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POPULAR AND ECONOMIC ENTOMOLOGY.

NOTES OF ECONOMIC INTEREST FROM BRITISH COLUMBIA.*

BY R. C. TREHERNE, AGASSIZ, B. C.

The Province of British Columbia, from the standpoint of insects of economic interest, occupies an extremely interesting position, both in regard to those insects indigenous to and acclimatised within its boundaries and because the location makes the Province liable to insect migrations from points in the Pacific.

It has been said that the British Columbia field of economic entomological investigation is the most interesting of any in the Dominion of Canada. This, of course, is not strictly true, but the great interest of the western field lies in the fact that one is able to cover the essential history of agriculture, which has occurred for the most part within the past half century, and note the appearance and progress of related insect pests.

For instance, the Imported Cabbage worm (*Pontia rapæ* Sch.) was observed in the eastern section of the Province in 1898 and 1899. It had spread west to the Pacific Ocean in 1901, while in 1902 it had crossed the narrow strip of water and was taken on Vancouver Island. The Colorado Potato Beetle (*Leptinotarsa decemlineata* Say) became established at Nez Percé in Idaho State some 12 years ago. It now apparently infests southeastern Washington seriously and its movement is undoubtedly towards the southeastern boundary of British Columbia. As yet, we have no record of its presence in the Province. The San José Scale, however, was found at one known point in the Province some years ago,† and that in a small isolated orchard area. Through radical control measures the outbreak was checked and is now believed to be entirely eradicated, but the northern trend of this scale is being watched from the lower valley of the Okanagan River in Washington State. Two years ago it had reached a point at

*Contributions from the Entomological Branch, Department of Agriculture, Ottawa.

†1894.

the junction of the Columbia and Okanagan Rivers, but thus far has not arrived in the southern Okanagan orchards. The Codling Moth (*Cydia pomonella*) has gained access to the orchards of the Province on four or five definite occasions, each one traceable to Californian, Oregon and Ontario importations. Fortunately each of these outbreaks has been caught in its incipiency, consequently there is every reason to believe that few moths will appear in the spring of 1915. The record of the control of this insect alone constitutes an excellent example of applied economic entomology, and an account of the methods used might well find its way into the pages of this journal at some later date. This insect, however, is gradually moving up in natural stages towards the boundary line from the South, the nearest record being at a point midway between the junction of the two rivers before mentioned and the Okanagan boundary line. The Woolly Aphis (*Eriosoma lanigera*) is one of the most injurious insects in the Province, especially on the immediate Pacific Coast region, but there is good reason to believe its numbers were quite negligible about the year 1893. And this is much the case with most of the farm and orchard insects of the Province.

Horticulture is at present the "first arm" of the agricultural interests of the Province, and it is interesting to note that the Provincial Horticulturist, Mr. R. M. Winslow, has stated that the "census of 1890 showed 6,000 acres of fruit, the census of 1900 an increase to only 8,000. At the time of the 1910 census the acreage had increased to 33,606, and the survey of 1913 showed this further increased to 38,196 acres."

These facts, therefore, clearly indicate an original condition and establishes the point that the chief interest of economic entomology in British Columbia lies in one's ability to observe the growth of the agricultural industry in connection with the development of attendant insect pests.

While forest and range insects are not being referred to in this article, for the reason that they represent an entirely different problem, it is interesting to note that not the least important of the insect troubles of the orchard and farm are derived primarily from the virgin lands, which, as the above rapid growth of cleared land would indicate, are gradually being broken up to give place

to cultivated crops. It may be rightly assumed that such insects are worst pests to the agriculturist in the years immediately following the destruction of their native host plants. Eventually, it is hoped, their attacks will decrease for the reason that the food plant may not be entirely suitable. We may place the following insects in this category.

The Fruit Tree Leaf Syneta (*Syneta albida* Lec), which is believed to to have fed originally on the wild species of willow, now freely attacks blossoms and leaves of fruit trees and is reported as doing damage to strawberries and clover. The Bronze Apple Tree Weevil (*Magdalis ænescens*) formerly no doubt, infested dying twigs of forest trees, but now is recognized as an apple-infesting insect frequently met with in neglected orchards. It causes a series of minute punctures closely congregated on injured twigs and branches. Several species of Eleodes are recorded, notably *pimelioides, obscura, humeralis, hispilabris,* and some have been observed infesting potatoes. The genus *Otiorhynchus* represented by the species *sulcatus, ovatus,* and probably *rugifrons,* are in all probability primarily grass-infesting insects, but, in this latitude, are among the most important of the insect pests injurious to gardens, greenhouses and small fruit plantations. There are, again, at least twenty species of Click-beetles (*Elateridæ*) recorded at present for the Province, and while the larval (wireworm) stage is universally recognized as a serious nuisance to pasture land, the adults have shown themselves to be of economic importance to fruit growers by their attacks on blossoms and buds of fruit trees in the spring. Seven and eight-year old apple trees have been observed to be entirely denuded of bloom by the adults clustering on the flowers and devouring the pistils, stamens and calyces. Fruit on the tree will also be attacked in midsummer as will the leaves.

Ants are also shown to be enemies to the fruit grower. To Mr. W. H. Brittain (at present Provincial Entomologist for Nova Scotia, formerly of British Columbia) belongs the credit for first drawing attention to the injuries of blossoms by ants. Further observations which have been made lately have shown the correctness of Mr. Brittain's findings. The species *Formica rufa* subsp. *obscuripes* is alone, as yet, recorded in this form of injury. The

blossoms of peach, pear, apple and cherry are attacked and the settings of fruit totally destroyed. Those trees in the orchard immediately adjoining rough land suffer most, it would appear, for in such uncultivated places the nests of the species may be found. It is particularly interesting to note that no aphids exist on the trees at the time the fruit is in bloom, consequently the nectar remains the sole attraction. Later in the summer the ants attend the aphids of the Cottonwood poplars. Certain *Tischeria* Leaf-miners of the apple are noticeably worse in orchards near the timber line, and certain Bud Weevils are adopting fruit trees as hosts following the destruction of their own food plants. Slugs, while not insects, are animals very commonly found in the moist alluvial soil of the Lower Fraser Valley, and may frequently be observed under decaying leaves and vegetation in the "bush." Injury has been observed to young corn (maize) plantations in the spring by these animals and their presence is indicated by the peculiar slimy remains about the plants and the "shredding" of the young tender leaf shoots.

Most of these insects mentioned, it will be seen, are especially related to the forest or virgin lands of the Province, and this relation constitutes a remarkably interesting phase of the study of economic entomology in the West. The majority of the more important orchards pests of British Columbia are identical with those in other Provinces of the Dominion, and their life histories are very similar only in some cases slight variations occur owing to differences in climatic conditions. But as these variations take place within the Province itself, specific insects will, it is hoped, be dealt with on subsequent occasions.

LIFE HISTORIES OF NORTH AMERICAN TINEINA.

BY ANNETTE F. BRAUN, CINCINNATI, O.

Choreutis inflatella Clemens.

Brenthia inflatella Clem., Proc. Ent. Soc. Phil., II, 5, 1863; Tin. No. Am., 209, 1872.

Var. *virginiella* Clem., Proc. Ent. Soc. Phil., III, 505, 1864; Tin. No. Am., 257, 1872.

Choreutis inflatella, var. *virginiella*, Dyar, List N. A. Lep.,

No. 5519a; Kearf., Jn. N. Y. Ent. Soc., X, 111, 1902; Busck, Proc. Ent. Soc. Wash., V, 219, 1903.*

The larvæ of this species were found in great numbers feeding on leaves of *Scutellaria lateriflora* L., a plant which grows commonly on low-lying grounds around Cincinnati. A slight web is spun on the upper side of a leaf, causing the margins to approach. Within this folded leaf the larva feeds, picking out the substance here and there, but usually leaving the lower epidermis intact. Toward the top of the plant, where the leaves are small, several are drawn together. The cocoon is spun within a fold of a leaf, which has, as a rule, not been previously attacked by the larva. It resembles the cocoon of other species of the genus.

The larvæ, which were nearly full-grown when collected, September 9, yielded imagos from Sept. 21 to 28. The entire series, some 18 or 20 specimens, represent the varietal or more common form of the species, in which all the metallic scales are violet-coloured.

Aristotelia salicifungiella Clemens.

Gelechia salicifungiella, Clem., Proc. Ent. Soc. Phil., III, 508, 1864; Tin. No. Am., 262, 1872.

Aristotelia salicifungiella Busck, Proc. U. S. N. M., XXV, 798, 933, 1903; Proc. Ent. Soc. Wash., V, 220, 1903; Dyar. List N. A. Lep., No. 5599, 1, 1902.

This species has several times been recorded as bred from cecidomyid galls on willow, but without definite observations on its larval habits. I have bred a number of specimens from larvæ feeding on leaves of *Salix longifolia*, the original food plant. The larva stretches a very loose irregular network of silken threads between the leaves of the terminal or lateral shoots, but does not draw the leaves together. It feeds within, eating portions of the leaves. Pupation takes place (in the breeding jar) either between two leaves or amongst the debris in the bottom of the glass. The cocoon is spun of silk and particles of earth. Larvæ taken July 6, varying from very small to nearly full grown, produced imagos from July 29 to August 7.

Larva: Head pale straw coloured; body pale green, with a

*Only the reference to the original description, and references to papers subsequent to Dyar's List are given. For other references, see Dyar's List.

number of very fine, somewhat broken, faint blackish lines along the back and sides.

It would seem that the original association of the larva with cecidomyid galls was merely accidental, due to the frequency of the occurrence of these galls on this species of willow, from which, in this case, remarkably enough, they were almost entirely absent.

The ornamentation of all the bred specimens is very constant, and the brick-red colour easily distinguishes them from their nearest ally, *A. fungivorella* Clem.

Recurvaria dorsivittella Zeller.

Gelechia dorsivittella Zeller, Verh. zool.-bot. Ges. Wien, XXIII, 267, 1873.

Recurvaria dorsivittella Busck, Proc. U. S. N. M., XXV, 813, 1903; Dyar, List N. A. Lep., No. 5603, 1902.

The larva feeds on sweet gum (*Liquidambar styraciflua* L.) and is common in Clermont County, O., where the sweet gum forms a large part of the forest over the flat, undrained areas.

A tube of brownish silk and frass, about 1 cm. long, with a diameter of about 1 mm., is spun along a vein on the underside of a leaf. The tube is open at both ends, but at each end the free side projects slightly over the opening. Along the sides of the tube, and around each end, the larva eats irregular patches of leaf substance, leaving the upper epidermis and veins; gradually it feeds farther from the opening of the tube. When found during the later larval stages, the leaf, near the vein, where the tube is attached, is usually perforated with irregular holes, due doubtless to disintegration of the epidermis where the underneath part of the leaf was consumed during the early larval period.

At pupation, the ends of the tube are closed.

The larvæ were collected August 27 and continued to feed for a couple of weeks. Imagos in May of the following year.

Elachista prælineata, n. sp.

Face gray, shining; head blackish behind. Palpi fuscous beneath, paler above; terminal segment with its tip and a broad band in the middle fuscous. Antennæ blackish with paler annulations; last one or two segments pale.

Thorax black, with a few scales at its posterior end, and at the tip of the patagia white. Fore wings black; base white with a faint yellow tinge; a slightly curved narrow white fascia at 2-5, about equally distant from the base on either margin; at 4-5, a triangular white costal spot, whose inner edge is almost on a line with the inner edge of a similar dorsal spot, placed a little nearer the base. Cilia around the apex white, elsewhere concolorous with wing.

Legs black, silvery on their inner sides, tarsal segments tipped with white. Hind tibiæ with a spot in the middle and the apex conspicuously white.

Expanse: 6.5–7.5 mm.

Eight specimens, Cincinnati, O., August 2–8.

Occasionally, especially in males, the fascia and pair of spots are very narrow, but still distinctly defined.

The larva is a miner in leaves of *Hystrix patula* Moench., a common tall grass in dry hillside woods. The mine starts as a narrow line, scarcely visible on the upper side, and gradually enlarges into a blotch, with its greatest width 4 or 5 mm. Except in the wider portions of the blotch, the parenchyma near the lower side only is consumed; even in the broadest part of the blotch some of the parenchyma near the upper epidermis is left, giving the mine a speckled and greener appearance on the upper side, so that the mine is more distinctly visible on the lower surface where the epidermis is whitish. Pupa enclosed in a few criss-cross silken threads. At the time the larvæ were collected, July 18, many of the mines were deserted.

Theisoa constrictella Zeller.

Oecophora constrictella Zeller, Verh. zool.-bot. Ges. Wien, XXIII, 291, 1873.

Theisoa constrictella, Dyar, List N. A. Lep., No. 6130, 1902.

The larva feeds under a web on the lower surface of leaves of white elm (*Ulmus americana* L.) and cork elm (*Ulmus racemosa* Thomas). A whitish silken tube crosses from the base of the petiole to the underside of the leaf, but is not attached to the petiole except at the base. From the mouth of this tube a thin web spreads over the basal part of the leaf; gradually covering more and more of the breadth of the leaf as the tube is lengthened.

The web is, however, in large part confined to the half of the leaf upon which the tube opens. The tube is of but little greater density than the web and is chiefly defined by the frass which collects along its sides.

The cocoon is a thin oval silken affair, spun between two leaves or on the ground, and is very similar to that of the species of *Chrysopeleia*.

The larvæ from which the above notes were made were collected July 3 near Cincinnati; one imago appeared July 30. A later generation of larvæ produces the imagos which appear in May of the following year.

Psacaphora engelella Busck.

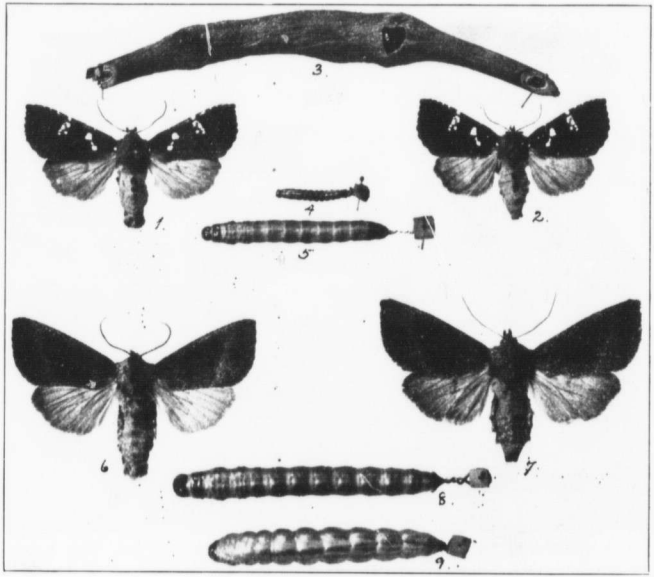
Psacaphora terminella Westw.

? Syn. *Mompha engelella* Busck, Can. Ent., XXXVIII, 123, 1906; Proc. Ent. Soc. Wash., XI, 96, 1909.

At the time of describing *Psacaphora* (*Mompha*) *engelella*, Mr. Busck noted its very close resemblance to *Psacaphora* (*Mompha*) *terminella* Westw. of Europe. I have succeeded in rearing a number of specimens, and the life history is identical with that of the European *P. terminella*. The larva mines leaves of *Circaea lutetiana* L. The earliest mine is a narrow thread-like, sometimes spiral, tract, which abruptly enlarges into a small blotch. Several successive blotches are formed, the last occupying almost half of one of the larger leaves. The mines were collected July 3. At this time many of the larvæ were full grown and ready to leave the mines preparatory to pupation. The cocoon is yellowish, flattened, tapering at the posterior end, broadly rounded at the anterior end where the two sides form a lip-like opening to admit of the emergence of the adult. Imagos emerged July 22-27.

These bred specimens agree in all respects with a number of flown specimens in my collection from one of the type localities (Pittsburg). As would be expected, the golden colour of the bred specimens is a little deeper—more orange—and the metallic margining of the basal black blotch is more conspicuous.

Although I have no specimens of the European *P. terminella* for comparison, the fact that the descriptions are practically the same, and that the food plant is native both to Europe and North America, strongly support the synonymy suggested above.



PAPAIPEMA HUMULI (1-5).

P. SILPHII (6-8).

P. MARITIMA (9).

(See p. 115).

NEW SPECIES AND HISTORIES IN PAPAIPEMA SM. (LEPIDOPTERA.)

BY HENRY BIRD, RYE, N. Y.

(Continued from Vol. XLVI, p. 73.)

Recent investigations of the Papaipema fauna in the vicinity of Chicago, Ill., has brought to light, among other things, the prevalence of an undetermined species, a representative of the Central States. More success attaches to this, since instead of a chance happening on an imago, a well directed search of the more indigenous plants disclosed the larva, and put the additional evidence of the early stages at our disposal. After moths were reared, it was seen to be a form that had been taken occasionally in former years, but identified as *P. necopina* Grt., and so distributed in a few instances by the local collectors. But the departures in the larval and pupal stages as well as the apparent difference in the imago, when a fresh series is at hand, produce a sum of evidence prohibiting its association with any described form.

To the efforts of Messrs. A. Kwiat and E. Beer, whose early studies in these life-histories are thus encouragingly rewarded, we are indebted for this fine disclosure, whereby one of our largest *Papaipema* species has its individuality proclaimed. Very generously they have placed their material and data in our hands for treatment.

In our early correspondence it was suggested that special attention be given to indigenous and primitive prairie plants in the effort to locate larva, the writer's hopes of conducting such investigations personally, failing of realization up to the present. The new form is found working in *Silphium*, principally *S. terebinthinaceum*, but in some extent in *S. perfoliatum* and *S. laciniatum* also, while in one instance a pupa from *Arctium* indicates an alternative occupancy of this cosmopolitan substitute, which happens so frequently in suburban borders. Believing the preferred foodplant to be restricted to the genus *Silphium*, which seems more or less a prairie type, we beg to propose the following name:

Papaipema silphii, n. sp.

Ground colour smoky umber brown with whitish to purplish grey powderings on thorax and primaries. Head and vestiture of thorax show ground colour deeply, the long scales tipped white and the border of collar often so defined; antennæ of male heaviest and show minute ciliations, no conspicuous white scales at their bases; anterior thoracic tuft prominent but not broadened out laterally so much as usual. Fore wing of similar hue and of almost even tone throughout, the median space the darkest, the ante- and post-medial areas tinted with a faint lilac or mauve reflection in most cases, but contrasts are minute; the post medial line is rather straight in its oblique course after turning past the cell and but faintly indicated usually, sometimes, especially near the hind margin, it becomes conspicuous in a fasciate sprinkling of white scales; subterminal line rarely shown as a simple marking of lunulate whitish scales, excurved centrally; the central portion of the reniform is sometimes indicated as a blackish shade, or it may be illuminated by lighter scales of the ground colour, but generally the stigmata may be said to be practically obsolete; at the outer margin a minute white dot may mark the extremity of the veins, and on the costa, outwardly from the inception of the post medial line, four prominent white dots usually occur. Secondaries paler, suffused in the deeper smoky tone at the outer margin; veins darkly marked in similar hue. Expanse 40 to 50 mm.

The male genitalia are of the usual generic type, but more heavily chitinized and larger than common, the valves broader than with the allies, the clasper or harpe (Pierce 1914) is toothed but slightly on the outer side, the clavus an elevated ridge densely clothed with short pile-like hair.

Habitat.—The suburban environs of the city of Chicago, Ill., and undoubtedly following the foodplant generally through the Central States. The male specimen marked *type* with the author bears the label Cicero, Ill. Twenty-five examples are under examination. Paratypes are with Messrs. Kwiat and Beer, and one will be placed in the United States National Museum. Emergence dates for the series bred are Sept. 17 to Oct. 4.

Silphii has broad primaries, is larger than its associates, *necopina, duplicata, nebris* and *maritima*, being nearest the latter

in general appearance, but browner and easily separated when fresh. Some variation exists, but it is not pronounced, and old specimens seem to fade to an even, sordid brown tone.

On larval observations the following is gathered from correspondence with Mr. Kwiat. In *S. terebinthinaceum* the larva enters before the principal flowering stem has arisen, working usually down through the lower stems of some subsidiary growth, and soon is in the root where it tunnels rather extensively about. In old established plants the fleshy roots become tough and spreading, and such are the more likely to be infested. "These roots are certainly immense. We took up some which were fully a foot in diameter, and eight or ten inches deep in the ground. In turning up such roots, we found one pupa and five larvæ ready to pupate. These were under the root, and we observed that they eat through the root into the soil for pupation. The proper time therefore to get the species is July 15 to 25." Arriving at maturity at this date would indicate the hatching period to be about the middle of May. While parasitism was not observed in the later stages, a fungous disease, however, claimed many.

The associated insect fauna of these *Silphium* root clumps is of interest. Mention need only be made of *Hydroecia immanis* Gn. as a decidedly unexpected occurrence, and of a curious dipteron, an Ortalid which seems to be new. Thus *immanis* makes a radical departure in this selection, as against the root crown of Hop, in which it has so long been known to operate throughout the East. The fact of the alternative food plant becomes of some economic import, since it permits *immanis* to flourish where Hop might not grow, and opens the question of a primitive food plant for this species. It seems strange that plants so far removed in botanical systematisations should both appeal to the taste of an insect so discriminating as this one has proved to be in the past. Our correspondents inform us they failed to encounter Hop in their local observations so far.

The following brief characterization may sufficiently place the larva.

Penultimate stage: Generically typical; head large, brown, a black line at ocelli, plates heavily chitinized, the cephalic wide

as head and margined laterally with black border; body colour a sordid pinkish hue, the usual lines drawn in pale yellowish, the dorsal entire, the subdorsal broken on joints four to eight; tubercles well shown, brown, IVa wanting on joint ten.

Maturity: Similar, but much more robust; the lines more prominent than usual for the stage; tubercles of increased size and prominence, on joint ten there is faint indication of a plate at IVa, this feature being likely variable and on eleven I and II very large. Length 47 and 52 mm. for the stages respectively.

The pupa is robust, having a dark shell like *nebris*, a slight swelling occurs at the anterior tuft but it is not produced with the prominence attained in *maritima*; 28 mm. long by 9.5 mm. wide.

The pupal period seems rather longer than usual; it may average fifty days.

In 1899, when the late Prof. J. B. Smith published a Revision of *Hydroecia*, among material loaned by the writer for study, two specimens returned labelled *H. circumlucens* Sm., a new specific name proposed at that time. One, a pale yellow and much worn example, was in addition marked "female co-type." The fresher, browner specimen was later discovered in the larval stage boring in the vine of the Hop, and its life history was published in 1907, Can. Ent., XXXIX, p. 137, as that of *"circumlucens."* As the years proceed and a large number are reared, it is seen there is no variation to the yellow, "co-type" form, and we are early convinced two distinct species are involved. But as this "co-type" was a flown, Rye example, it was deemed advisable to await the discovery of its larva and the better acquaintance thus offered, before calling attention to the matter. Now, after ten years, this has come about and supposition fully confirmed.

In 1908, however, Dr. H. G. Dyar recognizes the Hop vine borer to be distinct from the *circumlucens* in the U. S. National Museum collection, and in writing of the group at that time (Can. Ent. XL, p. 78), considers it to be properly the *marginidens* of Guenée, but such an association has been declared erroneous by Hampson in his studies of the group in 1910. Without entering the details, but accepting the later findings, it is sufficient to state that our Hop vine borer is without a name.

In our rather extended observations on the species we have everywhere found it associated with *Humulus lupulus*, where conditions were at all favorable for the species to gain a foothold, and we wish to propose as a name:

Papaipema humuli, n. sp.

Ground colour a rather even brick-red brown. Head and thorax shaded purplish, the base of the antenna encircled by a cluster of white scales; the tufts on thorax and abdomen specially prominent in both sexes, the anterior one above collar wide-tipped and spreading. Fore wing almost without contrasts, excepting the white stigmata; basal area concolorous, median field similar, the postmedial area narrow, tinted purplish, a yellow shading near apex; antemedial line indistinct, postmedial line double, curving out broadly past reniform, subterminal faint and very irregular; a conspicuous white scale at extreme base of wing, also along the costa above the stigmata and near the tip, several whitish dots occur; the orbicular and claviform are brightly white, superimposed as usual, the central spot much the smaller; reniform narrow, but made up of broken pure white spots collected around the central, yellow, lunulate line; fringes purplish dentate. Hind wings paler, silken, yellowish rufous with dull purplish shading at the terminal area, above which a medial line is indicated. The abdomen is of similar hue. Expanse 30 to 38 mm. The male genitalia are generically typical and show little individuality; the trigonate costa is not deeply indented on the outer margin, the anal angle much produced and at a right angle with the axis of the valva; the clasper proportionately large and heavily toothed.

Habitat: Eastern United States, southeastern Canada; New Brighton, Pa., Wilmington, Del., West Chester Co., N. Y.; Cartwright, Manitoba; type locality, Rye, New York.

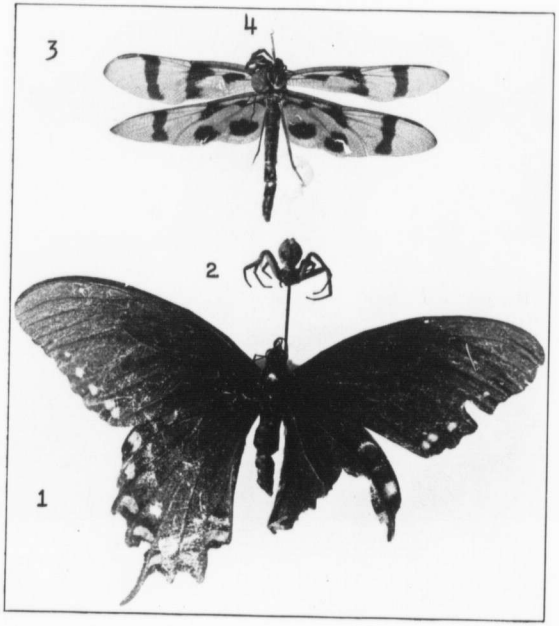
Thirty bred specimens are at hand, the type with the author, paratypes will be placed in the United States National and the British Museums and in other American collections, rectifying as far as possible the wrong determination of the species as disseminated from Rye.

The species seems closest superficially to *marginidens* Gn.,

but the stigmata are not so large, and the basal area is never white, while there is much difference in the genitalia of these two.

The larva belongs to that group having only the dorsal line entire, and has been discussed in the paper referred to. The characteristic gall produced in the stem of the vine seems always to furnish a restricted food supply, except when very large vines are chosen. But one gall is made as it is impossible for a larva to re-establish itself a second time due very shortly to their increased size, and some seem to perish from the gall becoming too small to shelter them, or upon splitting open adversely. Parasitism does not appear to be pronounced, but the insect fauna of these galls is always noticeable. The larvæ of several small dipterous species flourish in the chewed fragments and frass, especially in deserted galls, and the imago of a deltoid moth, *Palthis asopialis* Gn. has several times been reared from a larva feeding upon and having pupated within a gall. It seems improbable this common species is dependent on *humuli* galls for food supply, but that its association with Hop may be along more usual lines. The Cecidomyid, *Lasioptera humulicaulis* Felt, produces a similar gall, at times very much larger, up to 50 cm. in length, and frequently on the same stem with *humuli*. Even then the vine manages to thrive very well.

Since the association of a particular food plant is so noticeable with most *Papaipema* species, and may have had much to do in helping fix specific modifications, it seems reasonable to assume these associations date back remotely. It is true some Old World plants may serve as a substitute for this North American genus, *Arctium* meeting the cosmopolitan taste most conspicuously, but in nearly every case an indigenous, preferred food plant is very apparent. So that in advancing a name at this time we consider the Hop as indigenous, notwithstanding some botanists have designated it as introduced. The insect fauna of *Humulus lupulus* is a very considerable one and seems a fact worthy of weight. That such a large number of species subsist on it would not be likely if introduction had occurred since pre-Columbian times. We note Britton and Brown in Illustrated Flora, 1913, cite the plant as widely distr buted throughout the north temperate zone.



Papilio asterias (1) captured by *Misumena vatia* (2).
Celithemis eponina (3) killed by *M. vatia* (4).

The Japanese Hop, *H. japonicus*, clearly an introduction, yet escaped to some extent, is notoriously free from insect attack. Where doubt may arise over the question of a plant being indigenous or not, some evidence should be adduced from its insect associations.

EXPLANATION OF PLATE I.

Fig. 1—*Papaipema humuli*, male.

Fig. 2—*Papaipema humuli*, female.

Fig. 3—Gall produced in Hop vine by larva.

Fig. 4—*Papaipema humuli*, larva, stage III.

Fig. 5—*Papaipema humuli*, larva, last stage.

Fig. 6—*Papaipema silphii*, male.

Fig. 7—*Papaipema silphii*, female.

Fig. 8—*Papaipema silphii*, larva, last stage.

Fig. 9—*Papaipema maritima*, larva, last stage.

INSECTS CAPTURED BY THE THOMISIDÆ.

BY JOHN H. LOVELL, WALDOBORO, MAINE.

The Thomisidæ, or crab spiders, have acquired the habit of frequenting flowers for the purpose of preying on the insect visitors. They usually lurk in thyrsoid or dense clusters of small flowers, like the inflorescence of the sumac (*Rhus*), meadow sweet (*Spiræa salicifolia*), elderberry (*Sambucus*), Viburnum, Cornus, and the bristly sarsaparilla (*Aralia hispida*), although they are also found on large individual flowers as the rose. The commonest species of this family is *Misumena vatia*, a white spider with a crimson stripe on each side of the abdomen (Pl. II). It is quite common, but its colour will often cause it to be overlooked until a dead insect is noticed lying upon the surface of the inflorescence. Mr. J. H. Emerton informs me that this species and also *M. aletaria* may be either white or yellow, and the pink stripes on the sides of *M. vatia* may be either present or absent. Another species (*M.*

asperata), he further states, has red markings, and sometimes resembles exactly the sorrel (*Rumex acetosella*).

Misumena does not spin a web, but conceals itself among the flowers and pounces upon its unsuspecting prey while it is collecting pollen or nectar. On the 16th of July I had the opportunity to observe the capture of a bumblebee gathering pollen on a wild rose (*Rosa lucida*). My attention was a moment diverted, but was again recalled by the loud buzzing of the bee. The spider had leaped upon its back and grasped it with its mandibles just behind the head. At first the bumblebee struggled violently, but so virulent was the poison that its movements speedily ceased entirely. The spider then dragged it over the edge of the flower to the leaves beneath, where it dined at leisure.

The temerity and success with which the Thomisidæ attack large butterflies or dragonflies, or stinging insects, as wasps, bumblebees and honey-bees, is astonishing. Honey-bees are often captured, and large flies belonging to the genera *Archytas* and *Therioplectes* and rarely the wasp *Vespa germanica*. In one case I observed that a small butterfly (*Melitæa tharos*) had been taken. From Framingham, Mass., I have received from Mr. C. A. Frost a number of very interesting specimens together in each instance with the spider by which it was killed. The dragonfly *Celithemis eponina*, the large butterfly *Papilio asterias* and the smaller species *Colias philodice* were captured by *Misumena vatia* (Pl. II); and the fly *Desmometopa latipes*, the wasp *Vespa germanica* and the copper butterfly *Chrysophanus americanus* by *M. aletaria*. It is difficult to understand why the spiders were not carried away by such strong-winged insects as the dragonfly and the large butterfly *Papilio asterias*. which so greatly surpass them in size and strength.

The habit of resorting to flowers to capture anthophilous insects and the protective resemblance of coloration must have been acquired by the Thomisidæ in comparatively recent times—that is, since the evolution of flowers and the development of anthophily among insects. The new habit would seem to be the result of observation and experience.

For the determination of the species of *Misumena* I am indebted to Mr. J. H. Emerton.

NOTES ON *ITHYTRICHIA CONFUSA* MORTON.*

BY J. T. LLOYD, ITHACA, N. Y.

To the family Hydroptilidæ, the most minute of all Trichoptera, belong the most oddly formed larvæ of the order. *Ithytrichia lamellaris*, of Europe, with flat form and laterally extended abdominal segments, and the more common types with swollen abdomens are noticeable departures from the usual cylindrical form of Trichopterous larvæ. The species under discussion, *Ithytrichia confusa* Morton, kindly determined for me by Mr. Kenneth Morton, belongs to the class with swollen abdomens, but carries the peculiarity to the greatest extreme. So much enlarged is the abdomen that the creature, if removed from its case and placed on its back, is unable to aright itself, and only under the most favourable conditions of still water can it, with its comparatively feeble thorax and legs, drag its great abdomen slowly about. In spite of its helplessness when removed from its case, the specialized case-building habits of the species adapt it to life in swift water. Its habits and life-history are described more in detail on the following pages.

Habitat.—In December, 1911, my attention was called to small ovals of silk which were abundant, tightly cemented to rocks in swift water of Cascadilla Creek on the Cornell Campus. Examination proved that these cases contained the peculiar larvæ which later proved to be *I. confusa*. At the time of their discovery the cases were all securely fastened to the stones, occurring, apparently, in equal abundance on top, sides, and, when space allowed, on the bottoms of their supports. At this time the creek was at its winter level, which it had assumed two or three months earlier, with the coming of the fall rains. The water was several inches higher than its usual summer level, when rocks and boulders everywhere protrude from the surface and one can almost step across its breadth. In spite of the facts that the water was much higher than when the eggs were deposited (the adults emerge in May) and that the cases, as we know them, are not portable, they were often found at slight depth, on rocks that had previously been completely above water and exposed to the intense glare of

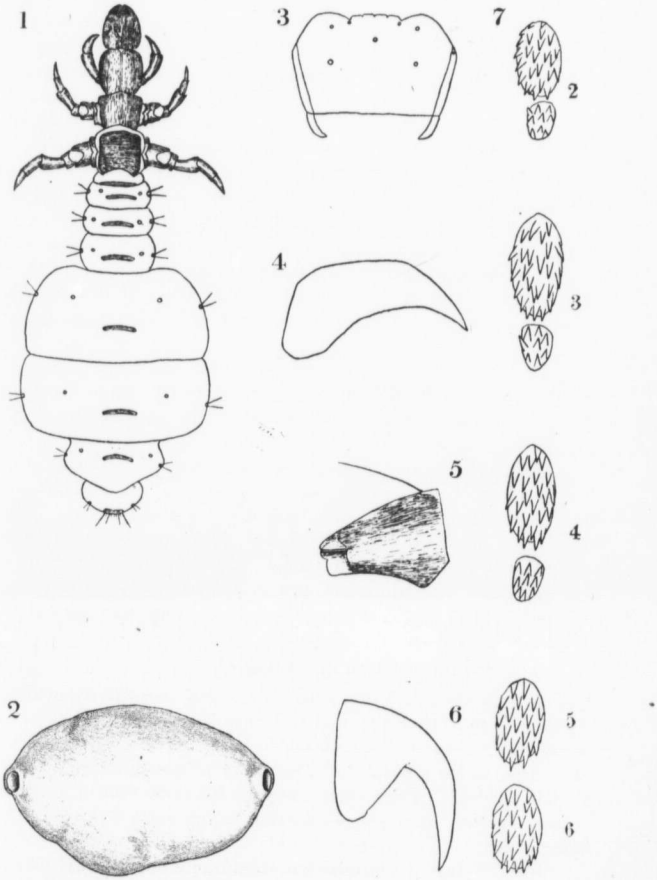
*Contribution from the Limnological Laboratory of the Department of Entomology in Cornell University.

the summer sun. Later, when the creek went down in the spring, hundreds of larvæ were unable to follow the receding water and perished of desiccation. Though we do not know the early larval stages, the facts accounted indicate that its form and habits and case must be very different from those of the mature larva. The sluggish form that is known is incapable of locomotion, and the case, with open bottom and tightly cemented periphery, is incapable of transportation, even in following the few inches of fluctuation of the creek. Yet some get to levels which during their early life were exposed to the air; then perish because evident later modifications make them unable to follow the receding water.

Not only do many larvæ die on account of desiccation, but in the spring quantities of larvæ, as well as pupæ, also perish from some other cause. Until the latter part of April the larvæ all seemed healthy; then great numbers of them died and decomposed in their cases. On the 1st of May 132 cases were examined. Of these 15 contained living larvæ, 9 cases were empty and 108 contained Chironomid larvæ. Apparently the Chironomids, the most abundant insects in the stream, had found the cases already empty or occupied only by the corpses of their previous occupants. It seems probable that this high mortality was brought about by the spring growth of algæ and deposits of silt smothering the Trichoptera to death, for larvæ and pupæ on the clean under surfaces of rocks, or in places free from deposits, lived to reach maturity.

In the spring of 1914 there were very few *I. confusa* in the stream—indeed, the entire Trichoptera population of all species was far below its normal numbers.

Larval Case.—The larval case, fig. 2, is from 5—6 mm. long and 2½—3 mm. wide. Its height above its support is barely enough to accommodate its occupant. In breadth, however, the occupant is more than amply provided for, having an abundance of room to turn around while completely within its case. At each end of the case there is a circular opening not exceeding ½ mm. in diameter. These openings sometimes are at the ends of short tubular projections of the case. In structure the upper surface of the case is composed entirely of closely woven silk cemented tightly along the edges to its support. There is no floor between the larva and the rock.



ITHYTRICHIA CONFUSA MORTON.

Larval habits.—Within its case, with openings less than ½ mm. in diameter, the larva, fig. 1, measuring three mm. in breadth at its 5th abdominal segment, is held a prisoner, unable to move from place to place or to escape. In the stream we were never able to detect any activity on the part of the larvae, nor to see any part of its protruding from its case. In the laboratory, however, though the larvæ remained concealed within their cases during the day, they fed actively at night, protruding the long thorax and first four abdominal segments from one opening of the case, swinging them slowly from side to side while scraping the rock with their mandibles; then withdrawing into the case, only to appear and repeat the procedure from the other end.

When at rest in the case, the long neck-like thorax and abdominal segments are looped back, reaching to about the caudal extreme of the abdomen.

Larval Food.—The stomachs examined contained the algæ, mostly diatoms, which form the ooze on the rocks where the larvæ live—Meridion, Gomphonema, Synedra, etc., and a few undeterminable fragments of Chlorophyceæ.

Pupal Habits.—In preparation for pupation the larva plugs the openings of its case with thick, unperforated, silk, and between itself and the rock spins a thin loose maze of silken threads. The first pupæ appeared about the first of May, and by the 12th of May almost all had pupated, though a few prepupa still remained. On May 21st two adults emerged in captivity. When emerging the pupa cuts a jagged, irregular hole in the top, near one end, of the case through which it escapes.

Description of Larva and Pupa.

Larva.—Length 5 mm. Breadth of 3rd thoracic segment ½ mm., 5th and 6th abdominal segments 3 mm. each. Colour of fleshy portions in life, brilliant bluish green, except the two swollen segments, which are duller. The colour is apparently due to fat within the body, which shows through the body-wall in irregular masses, giving an uneven coloration when viewed through the microscope.

Head.—Heavily chitinized and uniformly dark brown, except the labium and maxillæ and an ill-defined ring around each eye, which are lighter. The frons, as an area, shows rather distinctly

in intense light but its suture, even in caustic potash mounts, is not apparent.

Thorax.—A heavy chitinous plate on the dorsal side of each segment and a narrow semicircular piece of heavy chitin above each coxa; the ventral surface is weakly chitinized; the legs are robust and heavily chitinized; there is a well-developed tooth at the base of each tarsal claw.

Abdomen.—A chitinous plate, fig. 1, on the dorsum of each segment, the plate on the first segment is broader than those of the succeeding segments, the plate on the last segment (not apparent in the illustration due to the curling of the abdomen) covers the entire top of the segment, extending shelf-like over the last segment, each plate is armed with several small setæ; the 5th segment has a collar-like projection to which the 4th segment is joined, this projection may be telescoped, as in fig 1, or protruded, in the latter position it may easily be mistaken for a distinct segment, but may be distinguished by the absence of a chitinous plate; on each side of the median line on each segment except the last two and apparently the first there is a small circular spot bearing two setæ, a similar spot occurs on each side of the same segments, and also on the next to the last segment.

Pupa.—Length 3½ mm.; the antennæ extend back to the caudal margin of the 3rd abdominal segment; each mandible (fig. 4) is connected on its outer margin by two chitinous rods which run obliquely back toward the eye; behind the base of each antennæ there is a semicircular brown mark; the first two thoracic segments bear plate-like marks above; the third thoracic and 1st abdominal segments are marked dorsally by a few narrow, apparently chitinous, lines; the last segment lacks appendages.

Explanation of Plate III.

Fig. 1—*Ithytrichia confusa*, larva, dorsum.
Fig. 2—*Ithytrichia confusa*, larva, case.
Fig. 3—*Ithytrichia confusa*, larva, labrum.
Fig. 4—*Ithytrichia confusa*, pupa, mandible.
Fig. 5—*Ithytrichia confusa*, larva, mandible.
Fig. 6—*Ityhtrichia confusa*, larva, drag-hook.
Fig. 7—*Ithytrichia confusa*, pupa, chitinous plates of abdomen.

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from Page 42.)

635. **Mamestra carbonifera** Hamps.—(Can. Ent. XL, 104, March, 1908, Miselia.) Described from two females taken on Wilcox Pass, Alberta Rockies in 1907, by Mrs. Nicholl. I have a female in my collection taken at treacle on Pine Creek on July 4th, 1904. Mr. Sanson has taken it at Banff on several occasions, having shown me four males, dated July 25th, 1911, or prior, and July 1st and 13th, 1914. It might be taken for a melanic form of *imbrifera*, but lacks the ochreous tints of that species, and has more hairy thoracic vestiture. The male antennæ are minutely serrate-fasciculate, exactly as in *discalis*, with the addition of a short bristle, shorter than in *imbrifera*. Hampson finds *Miselia* Ochs. a prior name for *Polia* Ochs., to which he refers most of our species known under *Mamestra*.

A close ally of this species is *leomegra* Smith from Newfoundland, in which male antennæ are, however, ciliate only.

[636. **M. plicata** Smith?—There is a specimen in the Rutgers College collection taken at High River by Mr. Baird, and dated Sept. 21st, 1907, which seemed distinct from anything known to me in Alberta. It stood near *plicata*, but was spaced apart. It is larger than any *negussa* I have seen from here, and looked to me like a pale specimen of *plicata*. The correct dates, however, for both *negussa* and *plicata* appear to be May.]

637. **M. chunka** Sm.—(Trans. Am. Ent. Soc., XXXVI, 265, Nov., 1910.) Described from three males from Aweme, Man. I have a female in my collection taken at High River by Mr. Baird on May 4th, 1910. Its nearest ally known to me is *crotchii* Grt.

638. **M. lubens** Grt.—High River (Baird), three specimens. Two on April 31st, 1910, on tree trunks, and the other on June 15th, 1914. I have already pointed out that this is distinct from *cristifera*.

639. **M. artesta** Sm.—Two specimens at Dorothy, Red Deer River, July 1st, 1905, flying at dusk, and at High River by Mr.

Baird. Holland's figure under *congermana* appears to be this species.

640. **M. pulverulenta** Smith.—High River, June 16th, 1914 (Baird), one male. Banff (Sanson). Described from Mrs. Fernald's collection as a grey variety of *assimilis*, the reference having been decided by identity in the rather peculiar structure of male genitalia in the two forms. These I have not so far examined, but I feel quite convinced that the two forms are distinct species. In *assimilis* the t. a. line is nearly straight in the sub-median interspace. In *pulverulenta* it is rather deeply crenate. The claviform in *pulverulenta* is both narrower and shorter, and, as a rule, the *orbicular* and *reniform* are smaller. The white patch near the anal angle is usually larger, and there is more white in the s. t. line opposite the cell. A red-brown tinge to the entire ground colour of primaries is not unusual.

No locality is given with the description. In Hampson's Catalogue *pulverulenta* is treated as "ab.1" of *assimilis*, under which specific name only two specimens are listed, a male from Vancouver Island, and a female from Buffalo, N. Y. (Massachusetts in error). Both these specimens are *pulverulenta*, and that from Vancouver Island is figured under *assimilis*. In Vancouver I. specimens the grey overlay is usually very slight. The most intensely black specimens which I have seen are a pair from Tacoma, Washington. The *assimilis* of the Kootenai List is this species.

641. **Barathra curialis** Sm.—Edmonton. A male, rather rubbed, June 17th, 1910. (F. S. Carr.)

[642. **Xylomiges cognata** Sm.—Barnes and McDunnough, in Contr. II, No. 1, pl. vii, fig. 4, figure a male of this species from Calgary. Its occurrence in Alberta is of course possible, but so far I have no authentic record of any Xylomiges from east of the Rockies in Canada besides *dolosa*, with the exception of *tabulata*, which is recorded from Montreal, and is apparently exclusively eastern.]

[643. **X. pulchella** Smith.—In Journ. N. Y. Ent. Soc., XIX, 140, Sept. 1911, Prof. Smith claims to have this species in his

collection from Laggan. Mr. Bean may perhaps have taken it there, and the specimen have come from him. On the whole, the occurrence of a species of this genus at Laggan is more probable than at Calgary.]

644. **Scotogramma submarina** Grt.—Dorothy, Red Deer River, July 1–4, 1905. About eight specimens at snowberry flowers at dusk, by the author and Mr. Arthur Hudson.

645. **S. conjugata** Smith.—Laggan, July 18th, 1907, a fine female at the Chalet lights, by the author. Banff, June 24th, 1912, and July 3rd, 1914 (Sanson.) Hampson figures a Colorado female from the Washington collection. The ochreous shades shown in the figure are non-existent in the specimen.

646. **Anarta richardsoni** Curt.—Wilcox Pass, one male and two females; Mt. Athabasca, three males, 1907. (Mrs. Nicholl.) The specimens are in the British Museum.

647. **A. secedens** Walk.—Banff, July 25th, 1911, June 20th and 21st, 1912. Five males on electric light poles (Sanson). I have compared the type, from St. Martin's Falls, Hudson's Bay Territory. As I stated in the Entomological Record for 1912, this appears to me better placed in Anarta than in Polia, where Hampson places it. A close ally of this species which occurs in Northern Europe and Asia is *bohemanni* Staud. This differs from *secedens* in having a much narrower black border to the yellow secondaries.

648. **A. impingens** Walk.—Wilcox Pass, and Brobokton Creek, Alberta Rockies, 5 males, 1907. (Mrs. Nicholl). One is in my collection, and the rest in the British Museum. Banff, July 3, 4, 1914, a pair at light (Sanson). Laggan, 6,800 feet, July, in coll. J. B. Smith.

649. **A. cocklei** Dyar.—(Can. Ent. XXXVI, 31, Feb., 1904.) *Homohadena*, Brobokton Creek, 1907, one female (Mrs. Nicholl) in British Museum. Laggan, Aug. 23rd, 6,800 ft., one male in coll. J. B. Smith. The latter specimen stood under *funebris* Hbn., to which Hampson finds *funesta* Payk. a prior name. I noted that the specimen was much like a Labrador specimen there, and darker only than European *funesta* in the same collection. So far, I have

discovered no way of separating *cocklei* and *funesta*, and doubt their distinctness. I have Labrador (Moeschler) specimens in my collection which agree with *funesta* in the British Museum. I have named a Newfoundland specimen *cocklei* for Mr. A. F. Winn. Hampson places both in *Sympistis* Hbn., with others from our list of Anartas having eyes ciliate (i.e., overhung by ciliæ) and not hairy.

650. **A. staudingeri** Auriv.—Brobokton Creek (Mrs. Nicholl), one male, Aug. 13th, 1907, in my collection, and four females in coll. British Museum. Up to the date of Hampson's publication in 1905, this species had not been recorded from North America. In the Staudinger Catalogue *mæschleri* and *staudingeri* are listed as vars. of *leucocycla*. Sir George Hampson makes *mæschleri* a var. of *staudingeri*, and *leucocycla* distinct. *Mæschleri* was described from Labrador, whence I have a specimen so named from Bang Haas, probably of Mœschler's collecting. This is greyer than Greenland *leucocycla*, and has not the yellowish secondaries of that, but otherwise resembles it more closely than it does *staudingeri* from the Alberta Rockies.

651. **Tæniocampa oviduca** Grt.—A male on Pine Creek, June 2nd, 1914.

652. **Pleroma obliquata** Smith.—Banff, April 25th to May 8th, 1910, several specimens on electric light poles (Sanson). Head of Pine Creek, April 22nd, 1911, a male at light (E. R. Brill). The specimens are a darker, bluer grey than a Glenwood Springs, Colo. series in my collection. It was described from Colorado. A Vancouver Island specimen is much like the Alberta captures.

653. **P. conserta** Grt. syn. *apposita* Smith.—Banff (Sanson). I have no record of date. In 41st Rept. Ent. Soc. Ont. for 1910 (p. 11 of the "Record") I recorded *conserta* from Banff, and referred to "a form without the black suffusion, which I believe to be the same species." The latter form was *obliquata*, recorded above. *Conserta* has a black cloud over the greater part of the primaries below the basal streak and median vein, as far as the subterminal line, and extending obliquely to the apex from opposite the cell. In other respects the maculation of *obliquata* and *conserta*

seems practically identical, and an examination of the two forms from Banff led me to believe that they might be forms of one species. I have no Banff *conserta* in my collection, but have two from Vancouver Island. In these the fringe on primaries is cut with white opposite the veins, which is not the case with any of my *obliquata*, and my suggestion was probably wrong.

654. **Calocampa thoracica** Put. Cram.—Common some years in September and October, and again in the spring in April and early May. At light, treacle and sallows. Like most hibernating species, it appears in greater numbers after hibernation than before. I am satisfied that this is a distinct species, and not a variety of *cineritia* as described, and as treated by Sir George Hampson.

Ottolengui, in his "Notes on Calocampa" in Journ. N. Y. Ent. Soc. X, 77, June, 1902, says: "The study of the genitalia disclosed the fact that *thoracica* is not a variety of *cineritia*, as it has been described and listed, but a distinct species. This I am told has been corroborated by breeding, the larval stages of the two being also distinct."

Last spring Mr. Tams procured batches of ova from four or five females of each species. As soon as the eggs turned colour a difference was manifest in each case. The egg of *cineritia* is uniform reddish brown. That of *thoracica* is yellowish white,, with the exception of a spot at the top, and a ring half way between that and the equator, which are reddish-brown. The largest batch of eggs procured of each species was kept, and after hatching the two broods of larvæ were carefully isolated. Both broods were found to feed on several different plants, but seemed to prefer willow. No larval differences whatever could be discovered from first to last. Over thirty imagines were hatched from each brood, and both broods came absolutely pure.

In the imago, the difference is almost entirely one of colour. The ground colour of both may be described as blue-grey, but the grey is far brighter and more silvery in *thoracica*. The yellowish streak from the reniform to the s. t. line is less conspicuous, and the area immediately above it always a brighter grey than in *cineritia*. Perhaps the most easily expressed distinctive character

which I have so far been able to discern lies in the subterminal line. This is brighter and more irregular in *thoracica*, and is thrown more into contrast in fresh specimens by the dark preceding and following shades. But in worn and hibernated specimens contrasts become lost. The black dash before the s. t. line opposite the reniform is slightly heavier and longer in *thoracica*. The reddish costal shades are often of a lovely bright chestnut in fresh specimens. They are far duller in *cineritia*. The thorax is always a trifle grey. But none of these characters are at all obvious, and a student will require to become familiar with the sight of both before being able to distinguish them with certainty. Both occur in Manitoba, but I have not so far received *thoracica* from B. C., where *cineritia*, apparently redescribed by Smith as *mertena*, seems widely distributed. I have *thoracica* also from Glenwood Springs, Colo. I have what I believe to be a very dark, small, subarctic form of this species from Dawson City, Y. T., and have seen an exactly similar form taken by Mr. Sanson at Banff.

Mr. Tams has prepared seven mounts of the genitalia of each species, but we are entirely unable to find any difference between the two as Dr. Ottolengui appears to have done. The harpes are bifurcate, and their form at the tip may be likened to a snake's head with open jaws. The relative length and shape of these jaws varies considerably in the fourteen specimens, but the organs of the two species vary to the same extent.

655. **Rancora solidaginis** Behr.—Banff, May 4th, 1911 (Sanson). A specimen bearing this date was sent to me for naming, and I compared it with the British Museum material, amongst which it agreed with a specimen from Osoyoos, B. C. Holland's figure under *solidaginis* appears to be *albicinerea*, a closely allied but paler form already recorded by me from Alberta. In the Entomological Record for 1912, Mr. Sanson records this species from Banff under date Aug. 20th. The date, if correct, is probably abnormal.

656. **Asteroscopus borealis** Smith.—A male, in perfect condition, taken at rest at Red Deer, about April 24th, 1914, by Mr. F. C. Whitehouse, to whom I am indebted for the specimen.

657. **Orthosia inops** Grt.—A badly worn male, taken near the mouth of Fish Creek on Aug. 27th, 1893, probably at treacle, stood for many years in my collection without a name, until I was at last able to identify it with the help of a Manitoba series, one of which I have compared with the type in the British Museum. I have received a number from Manitoba at different times, mostly from Heath. It appears to be hard to get in good condition. It does not belong properly with *Amathes*, which is the generic term used by Hampson for this and other species standing in our lists under *Orthosia*. It differs from the others in having an abundance of hair-like scales amongst the thoracic vestiture, and in the eyes not being overhung by cilia. I noted this concerning the type, and it is so in my series. It belongs with the *Acronyctinæ* as used by Hampson, and is better placed with *Athetis* than with *Amathes*, though its position there does not satisfy me, as it is of lighter build, and the abdomen has more prominent lateral tufts. It varies considerably in size in the Northwest, my specimens ranging from 24 to 33 mm. In Ent. News, XXIV, 256, June, 1913, I referred *Caradrina insipida* Strecker doubtfully to this species, and must leave the matter to be decided by someone who can compare a specimen with the type of that. *Insipida* appears in Hampson's Catalogue as an unknown species referred doubtfully, and probably wrongly, to *Proxenus* Herr.-Schäff. It was described from Wisconsin. *Inops* came from Kittery Point, Maine.

658. **Nycterophæta luna** Morr.—Three specimens at Dorothy on the Red Deer River, northeast of Gleichen. Two of them at rest on thistle heads after a rain storm, the other feeding on a thistle in sunshine. July 24th to 26th, 1907. I understood Mr. C. G. Garrett to tell me that he had taken this species near Calgary on July 14th, 1906.

659. **Schinia acutilinea** Grt.—A female at the Calgary town lights on Aug. 8th, 1910, by Mr. A. F. Hudson. I know of no other record for Canada.

660. **Dysocnemis borealis** Hampson.—(Cat. Lep. Phal., IV, 24, pl. LV, fig. 6, 1903). Mr. A. F. Hudson took a specimen of

this species on May 7th, 1895. It was one of those specimens retained by Prof. Smith from amongst consignments sent him for naming about that time, and we did not meet with it again for years, it remaining as but a vague memory in our minds until I saw the specimen in Smith's collection on my visit to him, fourteen years later. I then recognized it as this species, of which Mr. Hudson had taken three specimens flying in sunshine at sallow blossoms on April 29th, 1906. He took it again in May, 1912, but it remained for Mr. W. H. T. Tams to take the species in any numbers. That gentleman took from 30 to 40 specimens between May 8th and 24th, 1914, in sunshine, at sallow and bearberry blossoms, and at mud patches in dry weather. Mr. Criddle has taken the species at Treesbank, Manitoba, and Mr. Garrett at Cranbrook, B. C. The type came from St. Martin's Falls, Albany River, Hudson's Bay Territory. It is a worn specimen, and totally lacks the natural beauty of fresh examples. Both t. a. and t. p. lines are present in all the good specimens I have seen, the latter fine, thread-like, blackish, outwardly dentate on the veins, inwardly crenate in the interspaces, and showing up well against the large pale region extending from the orbicular to the terminal border, and from the costa to the inner margin. There is a narrow terminal border in sharp contrast to this pale area. The thorax is dark vinous red, and a faint tinge of this colour pervades the primaries, especially towards the apex. This appears to fade to olivaceous brown in flown specimens.

661. **Melicleptria villosa** Grt.—I have four males and a female taken at Dorothy, on July 25th and 26th, 1907. I erroneously recorded these specimens as *Heliaca diminutiva* in 38th Rept. Ent. Soc. Ont. 1907, p. 122 (1908). The female is larger than any of the males, and has larger pale areas on all wings, and possesses the pale mark in the cell before the orbicular, which is one of the characters distinguishing *persimilis*, but entirely lacks the vinous shades of that species. I took a pair in cop. on the top of a hill near Millarville on July 16th, 1911. In this case the female is slightly the smaller and darker of the two, though the maculation is identical with that of the male. Barnes and McDunnough, in Contr. I, No. 4, p. 39, point out that *villosa* and *persimilis* are distinct. Hampson's figure under *villosa* is of

persimilis type, and Holland's figure under *Heliaca diminutiva* (Pl. XXVII, fig. 56) is also *persimilis*.

662. **Calpe canadensis** Beth.—I enter this record solely on the authority of Dr. Holland, who states in the "Moth Book" that the species ranges as far westward as Alberta. Its occurrence in the province is by no means unlikely, though I never saw an Alberta specimen.

663. **Autographa brassicæ** Riley.—I found a worn female in my house on July 6th, 1905, and took a fine male during the following month. Two fine females were taken at light on Sept. 2nd and 3rd, 1914.

664. **A sansoni** Dod.—(Can. Ent., XLII, 349, Nov., 1910). Described from a single fine male taken at Banff by Mr. Sanson on June 10th, 1910. The type is in the United States National Museum at Washington. Before describing it, I had submitted the specimen to Sir George Hampson, and he has described and figured it in Cat. XIII, 546, pl. CCXXXVIII, fig. 32. Mr. Cockle has recently shown me a worn female taken by him at Kaslo, B. C., on July 1st, 1913.

665. **A. octoscripta** Grt.—Two females on Pine Creek, Aug. 21st, 1903, and Aug. 27th, 1914. Banff, Aug. 1910, one male (Sanson). I have a note to the effect that I have seen a second Banff specimen taken by Mr. Sanson. I referred to this form in my notes under *alias* (Can. Ent. XLV, 191, No. 402). I have no longer any doubt as to the form being *octoscripta*, but still lack the material to decide definitely whether it is really distinct from *alias*. I enter it here as distinct, as I think it may be.

666. **A. selecta** Walk.—High River (Baird). Banff, Aug. 4–19, 1910 (Sanson). On page 12 of the "Record" for 1910 I suggested that *selecta*, with the subterminal line waved, might be distinct from *viridisignata*, the more usual form with it dentate. Sir George Hampson treats *viridisignata* as "ab. 1," giving as a character, besides the dentate line: "the lobe on the outer edge of the stigma rounded." Recent observation has led me to look upon the form as varietal only. The sign varies in colour from

golden to green, and in a female from Hymers, Ont., is distinctly blue.

667. **A. v-alba** Ottol.—Banff, Aug. 19th, 1909. A male on an electric light pole (Sanson). The specimen agrees with Ottolengui's figure of the type in all except the sign, which is more like that in his figure of *surena*, though not nearly as wide. The sign appeared to me to be well within the probable range of variation.

668. **Syngrapha parilis** Hbn.—Mt. Athabasca, Mt. Saskatchewan, and Wilcox Pass, 1907 (Mrs. Nicholl). Two of the specimens from Mt. Saskatchewan are in my collection, and are labelled July 27th, 7,500 ft. Holland's Pl. XXVIII, fig.40 is this species, and not *devergens*.

669. **Abrostola urentis** Gn.—A female at Dorothy, on July 5th, 1905, flying at dusk.

670. **Eustrotia albidula** Gn.—Didsbury, June 11th, 1906 (Garrett).

671. **Conochares acutus** Sm.—(Journ. N. Y. Ent. Soc. XIII, 207, Dec. 1905.) Three specimens, two good males and a worn female, at Dorothy, July 5-8, 1905. They were identified by Smith as *elegantula*, but agree with Barnes and McDunnough's figure of a specimen of *acutus* which has been compared with the type. The species was described from Santa Catalina Mts. and Southern Arizona.

672. **Cirrhobolina deducta** Morr.—A worn female at treacle on a fence-post within a few hundred yards of my house on Pine Creek, on July 8th, 1909. I made repeated visits to the spot again, by both day and night, but never saw another. It is a day-flying species common in parts of the southern states. Mr. Cockle has recorded it from Kaslo, B. C., as well as *mexicana* Behr., of which *deducta* seems to me only a variation. It is possibly only a migrant to Canada.

673. **Syneda perplexa** Hy. Edw.—A fine female at Dorothy, on July 4th, 1905. It is exactly like *perplexa* in my collection from Utah and Arizona, and I identified the species by a Glenwood

Springs, Colo. specimen in the British Museum, named, I think, by Dr. Barnes. I know of no other Canadian record.

674. **Catocala pura** Hulst.—A single fine specimen taken at electric light in the town of Red Deer about Sept. 1st, 1914, by Mr. F. C. Whitehouse. The captor has very generously presented me with the specimen, which agrees with Holland's figure of *pura*. That figure has never been corrected, but I cannot vouch for its accuracy.

675. **Epizeuxis lubricalis** Geyer.—Dorothy, July 23rd, 1907. One female at treacle.

676. **E. æmula** Hbn.—A female, at the same time and place, and also at treacle.

677. **Palthis angulalis** Hbn.—A pair at treacle on Pine Creek, June 26th, 1909. Edmonton, 1914. (D. Mackie.)

678. **Bomolocha chicagonis** Dyar var. *perpallida* Dyar. A female taken at St. Albert, northwest of Edmonton, on July 21st, 1904, by Mr. T. N. Willing, is in my collection, and has been so named by Dr. Dyar himself. *Chicagonis* is brownish grey, and was described in Proc. Ent. Soc. Wash. VI, p. 105, May, 1904, from a single female from Chicago, from Mr. Kwiat. But F. A. Merrick sent me specimens from Milwaukee, Wis., claiming that that was really the type locality. I have a Milwaukee specimen also from Mr. Kwiat. In the same paper the varietal name *perpallida* is applied to a pallid whitish ochreous specimen from Turtle Mts., N. Dak. (A. H. Verril). This is the colour of my specimen.

THYATIRIDÆ.

679. **Euthyatira pudens** Gn.—Two males at light and treacle on Pine Creek, July 13th and 17th, 1914.

NOTODONTIDÆ.

680. **Schizura unicornis** Sm. & Abb.—Several specimens. Pine Creek, end May, 1913, and July 10th, 1914. High River, two specimens, one of them July 29th, 1911 (Baird). The species seems a trifle smaller and less robust here than on Vancouver Island.

681. **Gluphisia severa** Hy. Edw.—Banff, May 26th to June 1st, 1910. Several specimens on electric light poles (Sanson). In the Kootenai List Dr. Dyar treats *severa* as a western race of *lintneri*. *Lintneri* occurs at Calgary, but is rare. I have eight specimens at present under examination, two of them females. Of *severa* I have three males from Kaslo, one from Duncans, V. I., and two and a female from Banff. I have little doubt that they are distinct species. In *lintneri* the coloured shades are ochreous. In *severa* they are pale sienna brown. But the colour seems variable both in shade and degree, and may not always serve to distinguish them. The lines differ in course. A basal transverse line is occasionally present in both. There is also an extra-basal line, about midway between the base and the t. a. In *lintneri* this is sharply outcurved in the submedian interspace.. In *severa* it is slightly waved throughout. The t. a. varies in course in both species, but is directed more obliquely outwards from the costa to the subcostal vein in *severa*. The t. p. line is also more dentate and crenulate in the latter, especially near the inner margin. Structurally, *severa* is rather broader winged, and the scaling and vestiture is rather rougher. In my female *severa*, the antennal pectinations are considerably shorter than in *lintneri*, and lie closer along the shaft, giving at first the impression of a simple antenna.

LIPARIDÆ.

682. **Olene plagiata** Walk.—Banff, Aug. 2nd (Fletcher). The record is taken from Barnes and McDunnough's Contr. II, No. 2, p. 75, on "The Liparid Genus Olene." In that work they point that though *plagiata* Walk. has been quite erroneously used for one species of *Olene* (vide also Can. Ent. XLV, 301, Sept. 1913, No. 447, of this list), through *Acyphas plagiata* Walk. iv, 799, 1855, having been misidentified, yet the name must immediately be reintroduced for another *Olene*, which is *Edema plagiata* Walk. xxxii, 427, 1865, and which stands wrongly in our lists as *Symmerista*. I should judge from their figures that this is very likely the species referred to by me from Banff as *styx* B. & McD., though paler than Vancouver Island specimens (43rd Rept. Ent. Soc. for 1912, 121 (1913). Of this Mr. Sanson took four males, July 21st–25th, 1911. As Messrs. Barnes and McDunnough suggest them-

selves on page 76 of the above-mentioned revision, that *styx* may prove to be only a melanic form of *plagiata*, I have no cause to feel ashamed of my record. It may be as well here to mention that B. & McD. have pronounced *Acyphas plagiata* Walk. to be *Hemerocampa definita* Pack. and not *leucostigma* A. & S., as I at first thought. (Contr. II, No. 5, p. 203, Aug. 1914).

PLATYPTERYGIDÆ.

683. **Eudeilinea herminiata** Gn.—Dorothy, July 5th, 1905. One specimen.

OCCURRENCE OF *EUMERUS* (SYRPHIDÆ) IN CALIFORNIA.

BY W. M. DAVIDSON, U. S. BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

The large Syrphid genus *Eumerus* Meigen is well distributed over the lands of the Eastern Hemisphere, occurring from Britain to Australia. In the Americas there appear to be no indigenous species, but the onion fly (*Eumerus strigatus* Fallen) has been bred from Iris and Amaryllis bulbs in North America. Felt* records that it was reared in New York State from Iris roots found at Saratoga Springs, N. Y., August, 1911. He also states that it has been recorded from Buffalo, N. Y., Connecticut and Brownsville, Texas. During the summer of 1914 I was surprised to find an *Eumerus* on the wing in central California. Ten specimens, of which 8 were males, were secured, the dates and numbers taken being as follows: 1 male at Walnut Creek, Cal., May 25; 1 male at Berkeley, Cal., June 12; 6 males and 2 females at Oakland, Cal., July 26. At Berkeley a few others were observed and at Oakland many more. At both places the flies occurred in gardens flying close to the ground and making short darting flights among the vegetation, thereby reminding one of some of the smaller bees. Professor Bezzi of Turin, Italy, to whom I sent a male, pronounced the specimen very similar to the European *E. tuberculatus* Rondani, which he states is perhaps only a variety of

*Felt, New York State Museum, Report of the State Entomologist, 1911; p. 119.

strigatus Fallen. Mr. F. Knab, of the U. S. National Museum, has pronounced the specimens I submitted to him *strigatus*. It would appear that this European insect has a wide distribution over the United States since it has been taken in the East, South and West. Its habits on the wing are rather similar to those of *Paragus tibialis* Fallen, a common species that superficially resembles the *Eumerus*.

FIELD NOTES AND QUESTIONS.

The Occurrence of Mantis religiosa L. in Canada.

Four specimens of the European Praying Mantis (*Mantis religiosa* L.), taken in Ontario, have been seen by the writer since September, 1914. Three of these were captured in Prince Edward County during the past two seasons, while the fourth was taken some years ago near Simcoe, Norfolk Co. The latter specimen was sent to me for determination by the Rev. Prof. C. J. S. Bethune.

Of the three specimens from Prince Edward County one was taken last year near Picton, and is now in the collection of the Picton Collegiate Institute; a second was taken at Green Point, Sophiasburg Township, about Aug. 15, by Mr. Hugh W. Clark, Assistant Representative of the Dept. of Agriculture, Picton; while the third comes from Carrying Place, and is in the International Collection of Canadian Insects, Ottawa. It was taken by Mr. J. H. Herrington on Oct. 10, 1914.—E. M. W.

Referring to Mr. Bethune's remarks in the January number on "Caterpillars as Weather Prophets," according to Brez in "Flores des Insectophiles, Notes suppl. p. 134," "when a spider spins a long thread, there is a certainty of fine weather for at least ten or twelve days afterward." Of this Kirby had the following to say: "Without going the length of deeming this important enough to regulate the march of armies or the sailing of fleets or of proposing that the first appearance of these barometrical spiders in the spring should be announced by the sound of trumpet, I have reason to believe from my own observations that his statement is in the main accurate and that a very good

idea of the weather may be formed from attending to these creatures."

The above, however, is a conservative forecast compared with the one mentioned by Mr. Bethune.

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INSECT IMPORTATIONS INTO NEW JERSEY DURING THE FALL OF 1914.

Four thousand six hundred and eight parcels of nursery stock were shipped into New Jersey during the past fall, emanating from such countries as Holland, Belgium, United States of Columbia, England, Germany, Japan, Ireland, Denmark, Scotland, Brazil, Trinidad, France, Cuba, Italy, Canal Zone, Central America and Venezuela. Four-fifths of the above quantity came from Holland and Belgium, these two countries being by far the largest exporters into New Jersey. Every year it is customary to find on this stock what might be called standard infestations and the following list which gives the species found last season may be taken as a fair example of what one can expect more or less regularly.

Diaspis boisduvalii on orchids from Belgium and England; *Pseudococcus* sp. on palms and metrosideros from Belgium; *Coccus hesperidum* on bay trees and camellias from Belgium and Germany; *Chrysomphalus dictyospermi* on palms from Belgium, England and Scotland; *Aspidiotus hederæ* on palms, camellias, lapagerias from Belgium, Germany, England; *Hemichionaspis aspidistræ* on aspidistra from Belgium; *Chrysomphalus aonidum* on palms from Belgium; *Lepidosaphes ulmi* on apple, boxwood from England and Holland; *Targionia biformis* on orchids from Central America; *Isosoma orchidearum* in orchids from Brazil and Central America; *Notolophus antiqua* eggs on roses from Holland; *Aleyrodes* sp. on azaleas from Belgium, Holland, Germany; *Gracilaria azaleæ* larvæ on azaleas from Belgium; Tingitid eggs on rhododendrons from Belgium, Holland; and *Ceuthophilus* sp. in packing around stock from England.

As is seen, scale insects continue to outnumber all other species. This is undoubtedly due to the ease with which they can be transported and overlooked if present only in small numbers.

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Mailed April 10th, 1915