 113.
Bees, some Euglossine, 144.
Bees, some neotropical Megachilid, 252.
Bembicinae of Nebraska, 285.
BETHUNE, C. J. S., articles by, 37, 153.
BEUTENMULLER, WM., article by, 345.
Bicyrtes, Nebraska species of, 286.
Bindweed prominent, 280.
Biocrypta magnolia, n. sp., 236.
Biorhiza capulaeformis, 348.
BIRD, HENRY, article by, 121.
Blaberus discoidalis, 295.
Blapstinus aciculus, n. sp., 275.
BLATCHLEY, W. S., articles by, 137, 236, 272.
BOOK NOTICES:
Aldrich's Sarcophagidae of N. America, 34.
BARNES' and McDUNNOUGH'S Checklist of N. American Lepidoptera, 219.
CALVERT'S Year of Costa Rica Natural History, 255.
HEBARD'S Blattidae of N. America, 363.
Proceedings of the Entomological Society of Nova Scotia, 292.
VAN DUZEE'S Checklist of N. American Hemiptera, 33.
VIERECK'S Hymenoptera of Connecticut, 362.
WALSINGHAM'S Lepidoptera—Heterocera, Vol. IV, Biologia Centrali-Americana, 31.
Brachyopa daeckei, n. sp., 360.
 " *diversa*, n. sp., 361.
 " *flavescens*, 362.
 " key to eastern species of, 360.
 " media, 362.
BRITTAİN, W. H., articles by, 149, 186.
Bumble-bees, cleaning, 291.
Butterflies, two new Californian, 349.
CAESAR, L., article by, 17.
Carebara californica, n. sp., 357.
Caterpillars, death-feigning instinct of, 222.
Cebrio mandibularis, 142.
Ceutorhynchus convexipennis, n. sp., 390.
Ceutorhynchus echinatus, n. sp., 386.
 " *invisus*, n. sp., 388.
 " *omissus*, n. sp., 388.
Chaetocnema brunnescens, 275.
Chalcid-fly, a new West Indian, 356.
Chalcoscirtus carbonarius, n. sp., 271.
CHAMBERLIN, W. J., articles by, 321, 353.
Chionea gracilis, n. sp., 205.
 " *novaboracensis*, n. sp., 205.
 " *primitiva*, n. sp., 204.
Chironomus decorus, habits and life-history of, 418.
Chlorophorus annularis, 239.
Cholus forbesii, 296.
Chrysobothris chrysoela, 239.

- Cicadellidae, additions to list of Missouri, 75.
- COCKERELL, T. D. A., articles by, 144, 212, 252.
- Cænagrion angulatum, 98.
- " resolutum, 98.
- Coleoptera from drift-line of L. Michigan, 133.
- Coleoptera from west coast of Florida, 137, 236.
- Coleoptera, new, 163, 385.
- Colopha, sensory structures in, 384.
- Conotrachelus biscaynensis*, n. sp., 385.
- " *maritimus*, n. sp., 278.
- " *obesus*, n. sp., 386.
- Cordulia shurtleffi, 100.
- Cornifrons pulveralis, 374.
- CRAMPTON, G. C., articles by, 213.
- Crane-flies, new nearctic, 22, 61, 199.
- CRIDDLE, N., article by, 77.
- Cryphalus amabilis*, n. sp., 321.
- " *grandis*, n. sp., 323.
- Crypteria americana*, n. sp., 29.
- Cuckoo-flies, death-feigning instinct of, 222.
- Cutworm, a little known, 401.
- Cynipidae, new, 345.
- Cytorrhinus caricis, 250.
- Death-feigning instinct, the, 221.
- Delphax maidis, synonymy of, 147.
- Dendroctonus, Oregon species of, 323.
- Dermestes elongatus, 141.
- Dialyta flavitibia, 148.
- Diasemia disputalis*, n. sp., 373.
- " *elegantalis*, 373.
- DICKERSON, EDGAR L., WEISS, H. B. and, article by, 104.
- Dicranomyia melleicauda*, n. sp., 22.
- Dicyphus luridus*, n. sp., 218.
- " *prasinus*, n. sp., 218.
- Diplostyla brevipes*, n. sp., 267.
- " *inornata*, n. sp., 266.
- " *keenii*, n. sp., 267.
- Disonycha abbreviata leptolineata*, n. var., 143.
- Dod, F. H. W., articles by, 81, 240.
- Dolichopodidae, new N. American species of, 337.
- Dragonflies of the Red Deer District, 96.
- Dragonflies from Prince Edward Island, 117.
- Dragonflies, season irregularities in occurrence of, 171.
- Drepanaphis, sensory structures in, 379.
- Dryocoetes pseudotsuga*, 324.
- Dryophanta floridensis*, n. sp., 349.
- DUPORTE, E. M., article by, 221.
- Dysstroma, the genus, 64.
- " *citrata*, 65.
- " *mulleolata*, 69.
- " " ab. *ochrofuscaria*, nov., 70.
- Dysstroma mulleolata ab. *subumbrata*, nov., 70.
- Eccoptogaster, Oregon species of, 325.
- Egesta, characters and synonymy of, 372.
- Elachertodomyia*, n. gen., 110.
- Elater discoideus, 142.
- ELY, C. R., article by, 31.
- Embiidae, antennæ of, 213.
- Emersonopsis*, n. gen., 110.
- EMERTON, J. H., articles by, 13, 261.
- Enallagma calverti, 98.
- " *civile*, 118.
- " *cyathigerum*, 98.
- " *hageni*, 118.
- Eriophyes malifoliae, 189.
- Erioptera cinereipleura* n. sp., 200.
- " *noctivagans* n. sp., 200.
- Essigella, sensory structures in, 379.
- Euchlana albertanensis*, n. sp., 351.
- Eufriesia purpurata, 144.
- Euglossa bicolor, 144.
- " *charapensis*, n. sp., 146.
- " *cyanura*, n. sp., 146.
- " *piliventris*, 144.
- " *variabilis*, 145.
- " *variabilis*, var. *hemichlora*, n. var., 146.
- Eumerus strigatus, occurrence in Canada of, 190.
- Euscelis ozarcensis*, n. sp., 184.
- Euxoa excellens, habits and life-history of, 401.
- Exochomus marginipennis childreni, 140.
- FALL, H. C., articles by, 163, 385.
- FELT, E. P., article by, 191.
- FENTON, F. A., article by, 309.
- FERRIS, G. F., article by, 375.
- FISHER, W. S., article by, 287.
- Flea-louse, Bay, in New Jersey 73.
- GAHAN, A. B., and ROHWER, S. A., articles by, 298, 331, 391, 427.
- Geometrid Notes, 64.
- GIBSON, A., articles by, 190, 401.
- GIBSON, E. H., articles by, 75, 183, 218.
- GILLETTE, C. P., article by, 193.

- GIRAULT, A. A., articles by, 110, 129, 178, 356.
- Glaucopsyche behri australis*, n. subsp., 359.
- Glossua*, n. subs. of *Euglossa*, 144.
- Gnathotrichus, Oregon species of, 325.
- Gongylidium curvitaris*, n. sp., 262.
- " *macrochelis*, n. sp., 263.
- " *unidentatum*, n. sp., 264.
- Graphic presentations of entomological facts, 366.
- GRINNELL FORDYCE, article by, 349.
- Grylloblattidae, antennae of, 213.
- Gryllotalpa gryllotalpa, 294.
- Habrocytus arkansensis*, n. sp., 180.
- " *aulacis*, n. sp., 150.
- " *borrowi*, n. sp., 179.
- " *canadensis*, n. sp., 181.
- " *dux*, n. sp., 181.
- " *franciscanus*, n. sp., 180.
- Habrocytus*, N. American species of, 178.
- Habrocytus rhodobaini rosa*, n. var., 180.
- Haliplus punctatus*, 138.
- Hallomenus binotatus*, 358.
- Halticus apterus*, 249.
- Heath Collection of Lepidoptera, 81.
- Helocharis maculicollis*, 139.
- Hemiptera Heteroptera, from drift-line of L. Michigan, 134.
- Hemiptera Heteroptera, in ocean drift, 45.
- Hessian fly, influence of weather condition on prevalence of, 79.
- Heterius exiguus*, 167.
- " *loripes*, 167.
- " *minimus*, 167.
- " *strenuus*, n. sp., 167.
- " *zelus*, n. sp., 165.
- Heterotoma merioptera*, 250.
- HEWITT, C. G., articles by, 34, 289.
- HOLLINGER, A. H., articles by, 19, 281.
- Hormaphis, sensory structures in, 384.
- Hymenoptera, lectotypes of Provancher's species of, 298, 331, 391, 427.
- Hypanthidium melanopterm*, n. sp., 253.
- Hypanthidium taboganum*, n. sp., 252.
- Hyperaspidium militaris*, 140.
- Hypotrichia spissipes*, 239.
- Idiocerus fitchi*, life-history of, 149.
- Insect collections of Canada, 111, 153, 240.
- Insect drift of lake shores, 129.
- Insect immigration into New Jersey, 293.
- Insects in ocean drift, 45.
- Instinct, an interesting case of, 161.
- Ips, Oregon species of, 328.
- Ischyryus tripunctatus*, n. sp., 238.
- Jassoidea, three new species from Missouri of, 183.
- JOHNSON, C. W., articles by, 148, 360.
- KENNEDY, C. H., article by, 229.
- KNIGHT, H. H., article by, 248.
- Lachnus, sensory structures in, 379.
- Lacon curtus*, 142.
- Lampyridae, light-emission of, 53.
- Lathrobium shermani*, n. sp., 164.
- Leaf-hopper, black apple, life-history of, 149.
- Lebia pulchella*, 138.
- Lecanium corni*, distribution of, 310.
- " " food plants of, 310.
- " " history of, 309.
- " " life-history of, 311.
- " " status in New Jersey of, 119.
- Lepidoptera, Heath Collection of, 77.
- Lestes*, species from Red Deer District, 97.
- Lestes*, species from Prince Edward Island, 118.
- Leucorrhinia borealis*, 102.
- " *glacialis*, 102.
- " *hudsonica*, 103, 119.
- " *intacta*, 103, 119.
- " *proxima*, 103.
- Libellula quadrimaculata*, 101, 119.
- LILJEBLAD, E., article by, 9.
- Limnobia indigena jacksoni*, subsp. n., 199.
- Limnophila cressoni*, n. sp., 208.
- " *subaptera*, n. sp., 207.
- Linyphia nearctica*, distribution of, 16.
- Lophocarenum sculptum*, n. sp., 261.
- MCDERMOTT, F. A., article by, 53.
- MCDUNNOUGH, J., BARNES, W., and, articles by, 320, 371, 404.
- MACNAMARA, CHAS., article by, 39.
- Macro-lepidoptera, the Dod Collection of, 240.
- Macrosiphum, sensory structures in, 380.
- Macrotheca interalbicalis, 374.
- MALLOCH, J. R., articles by, 225, 227, 352, 406.

- Mealy-bug, shell-back hickory, 19.
 Medonella minuta, 237.
 Melandryidae, some new and known, 357.
 Melanophila notata, 239.
 Melanoplus atlanis, 78.
 " scretis, 77.
 MICKEL, CLARENCE E., article by, 285.
 Miconeta clavata, n. sp., 265.
 " orcina, n. sp., 266.
 " pallida, n. sp., 265.
 Microsynamma bohemani, 248.
 Military service, officers and employees of Entomological Branch on, 72.
 Miridae, European, in N. America, 248.
 Mite, apple leaf, 188.
 " silver-leaf, 185.
 Mole cricket, European, 294.
 Morædus guttatus, 141.
 Monoxia batisia, n. sp., 273.
 MOORE, C. A., article by, 33.
 Mordellistena exilis, n. sp., 10.
 " gigas, n. sp., 13.
 " insolita, n. sp., 11.
 " pulchra, n. sp., 12.
 " rufa, n. sp., 11.
 " rutila, n. sp., 10.
 " vera, n. sp., 11.
 " wolcottii, n. sp., 12.
 MUIR, F., article by, 147.
 Mycetochares puncticollis, n. sp., 276.
 Myzocallis, sensory structures in, 379.
 Myzus, California species of, 49.
 " cerasi, secondary host of, 434
 " godetia, n. sp., 49.
 " sensory structures in, 380.
 NEEDHAM, J. G., article by, 129.
 Neobothynotus modestus, 251.
 Neoclytus simplarius, n. sp., 240.
 Neuroptera from drift-line of L. Michigan, 135.
 Noctuid, a new Canadian, 320.
 Nothosympycnus abbreviatus, n. sp., 341.
 " inornatus, n. sp., 340.
 Notomicrus nanulus, 138.
 OBITUARY NOTICES:
 REED, EDMUND BAYNES, 37.
 WILSON, TOM, 289
 Odonata of the Red Deer District, 96.
 " from Prince Edward Island, 117.
 Ophiogomphus severus, 98.
 Ormosia megacera, n. sp., 26.
 " mesocera, n. sp., 25.
 " nimbipennis, n. sp., 24.
 Orthocephalus mutabilis, 249.
 Otiorhynchus ovatus in British Columbia, 257.
 Papaipema eryngii, n. sp., 125.
 " new species and histories in, 121.
 Papaipema polymnia, n. sp., 121.
 Parachrysocaris, occurrence in U. S. of, 129.
 Parachrysocaris semiflava, n. sp., 129.
 Paragraphus setosus, 278.
 Pardosa mellakatta, n. sp., 268.
 " vancouveri, n. sp., 269.
 PARKER, R. R., article by, 157.
 PARSHLEY, H. M., article by, 45.
 Peltodytes oppositus, 138.
 Pemphigus, sensory structures in, 384.
 Peregrinus maidis, synonymy of, 147.
 Phalonia spartinana, life-history notes on, 93.
 Phenacoccus pettiti, n. sp., 281.
 Philhydrus estriatus, n. sp., 139.
 Philodromus canadensis, n. sp., 270.
 " macrotarsus, n. sp., 271.
 Phloeosinus, Oregon species of, 353.
 Photinus consanguineus, light emission of, 61.
 Photinus scintillans, light emission of, 61.
 Photuris pennsylvanica, light emission of, 56.
 Phycitinae, New N. American, 404.
 Phyllocoptes schlectendali, 185.
 Phyllogaster cordyluroides, 227.
 " littoralis, n. sp., 228.
 " robustus, n. sp., 148.
 Phylloxera, sensory structures in, 384.
 Physokermes piceae, distribution and history of, 317.
 Physokermes piceae, life-history of, 318.
 " parasites of, 320.
 PING, CHI, article by, 418.
 Pithanus maerkelii, 251.
 Pityogenes carinulatus, 355.
 Pityophthorus, Oregon species of, 355.
 Plagioderma versicolora, life-history of, 104.
 Pleroneura borealis, n. sp., 191.
 Plum Curculio, in Ontario, 17.
 " means of control of, 18.
 Poecilochroa columbiana, n. sp., 269.
 Polyphylla gracilis, 239.
 Popular and practical entomology, 17, 39, 77, 113, 149, 185, 221, 257, 293, 329, 365, 401.
 Potato beetle, influence of snow on prevalence of, 79.

- Precipitation in relation to insect prevalence and distribution, 77.
- Prociophilus, sensory structures in, 382.
- PROVANCHER, insect collections of, 300.
- " life and work of, 299.
- Pseudococcus jessica, 21.
- Pseudohylesinus, Oregon species of, 353.
- Pterocomma, sensory structures in, 380.
- Pyla fasciella*, n. sp., 405.
- " *viridisuffusella*, n. sp., 406.
- Pyractomena angulata, light emission of, 60.
- Pyractomena borealis, light emission of, 53.
- Pyractomena lucifera, light emission of, 60.
- Pyractomena lucifera angustata, 142.
- Pyrallid notes, 371.
- Pyrausta orphisalis, 374.
- Rhabdomastix flava coloradensis*, n. subsp., 28.
- Rhagoletis pomonella in British Columbia, 329.
- Rhaphidolabis major*, n. sp., 210.
- " *sessilis*, n. sp., 210.
- Rhodophaea bicolorella*, n. sp., 404.
- Rhopalosiphum, sensory structures in, 382.
- ROHWER, S. A., GAHAN, A. B., and articles by, 298, 331, 391, 427.
- ROSS, W. A., article by 434.
- Saltusaphis americanus*, n. sp., 3.
- " *ballii*, 4.
- " *elongatus*, n. sp., 4.
- " *flabellus* 6
- " key to species of, 2.
- " *scirpus* 6.
- " *virginicus*, n. sp., 7.
- Sameodes adipaliodes, 372.
- Saprinus carinifer*, n. sp., 167.
- " *ciliatoides*, n. sp., 168.
- " *martini*, n. sp., 169.
- Sarcophaga fulvipes dissidia*, n. sp., 157.
- SAUNDERS, L. G., BRITAIN, W. H., and, article by, 149.
- Sawflies, two new, 191.
- SCHAEFFER, CHAS., article by, 357.
- SHINJI, G. O., articles by, 49, 51.
- Schizura ipomeae, Louisiana records of, 280.
- Scolytid beetles of Oregon, annotated list of, 321, 353.
- Scraptia oculata, n. sp., 358.
- Scymnus oculatus, n. sp., 140.
- SKINNER, HENRY, article by, 342.
- SLADEN, F. W. L., article by, 113.
- SMITH, E. J., article by, 291.
- Somatochlora albicincta, 232.
- " *cingulata*, 235.
- " *elongata* 119.
- " *hudsonica*, 100, 232.
- " *septentrionalis*, 234.
- " *walkeri*, n. sp., 229.
- Soronia brunnescens*, n. sp., 238.
- Spiders, new Canadian, 261.
- Sphindocis*, n. gen., 170.
- " *denticollis*, n. sp., 171.
- Spiders, recent studies of Canadian, 13.
- Stelis veraecrucis*, n. sp., 254.
- Stephanitis pyrioides, 296.
- Stictiella, Nebraska species of, 285.
- STÖHR, L. M., article by, 161.
- Stomacoccus*, n. gen., 375.
- " *platani*, n. sp., 375.
- Strawberry root weevil in British Columbia, 257.
- Strymon sylvinus desertorum*, n. subsp., 349.
- Sunflower insects, 212.
- SWETT, L. W., articles by, 64, 351.
- Sympetrum corruptum, 101, 417.
- " *costiferum*, 101, 413.
- " *illotum*, 417.
- " nymphs of N. American species of, 409.
- Sympetrum obtusum, 119, 416.
- " *pallipes*, 414.
- " *rubicundulum*, 102, 119, 416.
- Sympetrum semicinctum, 413.
- " *scoticum*, 102, 417.
- " *vicinum*, 413.
- Sympycnus canadensis*, n. sp., 339.
- " *caudatus*, n. sp., 338.
- " *fasciventris*, n. sp., 337.
- Symydobius, sensory structures in, 379.
- Telephorus albolineatus*, n. sp., 143.
- Tenebrioides foveatus*, n. sp., 142.
- Tetragonoderus fasciatus, 138.
- Tetramerinx brevicornis*, n. sp., 226.
- " key to species of, 225.
- Thecabius, sensory structures in, 384.
- Theridion zelotypum, distribution of, 14.
- Thripsaphis*, n. gen., 195.
- " *balli*, 194.
- " *producta*, n. sp., 196.
- " *verrucosa*, n. sp., 194.
- Tiger beetles, 77.
- Tinobregmus moodii*, n. sp., 183.
- Tipulidæ, new nearctic, 22, 61, 199.

- Tomarus hirtellus*, 140.
 TREHERNE, R. C., articles by, 257, 329.
Tribalister striatellus, n. sp., 165.
Tricosiphum, sensory structures in, 380.
Tricyphona autumnalis, n. sp., 30.
 " *cervina*, n. sp., 62.
 " *glacialis*, n. sp., 63.
 " *degenerata*, n. sp., 209.
Trimicra angularis, 26.
Trioza alacris in New Jersey, 73.
Trirhabda canadensis, death-feigning instinct of, 224.
Tritona dissimilis, n. sp., 140.
Trypodendron, Oregon species of, 356.
Toxoptera, sensory structures in, 382.
 TUCKER, E. S., article by, 280.
Tychius picirostris, death-feigning instinct of, 228.
Typhlocyba modesta, n. sp., 184.
 VAN DUZEE, M. C., article by, 337.
 WALKER, E. M., articles by, 117, 171, 255, 292, 362, 363, 409.
 Wasps and bees, collecting, 113.
 Wheat-stem saw-fly, 78.
 WEISS, H. B., articles by, 73, 104, 119, 293, 365.
 WHITEHOUSE, F. C., article by, 96.
 WINN, A. F., articles by, 111, 219.
 Wolf Spider, on the portrait of a, 39.
Xylomoia chagnoni, n. sp., 320.
Zagloba bicolor, 237.
Zagymnus clerinus, 272.
Zonantes schwarzi, 277.