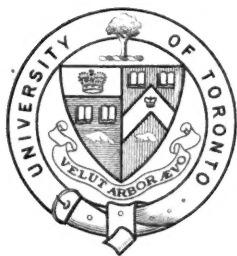


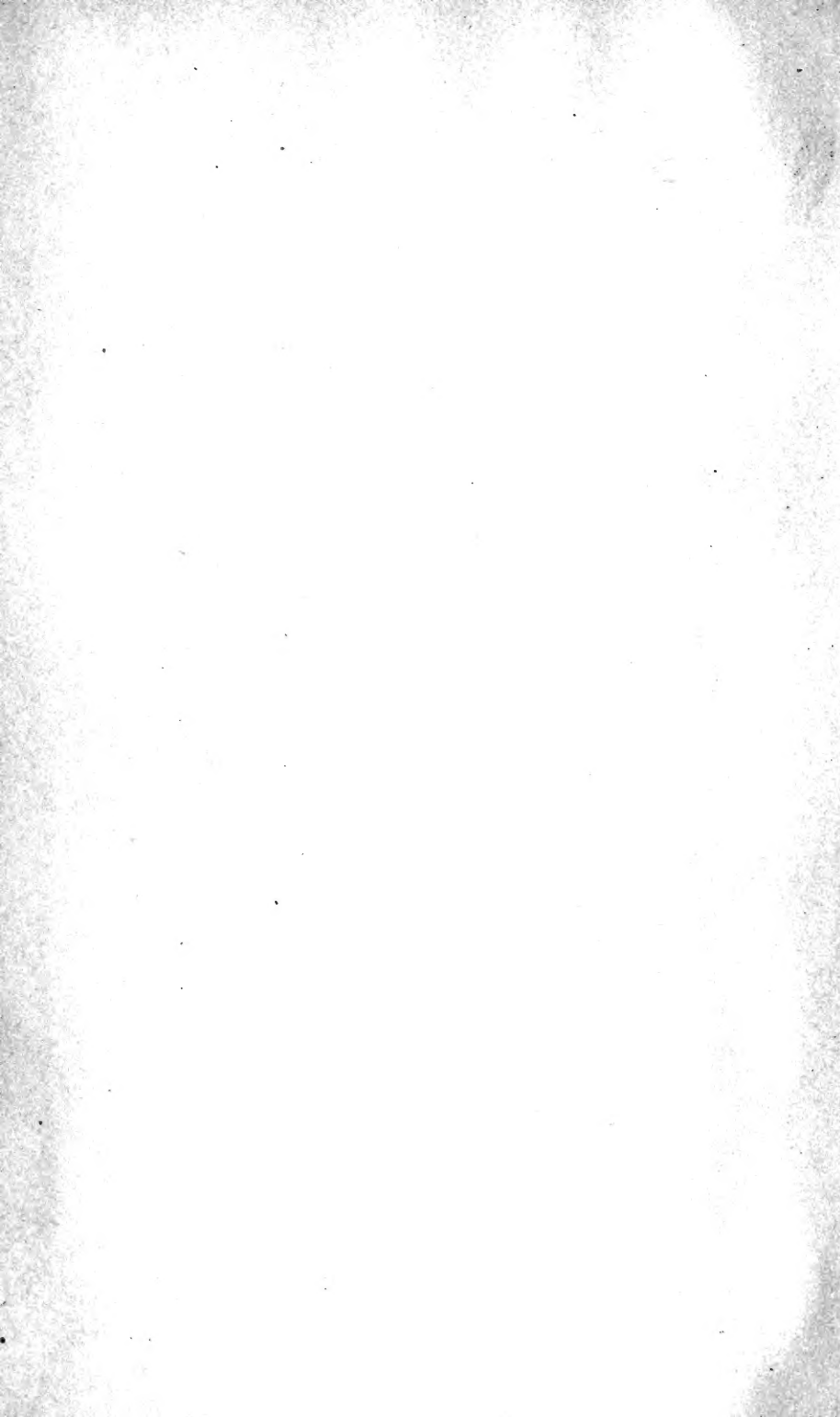


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DR. E. M. WALKER,

Biological Department,
UNIVERSITY OF TORONTO, TORONTO

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LIST OF CONTRIBUTORS TO VOL. XLVI

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No. 1

THE OCCURRENCE OF THE WARBLE FLY *HYPODERMA BOVIS* DE GEER IN CANADA.

BY C. GORDON HEWITT, D.S.C., F.R.S.C., DOMINION ENTOMOLOGIST,
OTTAWA.

In the early writings on the Warble Fly occurring in the United States, the species was constantly referred to as *Hypoderma bovis* of de Geer, which was supposed to be the species common to Europe and North America. Curtice, in 1891, concluded that the American species was *H. lineata* Villiers, and not *H. bovis*, and Riley in the following year (*Insect Life*, Vol. 4, pp. 302-317, 1892) discussed the question fully, and concluded that "the older Ox Bot-fly, *Hypoderma bovis*, hitherto supposed to be a common species of both America and Europe, is in reality either a very rare insect in this country, or possibly does not occur here at all." Aldrich (*Catalogue of North America Diptera*, 1905) states that *bovis* is not positively known from North America.

Subsequent workers on this continent have been accustomed to refer only to *H. lineata* in speaking of the North American species.

Brauer described *H. lineata* Villiers as *H. bonassi* from the larva only, specimens having been obtained in Colorado from the American buffalo. Besides being generally distributed through the United States, according to Riley, it also occurs commonly in Europe. Walker described it from Nova Scotia in 1853 as *Oestrus supplens*.

During the summer of 1912 Dr. Seymour Hadwen, in charge of the Branch Laboratory of the Health of Animals' Branch of the Dominion Department of Agriculture located at Agassiz, B.C., carried out a series of experiments on Warble Flies, and his important contribution to our knowledge of the biology of these insects has now been published (*Bull. No. 16, Health of Animals' Branch Dept. of Agriculture, Ottawa*). Dr. Hadwen made the interesting discovery that the common species of fly under observation was *H. bovis*, and all the full-grown larvæ collected at Agassiz,

B.C., both from local animals and from cattle imported from Eastern Ontario, in the previous December, were also *H. bovis*. Two larvæ collected at Mount Lehman, B.C., proved to be *H. lineata*.

As this discovery of *H. bovis* in Canada was of unusual interest, I examined the specimens of the collection of the Division of Entomology. The genus was represented by four specimens, which appeared to me to be *H. bovis*, but in order to be certain I submitted them to Prof. G. H. Carpenter, of Dublin, Ireland, who kindly examined them, and states that they are all *H. bovis*. These specimens are from the following localities: New Cornwall, (Lunenburg Co.), N.S., 1913; Brockville, Ont., 1913; St. Henri Levis, Que., 1911; and Southern Alberta, 1910. Our collections also contain larvæ of *H. bovis* from East End, Sask., 1913, and of *H. lineata* from Sarnia, Ont.

In view of the fact that *H. bovis* is evidently widely distributed in Canada, occurring, as our records indicate, from the Atlantic to the Pacific, it would appear to be extremely probable that this species occurs with *H. lineata* in the United States. The economic importance of the species renders the state of uncertainty of the presence or absence of this species all the more remarkable, and further investigation would be very desirable. The adults of the species have distinctive characters. *H. lineata* is smaller than *H. bovis*, it has black hairs on the head and on each side of the prothorax is a tuft of whitish hairs; the disc of the thorax is almost bare and striped longitudinally. The hairs on the head of *H. bovis* are yellow and a band of yellow pubescence stretches across the thorax in front. The larvæ are readily distinguishable by means of the spiny cuticular armature. Mr. C. W. Johnson reared *H. bovis* from larvæ obtained in June, 1910, at Manchester, Vt. (*Psyche*, XVII, Dec., 1910, p. 231).

ON THE PREDACEOUS HABITS OF *SCATOPHAGA*: A NEW ENEMY OF *MUSCA DOMESTICA*.

BY C. GORDON HEWITT, D.S.C., F.R.S.C., OTTAWA.

In view of the increasing attention which is now being paid to the character of the prey of certain groups of Diptera, the following notes on the feeding habits of *Scatophaga stercoraria* L. will be of interest, apart from their economic significance. While

it is known that certain of the flies of the family Cordyluridae prey upon insects which they capture, the common yellow coprophilous *S. stercoraria* is not usually regarded, so far as I am aware, as a predaceous insect. Yet the observations recently made and forwarded to me (30 Oct. '13) by Mr. George E. Sanders, in charge of the Dominion Entomological Field Station at Bridgetown, N.S., would indicate that this common species destroys, in the aggregate, no small number of other Diptera, especially Muscid flies, for which it appears to display a preference.

Specimens of *S. stercoraria* were found and taken by Mr. Sanders capturing *Musca domestica* L., *Calliphora erythrocephala* Mg., *Stomoxys calcitrans* L., *Fannia canicularis* L., *Pollenia rudis* Fab., and *Orthellia cornicina* Fab.* After seizing their victims, they wrapped their legs around them and the neck of the victim was then pierced from below by thrusts of the proboscis and sucked for a short time. The body was afterwards turned over and the proboscis inserted between the abdominal segments, in which position the fly continued to feed for a long time. In some cases, for example, *Pollenia rudis*, the victim's head was completely broken off.

S. stercoraria was also seen to capture *Bibio longipes* Loew, and a female of *S. merdaria* Fab. was caught preying upon *Scatops notata* L.

Mr. Sanders reports that *Scatophaga* has been seen catching *Musca domestica* on the porch of a house, and, when observing the flies attracted by the sugar bait at the laboratory, it was a common sight to see *M. domestica* captured by *Scatophaga*. A "yellow fly," probably this species, was reported to him as capturing and eating mosquitoes.

The preference of *Scatophaga* for Muscid flies is noticeable. This may be due to the fact that excrement has an attraction for both prey and victims. *S. stercoraria* breeds in excrement and commonly frequents it; *M. domestica* and certain of its allies have similar habits. The significant fact, however, is that *Scatophaga* preys upon *M. domestica* and other common Muscids, not only when they are visiting excrementous matter, but in other places, and these facts place *Scatophaga* in the category of decidedly useful insects.

*I am indebted to Mr. C. W. Johnson for assistance in determination.

THE CHRYSOMELIANS OF ONTARIO.

BY F. J. A. MORRIS, PETERBORO', ONT.

(Continued from Vol. XLV, p. 392.)

On these same raspberry leaves is often found a small yellow beetle with black thorax ornamented by two white spots; it frequents many other leaves besides, such as basswood and hazel, but it is most abundant on raspberry. It is *Bassareus luteipennis*, the first of seven genera that constitute Tribe VI. These seven genera contain over 100 species, about 50 being found in Ontario. Three of the genera, containing over 35 species, are represented right in this wood. *Bassareus* on the raspberry, *Cryptocephalus quadrimaculatus* (the size of the insect as usual in inverse proportion to its name) on the young shoots of white pine where the needles are soft, and *Pachybrachys* on the willow shrubs at the lower end of the wood. The members of this tribe are small, sometimes minute, and stoutly cylindrical in shape, what we would call "chunky"—indeed, *Pachybrachys* (the Greek for "thick-short") is only a grand name for "chunky." Some of the species of *Cryptocephalus* (which means "hidden head") are very pretty, especially *venustus*, which I have found on the blossom of the meadow-daisy, and *mutabilis* taken on birch and spiraea.

As we walk back to the road that we left at Mose Robinson's, we can collect no less than 5 genera of the next or VIIth Tribe. In the hollow at the north-east of the wood, where the clump of willow and dogwood grows, you will find *Xanthonia* on the leaves of the former and *Adoxus* on those of the latter; the first a small and the second a medium-sized beetle, closely resembling each other in shape and general colour; about the trunk and limbs of that newly-felled pine on the bank, *Glyptoscelis*, a fairly large beetle, metallic brown in colour, but looking lighter from its pubescence; on the common Dogbane (*Apocynum androsaemifolium*) you will find *Chrysochus aureus*, a large dazzlingly brilliant bluish-green beetle; it is said to feed on Indian hemp (*Apocynum cannabinum*) and on Milkweed (*Asclepias*), but I have never found it on any milkweed nor on any other species of Dogbane than the common, sweet-scented species with pinkish blossoms; *Apocynum cannabinum* has greenish-white blossoms and no scent; as the Dogbane is filled with a white milky juice just as abundant as that of the

Milkweed, Blatchley's description may be erroneous; on the dogwood, again, both leaves and blossom, a fifth genus of this tribe (*Colaspis*) is often found.

Returning to the road just east of Robinson's we face east. South of us lie two upland meadows of rough grass, somewhat rocky and covered with hummocks and watery hollows, a favorite place for the Kill-deer plover; here, too, sometimes in the fall is heard the peculiar cry of the Yellowlegs. As I was walking along here, at the end of last April, I heard a strange bird-note—a long, loud whistle, melodious and with something of the plover's plaintiveness about it. After some time I discovered a bird with long narrow wings circling at some height over the meadows, and several times the strange cry was repeated. I brought a friend out with me next week and, with the aid of a field glass, we watched as many as three pairs of the birds feeding, running and flying about these meadows. On alighting, they would raise their wings over their backs till the tips met and then slowly fold them down at the sides, at the same time uttering this long-drawn whistle. The bird I had first heard, however, was certainly calling as it hovered and circled high over the field, and as I stood under it I distinctly saw its neck and wings grow rigid for a moment as it forced the cry out on to the air; it was the Bartramian Sand-piper, and this was its mating call. I had the luck to startle a hen bird off her nest of eggs early in May quite near the fence that we are going along. Once the eggs are laid the birds become very shy and can rarely be approached. But in the mating season they seem fairly tame and we watched one settle twice on the top of a fence-post just north of where we are now, within stone's throw of a farmhouse. I was standing in the roadway at the time and my friend was at the snake-fence, his foot on the bottom rail and his field glasses resting on the top, when I noticed a weasel running along the bottom rail in our direction; it showed not the slightest fear and never hesitated, but, advancing steadily, stepped right over my friend's foot; in its teeth it held by the nape of the neck, limp and lifeless, a large field-mouse, doubtless the family dinner. These creatures are very bold and show the utmost unconcern of human beings. I remember being stopped some years ago by a section boss on the railway, who asked to show me a nest under a culvert that his gang had been cleaning out.

"There," he said, disclosing four little blind nestlings, "what's them?" "Why," I said, "they look like weasels." "That's what they are, I reckon," came the answer, "and the mother fought like a good one for nearly an hour to get back to them. We had to drive her off with stones before we could get at work on the culvert."

Along this stretch of road, within the space of a few rods, we shall find no less than 5 genera belonging to Tribe VIII on our list. Under chips of wood by the roadside in the early spring I have frequently found a small beetle, variegated black with yellow brown stripes, called *Prasocuris*; on the common milkweed the large handsomely marked orange and black *Doryphora divi-collis* and on the bittersweet growing over that stone-pile, its cousin *Doryphora decemlineata*, that ubiquitous pest, the Colorado potato-beetle; in the blossom of the dogwood, a small metallic dark green beetle that feeds also on elm leaves, *Plagioderia viridis*; about the knotweed at the wood's margin, the pretty little *Gastroidea poly-goni* with yellow brown thorax and peacock-green elytra; while in the grass, a little further on, I took two specimens of *Lina scripta* as early as the end of April; no doubt hibernated specimens, probably from the willow clump nearby, for that is the favourite food plant of the *Lina scripta*; it is a somewhat variable species, of which I have found two quite distinct forms on the willow—one the normal form at Guelph and the other near Lindsay. There still remains in this tribe a genus that I have so far left unmentioned, the most beautiful of all the family and well worthy of the high compliment (*pace* the economic entomologist) paid it by naturalists—*Chrysomela* (Golden Apple)—or is it an Homeric word, meaning "golden sheep?" from which the tribe gets its name of Chrysomelini or Chrysomela-like beetles, and the whole family its name of Chrysomelidæ; the scions or clan of Chrysomela. This is a most beautiful beetle; the characteristic appearance being roundish-oval in shape and decidedly convex above; head and thorax mostly dark metallic and wing-covers a creamy white, daintily sculptured with metallic greenish or bluish black. It suggests old ivory inlaid with ebony or jet. In the early days of collecting, this was a beetle I coveted more than any other; the species that above all took my fancy being *Chrysomela scalaris*. There was a brother-collector in town whose cases I was continually poring over. But

it was in my second season as a collector that I first had the luck to "strike ile," and it was right on that dogwood bush behind the north fence of our road. I found here several specimens of a *Chrysomela* rather smaller than *scalaris* with greenish-black head and thorax, elytra cream-coloured and finely sculptured and dotted with metallic greenish black; it proved to be *Chrysomela philadelphica*, and a short search among dogwood shrubs yielded me some 50 specimens of the beetle. This was at the end of June, and in July I migrated with all my bug-and-weed paraphernalia to the Rideau Lakes. It wasn't long before I found grazing on basswood leaves, along with walking-stick insects, whole flocks of a small whitish larva, marked with black, somewhat louse-shaped and so strongly resembling the larva of the Potato-beetle that visions of *Chrysomela scalaris* began again to float before my excited imagination and to haunt my dreams. I separated about 15 of the best-grown lambs of the flock and shepherded them home to a domestic fold. But they seemed to scorn captivity and quite obviously pined in their cardboard box. Twice a day I brought them fresh fodder from their native pasture, but they wouldn't browse worth a cent, and I lost one or two with every moult; less than half a dozen reached maturity, and of these two died in pupating. However, three emerged safely and proved the realization of my dream, *Chrysomela scalaris*, all the more lovely in being home-grown. The knowledge that hundreds of these creatures must have matured about basswood trees where I had made my captures drew me out to their feeding grounds again. This time I searched in vain, not a larva could I see on any of the leaves, still less a mature insect, for the full-fed larva in this genus drops to the ground in order to pupate, and though it was the beetle itself that I had found gregarious on the dogwood, there seemed to be no such luck in the case of this species; at the end of two hours I was still empty-handed. It was when I was passing across a stubble-field in the open, from one part of the edge of the wood to another, that I felt something crawling on the back of my neck. Of course, gentlemen, you all know the extraordinary phenomenon of an insect crawling on the back of the neck. No matter how rare it may have been when it first settled, if once you reach with your hand to make a capture it nearly always—well, if you wish for an exact figure, in

ninety-nine cases out of a hundred—it turns into an aculeate hymenopteron and poniards the cord of your neck with that most venomous of stillettos, the wasp sting; in the hundredth case, of course, it simply flies away. I was on the horns of a dilemma: if that creature was *Chrysomela scalaris*, I wanted it badly; on the other hand, I stood good chances of being stung, literally or figuratively, by its proving a wasp or something worthless or making its escape. My embarrassment was worse than that of the Cockney sportsman (as pictured by Punch) when the bird he was aiming at suddenly settled on the middle of his gun-barrel; because, though I am told this would make a very difficult shot, at least the man knew what he was trying to bag. There were big risks, it was a daring shot, but I took it and grabbed the insect as it was pushing down behind the collar of my negligé. An awful moment, while I waited for telegraphic communication from my neck to my inner consciousness of the sensation of five inches of hatpin jabbed viciously into the quick and centre of one's being, that matter-of-fact people call a wasp-sting; but there was no telegram, this was the 100th chance, and sure enough, when I came to examine my capture, it was what I had been looking for—*Chrysomela scalaris*. Where had it come from? I am certain there was none on the basswood; it had simply dropped out of pure cussedness on to my head, I presume, from the sky. Next season I found three more species—one on willows very like *Chr. philadelphica* of the dogwood, but with the front and sides of the thorax margined with cream; I have taken a great many specimens of this beetle in various places, always on the willow; it is *Chr. bigsbyana*. The second new species was a smaller member of the genus called *Chr. elegans*, first found early in the season crawling on railway ties, which are not its food-plant, but afterwards found feeding in abundance on water smartweed about the surface of a stream a couple of miles south-east of here. There is another species of small size closely resembling this, called *Chr. suturalis*. I have never discovered the food plant to which this beetle resorts about Port Hope, but I have twice found a stray specimen on grass blades. One year in August, when I returned from my holidays, I was looking over my friend's collection of Chrysomelas, mentally checking off their food-plants as

my eye roved from species to species; basswood, dogwood, willow, water smartweed and so on, when suddenly my attention was arrested by a whole row of fine specimens of this beetle. "Hullo!" I exclaimed, "where did you get these?" "Oh, on the beach, just a few days ago." In an instant I had registered a silent vow and next morning hastened off to fulfill it in our old stand-by, the North Wood, equipped for the sacrifice with some sandwiches and a cyanide bottle. All the morning I searched beech trees diligently, without success, and all the afternoon the same, and at last went home, weary and footsore, having got nothing but aching eyes and a stiff neck. In the evening I was round again at my friend's collection. "Are you sure that you got those beetles on the beech?" "Oh, yes, and they were in fine condition; in fact, one of them was still alive. I guess a thunderstorm the day before had blown them out over the lake; when I went down, the southeast wind was washing them up on the beach." My beech, with an "e," was his beach with an "a"; he had taken his specimens on the lake shore. Disappointments like these are bound to occur; I have spent days in search among spiræa and hazels which the collectors say are the invariable food of certain species, and so far the result has been an absolute blank.

We will now move east about a mile, past Davison's old chair factory on the Rice Lake Road, up hill, down dale, and up hill again as far as Bethel. Here we turn south down a grass lane to a wood of pine, oak and maple and skirt along the edge of this wood, keeping close to the fence. Notice that sandy knoll in the wood, just west of us, with a large burrow at the top; I was approaching this one day from the south, gathering morels as I went, when I felt that curious sense of being watched that we sometimes have. Looking up, I saw what I took to be a young collie dog, reddish-brown, sharp-faced, staring straight at me; as soon as it saw me look at it, it made a movement that is very characteristic of the collie, dropped flat on the ground, its head couched between the outstretched fore-paws and so lay, alert and watchful; I took a pace or two forward, when suddenly it did what no collie ever did—dived headlong into a sand-burrow and disappeared. It was a puppy, to be sure, about half grown—a young red fox.

A quarter of an hour's walk southeast brings us to our favorite lunching ground—a huge pine tree surrounded by glacial boulders right at the top of a steep slope facing south; for we are on a tableland here, some 300 feet above Lake Ontario, with a magnificent view, east, west and south. This is probably the old shore line of Lake Ontario—indeed, a few miles west there are clear traces of an old beach five or six miles north of the Lake's present boundary. The top of this hypothetical cliff overlooking an ancient Lake Ontario is clearly marked east and west by its fringe of white pine. East of us there must have been a magnificent bay, for the edge of the tableland recedes in a sharp curve for nearly a mile north, and then comes forward again with a sinuous sweep to the east. Out of the two corners of this bay now proceed southwest and southeast two little trout streams whose union half-way down the sloping valley results in Gage's Creek, a stream that meanders along through five or six miles of level farm land and at last reaches the lake just east of Trinity College School.

After lunch we descend the slope to a rough meadow at the foot on the edge of a tamarack swamp. Here we can examine some genera of Tribe IX of Chrysomelians; on the golden-rod, which earlier in the year was badly eaten by the larva of *Trirhabda canadensis*, we see the mature insect—a large soft-winged beetle of a yellowish colour with a black or dark grey line on the outside of its wing covers and a sutural stripe of the same down the centre of the back. Later in the year you will find two species of *Diabrotica*, commonly known as the spotted and the striped kind, respectively, of Squash beetle, their favorite food (especially in the larval state) being cucumber and melon vines. A third genus of this tribe I got two specimens of, on the edge of the swamp south of this meadow, but I only once have found it abundant, and that was in the Algonquin Park, in a marshy bay at the shore of Cache Lake. It is said to be rare, and Blatchley states its food-plant to be Arrow Arum (*Peltandra*). I found hundreds of it, feeding on a small species of the Skull Cap or *Scutellaria*; it is oblong, soft-winged, light yellow-brown in colour, with two black patches on each wing-cover—a small one at the base and a large one near the apex—its name is *Phyllobrotica discoidea*. One more genus is represented here—*Galerucella decora*—on the willow, and *luteola* on elm shoots

at the west end of the meadow; a third species, *nymphaea*, is found on lily-pads; some species are quite a pest, appearing in immense numbers and destroying a great deal of foliage.

We will now walk west, along the north end of Holdsworth's farm, to the road that runs south between Holdsworth's and a farm of John Hume, the Port Hope seedsman. After crossing the road, we come to a little brook; on the water smartweed that grows in this stream I found three or four years ago quite a number of medium-sized black and light-brown striped beetles that worked a new trick on me in methods of escape and with considerable success. I was used to beetles that took to flight suddenly and also to beetles that dropped from their perch on leaf or plant into the tangle of vegetation below, but, except for the small flea beetles of grape-vine, alder, turnip, horseradish, and so on, I was not prepared for jumpers. But this whole Tribe X consists of jumping beetles, and their hind thighs are greatly thickened in consequence. Their name, Halticini, is taken from the genus *Haltica* or Flea Beetle; the name simply means "the jumper." This beetle of the water smartweed is *Disonycha pennsylvanica*. A much larger beetle of the same genus I have found often on willow bushes by the railway near Carmel, 12 miles north of Port Hope, and also at several points in the Algonquin Park; it is light yellow-brown, with a black margin round each wing-cover and a black stripe down the middle of the same; thighs and abdomen orange-coloured; it is *Disonycha caroliniana* and a most active leaper. There is one more genus of these leapers that I have found, said to be uncommon in Ontario; it is a very pretty beetle of fair size, with a close superficial resemblance (in size, shape and colour) to *Chrysomela lunata*: reddish brown all over, this colour, on the elytra, being broken into irregular stripes by narrow wavy lines of yellow. I have found it abundant on the north shore of the Upper Rideau, feeding always on the Fragrant or Canada Sumach. Blatchley describes it as "common on the sumach," but I have never found it on the poison ivy or the stag horn's "only the fragrant sumach, which is a small shrub," about the size of a gooseberry bush, having leaves almost identical with those of the poison ivy-- i. e., divided into three leaflets and slightly toothed on one or both margins; the bark and wood are fragrant, but with a certain pungency, not altogether pleasant.

I shall never forget the time and the place that I first found this beetle—*Blepharida rhois*; for I got that day several treasures—this new beetle, a new fern (the ebony spleenwort), the rock selaginella, a new tree (the red cedar) and a new shrub (the Canada Sumach).

We are now on our way home. First we strike south-west for a couple of miles, through fields and woods; just before we reach the Sowden farm, we pass through some stumps of basswood, round whose base a sheaf of leafy twigs has sprouted. On these leaves I have found a smallish wedge-shaped beetle, reddish-brown in colour, with some small, darker marks on it; its surface is peculiarly striated lengthwise by alternate furrows and ridges. It is called *Odontota rubra*, a leaf miner, feeding between the upper and the under surfaces of leaves and often in the larval stage very abundant on basswood; it is the only representative of Tribe XI known to me.

At the Sowden farm we turn west on the old York coach road from Toronto to Kingston and pass presently through Dale or Bletcher's Corners. Arrived at the railway track, we go south along it to the Iron Bridge over the Ganaraska at the head of Corbett's Pond. Just before we cross, you will notice on the steep embankment to our right hand a great growth of wild convolvulus or Morning Glory. It was here that I first found the *Coptocyclus aurichalcea*, a little tortoise beetle of most marvellous brilliance; it looks, when seen alive on its food-plant, like a dewdrop sparkling in the sunshine and equally iridescent, but this dazzling lustre fades after death to a red gold. It was on the south shore of the lower Rideau that I first met this last tribe of the Chrysomelidæ, the Tortoise beetles. Feeding together on wild convolvulus, meadow rue and one or two other plants by the margin of the lake, I found two sorts of beetle—one large and the other small. There were larvæ, as well as beetles of both kinds, on the same plant and often on the same leaf. They proved to be *Coptocyclus guttata*, a less brilliant beetle than *aurichalcea*, and *Chelymorphism argus*. I took some larvæ and pupæ as well as imagoes home with me and watched them mature. These insects have devised a most extraordinary means of protecting themselves. From the end of the larva's abdomen protrudes what naturalists are pleased to call a forked process; on this miniature rack the creature's moults are spread and converted

into a sort of tarpaulin by liquid excretions; this is then retroverted and dangles over the creature's back like an umbrella. I wonder if any of you ever came across an old book called the "Voyages and Travels of Sir John Mandeville?" This mediaeval De Rougemont, borrowing some of his choicest traveller's tales from Herodotus, Pliny and others, describes a one-legged race of men in Africa who go so fast that (as the author justly observes) it is marvellous. As disuse leads to atrophy, much use produces hypertrophy, and Mandeville declares these one-legged men have developed such enormous feet that in the heat of the day they sit on the sand and hold their foot as a parasol over their head. In my edition of the work there is a woodcut illustrating this description, in which a native is seated on his one haunch (how to balance one's self must be as great a problem with that race as Columbus tackled in the hen's egg) shading himself from the sun with his foot over his head.

Some naturalists think that these larvæ are seeking protection from the sun in spreading this forked process over their back. But it seems more likely that they do it to escape detection by some bird foe for whom they would be a dainty morsel. What makes me think so is that the pupa, too, is protected in a curious way. The full-grown larva pupates attached by some silk thread to the leaf, more or less exposed and helpless, but, as soon as the pupa forms, almost its entire surface turns greyish or bluish white; it looks like a creature that has died and been attacked by fungus-growth of mildew. It so deceived me that I was on the point of throwing specimens away. It was only when I took one between finger and thumb and felt it writhe firmly under my touch that I realised the deception. Doubtless one more case of protective mimicry.

Now, gentlemen, we are nearly home. We skirt the side of Corbett's Pond, where in May you will sometimes find on the mud flats seven or eight species of plover and sandpiper at a time and, passing along Hope Street, turn up a lane near the C. N. R. bridge at Ontario street. This takes us to DeBlaquière street, and one block down brings us to the plantation of young trees sent from Guelph to Trinity College School a few years ago. Here we cross the cricket ground and gain the school, my home for more than twelve years. We have been out all day and walked some 15 miles and I seem to have done a great deal of talking. I only hope I have not wearied you.

AN UNDESIRABLE FOREIGNER ON THE AMERICAN CONTINENT (*CRYPTOCOCCUS FAGI* BAERENS).

BY R. W. BRAUCHER, KENT, OHIO.

The writer received a letter dated Oct. 2, 1913, from Mr. L. G. Vair, the Manager of the Canadian Davey Tree Expert Co., of Montreal, which reads in part as follows: "I am mailing you under separate cover a piece of bark cut from a common beech tree which is covered with what looks to be some form of insect. I hope you will be able to identify it and give its full history and control. If it is an insect, I should think it would be hard to control by spraying. The trouble is noticeable all through the woods in the vicinity of Halifax, N.S., and the whole trunk area will be covered just as the specimen is, as will also most of the limbs. It seems to be killing out the beech trees quite rapidly, and is really a menace which something should be done to exterminate."

The specimen was received in due time, but the writer was unable to find anything like it described in American literature, but on pages 234 and 235 of A. T. Gillanders' "Forest Entomology" he found a good illustration of the specimen sent and a description of the pest and its work.

Specimens were sent to Dr. L. O. Howard for verification of the determination, and he reports under date of Nov. 6, 1913, in part, as follows: "I have referred this material to Mr. Sanford, who is of the opinion that it is the European felt scale (*Cryptococcus fagi* Baerens). So far as I am aware, this is the first report of the occurrence of this coccid in North America, and its presence in Nova Scotia is a surprise to me. Doubtless it has been imported on European stock, and measures should be taken to prevent its becoming widely distributed."

Gillanders (page 235) says: "This insect confines its attacks exclusively to the beech (*Fagus sylvatica*), and, by reason of its whitish appearance, must not be confounded with the various species of *Chermes* (Aphidæ) on larch, silver fir, Weymouth pine, etc. It should also be noted that the 'Copper beech' is all but immune from this insect pest. In fact, I have occasionally seen cases where the copper beech was grafted on the common beech, of the pest appearing fairly thick on the stock or common beech

portion, and the copper beech portion above having only here and there the smallest possible speck on it."

The "copper beech" is probably the purple beech (*Fagus atropurpurea*). *Fagus sylvatica* is the common European beech and the specimen from Nova Scotia is doubtless from the American beech (*Fagus grandifolia* Ehrh.), an entirely new food plant for it. If this is the case and it acts like many of our foreign neighbors when they land on our shores, we may have a serious problem on our hands unless prompt measures are taken for its extermination.

From Mr. Vair's report of the conditions in the woods around Halifax, it would appear that this new pest is taking kindly to its new food and new climate. If it once becomes thoroughly established in our beech woods and thrives as it promises to do, it is impossible to foresee the damage that it may cause.

NOTE ON THE OCCURRENCE OF THE FELTED BEECH
COCCUS *CRYPTOCOCCUS FAGI* (BAERENS)
DOUGL. IN NOVA SCOTIA.

The opportunity which has been afforded me of reading Mr. R. W. Braucher's article on the occurrence of *Cryptococcus fagi* near Halifax, N.S., enables me to correct the impression it might convey that this insect had not been previously found in North America.

In August, 1911, specimens of the Felted Beech Coccus *C. fagi* Baerens were sent to me by Mr. Justice Meagher, of Bedford, N.S., which is near Halifax, and as a result of a careful inquiry, which was immediately made, we found that this Coccid was present on both ornamental and forest beeches in the neighbourhood of Halifax, where it had apparently existed for a number of years. Mr. R. Power, Superintendent of the Public Gardens, Halifax, sent specimens of *C. fagi*, taken from the European Beech (*Fagus sylvatica* L.) in the Halifax Public Gardens in September, 1911, and he informed me that he had known it for the last twenty years, and that he kept it in check on the purple variety, but did not spray the common variety.

While it is possible that the Coccid may have been introduced into Canada a number of years ago on ornamental beeches from England, to which opinion I am inclined, its occurrence in Nova Scotia and possibly New England does not necessarily imply introduction. We may be a little too apt on the discovery in the New

World of an insect described from the Old World, especially when it happens to be restricted in its distribution, to ascribe its presence to artificial introduction, when a more complete study of its geographical distribution might conceivably indicate that it was indigenous. Our native insect fauna is far from well known.

Be that as it may, *Cryptococcus fagi* appears to be well distributed in the Halifax district and its serious effects on its host plant, which it usually kills in England and Europe, where I have had the opportunity in the past of studying its occurrence, renders it desirable that care should be exercised to prevent its spread and efforts made to eradicate it on ornamental trees. Theobald (Reports on Economic Zoology, S. E. Agric. Coll. Wye, England, 1905-1912) gives abundant testimony as to the destructive nature of this insect. As a result of considerable experience he has found the Woburn Wash of Mr. Spencer Pickering the most successful remedial measure. This is made as follows: Soft soap, $\frac{1}{2}$ lb.; paraffin oil (kerosene), 5 pints; caustic soda, $2\frac{1}{2}$ lbs.; water, $9\frac{1}{2}$ gallons. The soap is dissolved in hot water, churn in the oil and when well mixed shake in the soda and churn thoroughly, and bring the quantity up to ten gallons with water. This wash is applied during the winter and two or three applications should be made. An effective summer wash is made from soft soap and paraffin (kerosene). Boil 8 lbs. of soft soap and five gallons of paraffin (kerosene) together, and, while they are boiling, add one pint of cold water and stir the mixture well. On cooling it becomes a jelly, which may be stored in pails or boxes. To use, add 10 lbs. of the jelly to every 30 gallons of water. It has been found that on ornamental trees the best results have been obtained by scraping off the felted masses of Coccids and scrubbing with the paraffin wash.

Owing to our Regulations under the Destructive Insect and Pest Act, it is unlikely that this pest will be introduced on beech trees imported into Canada from Great Britain and other parts of Europe, as all such trees are carefully inspected. Further, I am pleased to say that Prof. Brittain, Provincial Entomologist of Nova Scotia, of the Agricultural College, Truro, N.S., is making a careful investigation of the Halifax outbreak.

19th November, 1913.

C. GORDON HEWITT,
Dominion Entomologist, Ottawa

NOTES ON NORTH AMERICAN SPECIES OF NEPTICULA
WITH DESCRIPTIONS OF NEW SPECIES
(LEPIDOPTERA).

BY ANNETTE F. BRAUN. CINCINNATI, O.

Nepticula cratægifoliella Clemens.

Nepticula cratægifoliella Clemens, Proc. Ent. Soc. Phil., I, 83, 1861; Tin. No. Am., 173, 1872; Dyar, List. N. A. Lep., No. 6194, 1902.

Mines of this species, which Clemens named from mine and larva on *Cratægus parvifolia* Ait., occur at Cincinnati on *Cratægus punctata* Jacq. The mines on this species of *Cratægus* sometimes average about 2 mm. in width during the later portion of the mine, but are more often a little narrower, and the frass line is often rather broad. In other respects they agree well with Clemens' description of the mine. The larva, as Clemens notes, is bright green. The cocoon is

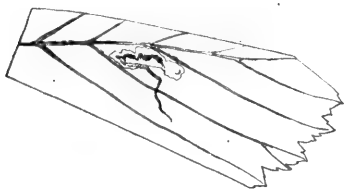


Fig. 1.—Mine of *N. cratægifoliella*

reddish brown, broader at the anterior end, not much depressed. The imago may be described as follows:

Palpi pale ochereous. Tuft ochereous, faintly tinged with red. Antennæ ochereous, partly suffused with fuscous, eye-caps ochereous.

Thorax and fore wings ochereous, the extreme edge of the costa near the base purplish fuscous, and a broad purplish fuscous band at the apex of the wing. Beyond this band the cilia are pale ochereous, giving the appearance of an ochereous apex preceded by a dark band. Cilia opposite the ends of the band concolorous with it. Hind wings and cilia pale grey.

Legs ochereous. Abdomen purplish fuscous above, ochereous beneath.

Expanse: 3.5 mm.

One specimen bred from a mine collected July 8th; the imago appeared July 29th. The mines occur again more abundantly during the last few days of August and the early part of September.

I refer to this species a flown specimen collected by Mr. Fred Marloff, Oak Station, Pa., June 5th, 1910. In this specimen the

eye-caps are yellowish white and the wings expand 4.5 mm. In all other respects it agrees with the bred specimen.

A distinct and very easily recognized species.

***Nepticula latifasciella* Chambers.**

Nepticula latifasciella Chambers, Bull. Geol. Surv. Terr., IV, 106, 1878; Dyar, List N. A. Lep., No. 6200, 1902.

In the description of this species, Chambers notes that it was taken resting on the trunks of chestnut trees, the leaves of which were full of empty *Nepticula* mines.

I have bred a number of specimens on red and scarlet oaks. The mine is a narrow linear tract gradually broadening to its end, where it measures scarcely 1.5 mm. in width. At first the frass is deposited in a broad line through the centre, later scattered across almost the entire breadth and toward the end of the mine collected in a broad band. On red oak, the mine measures approximately 5 cm. in length; on scarlet oak, it is much shorter, often not exceeding 3 cm. The larva is



Fig. 2.—Mine of *N. latifasciella*.

bright green and escapes from the mine through the lower surface of the leaf. Cocoon rough, ovoid and whitish in color. There are at least two (probably four) generations a year. The mines are abundant toward the end of July and at the beginning of September.

***Nepticula trinotata* n. sp.**

Palpi very pale ochereous. Tuft ochereous. Antennæ fuscous, eye-caps whitish. Thorax with deep blue reflections.

Fore wings velvety black, with deep blue reflections in the basal third and somewhat irrorated in the apical third, the scales here having pale bluish iridescent bases. At the basal third on the costa is a white spot of variable size, faintly tinted with violet in some lights. At the apical third there is a costal and an opposite dorsal spot, each larger and of a purer lustrous white colour than the spot at the basal third. The costal spot is usually more oblique,

its tip extending outwardly beyond the opposite dorsal spot. Cilia almost entirely pure white. Hind wings and cilia pale silvery gray.

Legs pale grayish ochereous, tarsal joints dark tipped. Abdomen purplish fuscous above, paler and iridescent beneath in the female.

Expanse: 4.5-5 mm.

Ten specimens bred at Cincinnati, O., from blotch mines on *Hicoria minima* (Marsh.) Britton. The mine is at first an extremely narrow linear tract, later suddenly expanding into a broader tract, 1 mm. or more in width, which in turn becomes a blotch, varying in width from 3 to 6 mm.

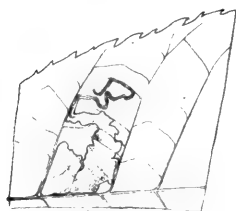


Fig. 3.—Mine of *N. trinotata*.

The mine is almost transparent even in the early linear portion, which thus distinguishes it from that of *N. juglandifoliella* Clemens, on hickory. This is the large blotch mine to which Chambers refers (*Psyche*, III, 66, 1880). The larva is of a dull grayish colour. Cocoon reddish brown.

There are two generations a year, the mines of the first appearing during the early part of July and producing imagoes during the first week of August. The mines of the second generation may be collected at the beginning of September. Up to this time I have found the mines only on the single species of hickory noted above, and never on *Carya alba*, as Chambers says.

Types in my collection.

***Nepticula flavipedella* n. sp.**

Palpi whitish. Tuft usually dark brown, collar creamy white; in one specimen the tuft is reddish ochereous on the face, brown on the vertex. Antennæ fuscous, eye-caps creamy white. Thorax dark purplish brown.

Fore wings dark purplish brown, somewhat shining, cilia with silvery tips. Hind wings and cilia gray.

Fore legs, except the femora, dark brown; middle legs pale silvery, tarsi yellow; hind legs silvery, tibiæ dark brown, tarsi

yellow. Abdomen dark purplish above, paler beneath in the female.

Expanse: 3.5-4 mm.

Three specimens, Cincinnati, O., two bred from mines on swamp white oak (*Quercus platanoides* (Lam.) Sudw.) the other on pin oak (*Q. palustris* Du Roi.) The mine is a very characteristic linear tract. The egg is placed on the upper side of the leaf and the larva for the first few millimeters mines near the upper surface, making a very narrow indistinct mine. Then the mine abruptly enlarges slightly and for a length of 8 or 9 mm. the leaf substance

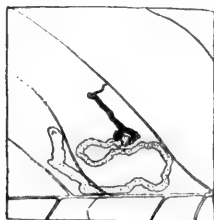


Fig. 4.—Mine of
N. flavipedella.

is entirely consumed and the mine rendered transparent. Then follows another enlargement, and the mine, often much contorted, increases very gradually in breadth to the end, where it measures 2 mm. across. This latter portion of the mine is not transparent. The frass is sprinkled in separate grains across the entire breadth of the mine. The accom-

panying figure shows the appearance of the mine when held toward the light. While most commonly found on pin and swamp white oak, the mine occasionally occurs on red and scarlet oaks. There are three generations a year: mines can be collected during early June, the latter half of July, and the early part of September. The larva is usually green, occasionally purplish and escapes from the mine through the lower surface of the leaf. The cocoon is almost white, woven of coarse rough silk.

The moths are almost indistinguishable from specimens of *N. castaneafoliella* Chambers; the only constant difference I have found to separate them is the yellow colour of the middle and hind tarsi of *N. flavipede'la* in contrast with the sordid white tarsi of *N. castaneafoliella*.

Types in my collection.

Nepticula chalybeia n. sp.

Palpi grayish ochereous. Tuft ochereous, collar yellowish white. Antennæ fuscous, eye-caps yellowish white. Thorax steel-gray.

Fore wings very narrow, steel-gray, with faint greenish golden reflections, the apex very slightly tinged with purple. Cilia gray, purple tinged around the apex. Hind wings gray.

Legs gray, tarsi ochreous. Abdomen dark gray, with a purplish luster.

Expanse: 3.5 mm.

Two specimens bred from mines on wild pear, *Pyrus communis* L., at Cincinnati, O. The mine is a short linear tract, brownish green in colour, not exceeding 2 cm. in length and gradually increasing in breadth to the end, where it measures 1.5 to 2 mm. across. The cocoon is small, obovoid and greenish brown. There are three generations a year, and mines may be collected in the early part of June, in July and during the last part of August.

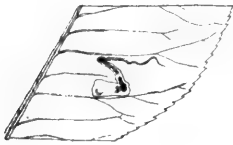


Fig. 5.—Mine of *N. chalybeia*.

Its general pale colour, narrow wings and small size easily distinguish this species from *N. pomivorella* Pack. which mines leaves of apple.

Types in my collection.

Nepticula apicialbella Chambers

Nepticula apicialbella Chambers, Can. Ent., V. 127, 1873; Cin. Quart. Jn. Sci., II, 118, 1875; Dyar, List N. A. Lep., No. 6185. 1902.

Syn. *leucostigma* Braun, Jn. Cin. Soc. Nat. Hist., XXI, 88, 1912.

A larger series, among them a flown specimen in which the white scales at the extreme apex are lacking, and merely the apical cilia are white, establishes the synonymy above given. *Apicialbella* was described from flown specimens. This is the only species I have seen with the oblique fascia.

Nepticula altella n. sp.

Palpi silvery gray. Tuft rust red, a little yellowish behind. Antennæ fuscous, eye-caps yellowish white. Thorax dark purplish brown.

Fore wings before the fascia purple brown, beyond it deep golden brown with purple reflections; the general colour to the naked eye is deep purple before the fascia and brown beyond it. A silvery fascia crosses the wing at three-fifths, and is usually a little broader on the margins of the wings. Cilia gray. Hind wings deep purple, becoming brown toward the tip.

Legs fuscous, tarsi of the middle and hind pair silvery. Abdomen purplish brown.

Expanse: 6.5-7 mm.

Described from three specimens bred on pin oak, *Quercus palustris* Du Roi and nine captured specimens, all from Cincinnati.

The mine is placed on the lower side of the leaf and is very much contorted, winding back and forth, the bends almost con-



Fig 6.—Mine of *N. altella*.

tiguous, and the frass is deposited across the entire breadth of the mine. In its early portion, the mine is scarcely visible on the upper side of the leaf, except as a slight discoloration, later it becomes more distinct, because of the partially eaten parenchyma. The mine is extremely long, but measures only 1 to 1.5 mm. in width at its end. The accompanying illustration

shows the mine as it appears when held toward the light; its distinctness has been somewhat exaggerated in the drawing in order to show its course. Cocoon dark brown, somewhat flattened, with projecting edges.

The mines were collected October 13th and produced imagoes the following May; the flown specimens were also taken in May. The species appears to be single brooded.

Types in my collection.

***Nepticula opulifoliella* n. sp.**

Palpi grayish ochereous. Tuft reddish ochereous, collar sometimes pale yellowish. Antennæ fuscous, eye-caps pale shining yellowish. Thorax dark fuscous, with purple and blue reflections.

Fore wings dark fuscous with pronounced purple and blue reflections, shading to bronzy green below the fold. At three-fifths is a broad very shining silvery fascia with faint golden lustre. Cilia gray, extreme tips pearly white. Hind wings and cilia gray.

Legs dark fuscous, except the middle pair, which are silvery. Abdomen purplish fuscous above, paler beneath in the female.

Expanse: 3.5 mm.

Eleven specimens bred from mines on *Opulaster* (*Opulaster opulifolius* (L.) Kuntze) at Cincinnati. The mine is a narrow linear brown tract with a dark line of frass running through it. The cocoon is reddish brown, its anterior end broader and flattened. On July 13th the larvæ were nearly full-fed, and all pupated within a few days. The imagoes appeared July 29th to August 4th.



Fig. 7.—Mine of *N. opulifoliella*.

This species resembles *N. rosa-foliella* Clemens, but differs from it in the smaller size, the narrower more lustrous fore wings and the much broader fascia.

Types in my collection.

***Nepticula terminella* n. sp.**

Palpi dull, pale ochreous gray. Tuft on the face dull brownish, on the vertex and head black. Antennæ gray, eye-caps shining white, with a very faint yellow tinge. Thorax bronzy.

Costal half of the fore wing to the fascia, blue-purple, the blue predominating at the extreme edge; below the costa the wing shades into a deep brilliant golden color, becoming more bronzy as it nears the fascia. The fascia is situated just beyond the middle of the wing, is almost straight and has a brilliant silvery lustre. Apical third of the wing blue purple, blue predominating. Just below the apex a double row of silvery scales margins the termen, becoming a single row toward the dorsum and sometimes connected with the fascia. Cilia gray. Hind wings and cilia gray, with a purple tinge.

Legs dark gray, tibiae and tarsi of the fore pair and tarsi of the others, ochereous. Abdomen dark purplish gray above, yellowish beneath toward the tip, anal tuft yellow.

Expanse: 5-5.5 mm.

Twenty-two specimens bred from mines on red oak (*Quercus rubra* L.) Cincinnati, O.; one captured specimen, taken at Oak Station, Pa., May 17th, 1910, by Mr. Fred Marloff.

The mine is a pale greenish gradually broadening linear tract, 3.5 mm. wide at the end, with a blackish line of frass through the centre. Larva yellow even when very young; thus this mine can early be distinguished from the other linear mines on oak. Cocoon brownish ochereous, obovoid.

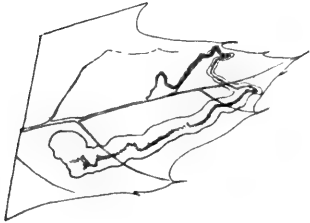


Fig. 8.—Mine of *N. terminella*.

There are three generations a year, and, in favourable seasons, a fourth. Mines containing full-grown larvæ may be collected in the middle of June, the latter part of July, the end of August and beginning of September, and during

the latter part of October up to as late as the ninth of November, producing imagoes during the summer within two weeks after pupation. The mines occur most commonly on red oak, but also on pinoak (*Q. palustris* Du Roi) on black oak (*Q. velutina* Lam.) and on *Q. marylandica* Muench.

A cotype in Mr. Marloff's collection.

NEW AMERICAN CHRYSOPIDÆ.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

The following five new species of Chrysopidæ are among recent additions to my collection from Central and South America. Of particular interest is the *Nothochrysa*, which is quite different from the other species of the genus from South America and more allied to our Californian one.

Chrysopa rufolinea, n. sp.

Yellowish green, a sinuate band of reddish below antennæ, and one across base of the clypeus, a red spot on the cheek, a red line

from base of antennæ up on to the vertex following a groove near the eye; antennæ pale, unmarked; pronotum with a faint dark mark on each side; thorax, legs and the abdomen unmarked. Wings with pale venation, costals partly obscured, gradates hardly infuscate, stigma greenish. Pronotum very broad, nearly twice as broad behind as long, narrowed in front. Wings long and slender, acute at tips, divisory veinlet ends much beyond the cross-vein, gradates very close together, the inner series very much nearer outer than to the radial sector, five or six in inner row, eight or nine in outer; marginal forks two and a half times as long as broad; second cubital cell much narrower at tip than the third at base. In hind wings five inner and eight outer gradates. Expanse 30 mm. From Cali, Colombia, 1000 m (Fassl).

***Chrysopa sarta*, n. sp.**

Yellowish green; no marks on head nor palpi; basal joint of antennæ yellowish, with black outer streak, rest of antennæ (including second joint) black, but getting paler towards tip, pronotum pale, with red marginal stripe; rest of thorax, legs, and the abdomen pale, unmarked. Wings hyaline, unmarked, venation greenish, most cross-veins wholly black, but some costals near stigma are pale, gradates black, and some veins running into hind margin also black; origin of the radial sector black; stigma scarcely distinct; hind wings with veins all pale greenish. Pronotum about as long as broad, not much narrowed in front. Wings moderately slender, acute at tips, fore wings with divisory veinlet ending beyond the cross-vein, second cubital cell much narrower than the third; five inner, seven outer gradates, each much separated from the next, inner series as close to radial sector as to outer series; marginal forks about three times as long as broad; hind wings with four inner and six outer gradates. Expanse 26 mm.

From Orosi, Costa Rica, 500 m. (Garlepp).

***Chrysopa leptana*, n. sp.**

Head reddish yellow; maxillary palpi with last two joints black; basal joint of antennæ yellowish, rest (including the second joint) black; pronotum green, rest of thorax green, with pale spots above base of wings; legs and abdomen greenish, unmarked. Wings hyaline; venation green, cross-veins, gradates, many branches

ending in hind margin, divisory veinlet, base of radial sector, upper side of second cubital cell partly, and bases of branches of radial sector black. Hind wings with costals and some other cross-veins partly black; stigma in both wings long, deep green. Pronotum much broader than long, narrowed in front. Wings not very broad, acute at tips, two or three inner gradates, four or five outer ones, inner series much nearer to outer than to radial sector; marginal forks hardly twice as long as broad; divisory veinlet ends beyond the cross-vein; second cubital cell much narrower than the third. Expanse 24 mm.

From Oaxaca, Mexico (Crawford).

***Leucochrysa luctuosa*, n. sp.**

Face with large spot on clypeus and triangular spot under each antenna reddish, vertex with an irregular red stripe each side; palpi unmarked; basal joint of antennæ with broad red stripe on outer side, about 20 of next joints with black on inner side; pronotum with red stripe on each side (not marginal) more approximate behind the furrow; thorax with red spots each side in front, two on each scutellum, and mark over base of hind wings; basal abdominal segments with red mark each side. Wings with greenish venation, base of radial sector and a portion toward stigma with its branches each side partly black; many costals at margin black, two or three radial cross-veins near base are black in middle; the base of second cubital cell, and part of third, and a few anals near by are black; gradates pale; hind wings with radial sector black near stigma, not at base, outer hind margin blackish for a long distance; stigma in both pairs black at base. In fore wings the inner gradates extend basally, so there are about 15 or 16 of them, 12 in the outer series, the two series farther apart in middle than at either end; radial sector sinuous.

Expanse 5.7 mm.

From Orosi, Costa Rica and Rio Longo, Bolivia (Fassl), Related to *L. azevedoi* Navas (which I have from British Guiana) but much larger, and various minor marks different.

***Nothochrysa tibialis*, n. sp.**

Head yellow, a black streak under eyes, two large black or dark brown longitudinal marks on the vertex; palpi marked with dark; basal joint of antennæ wholly shining dark brown above,

rest of antennæ beyond blackish, but paler towards tips; pronotum with a broad lateral black stripe, almost connected across the furrow; thorax with a broad black stripe over base of wings, anterior edge of mesothorax black; abdomen with a blackish stripe each side above, nearly connected at the tips of the segments; pleura with two black spots; legs pale, tibiæ I and II with a dark mark on outer base. Wings with almost wholly dark brown venation, the subcosta pale, and parts of median, the cubitus and anals at base also pale; hind wings with mostly pale venation, the costals, veins ending in hind margin, and base of radial cross-veins black; stigma narrow, yellow-brown, not distinct. Pronotum a little longer than broad, slightly narrowed in front; wings moderately broad, rounded at tips, the divisory veinlet ends in end-vein of cell, but near its upper end, so that the divisory cell is much broader at base than at tip, six gradates in each series, each gradate widely separated from the next, the inner series much nearer to radial sector than to outer row; the outer marginal forks mostly three times as long as broad; costal area quite broad; in hind wings five or six inner gradates and six outer ones. Expanse 27 mm.

From Rio Longo, Bolivia, 750 m. (Fassl).

ON THE SYNONYMY OF CERTAIN FLORIDA LEPIDOPTERA.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In the August number of *Insecutor Inscitiæ Menstruus*, Dr. Dyar has justified the title of his publication and subjected a recent papers of ours on "Some Apparently New Florida Species."* to a grilling calculated to prevent less enthusiastic entomologists than ourselves from ever again obtruding themselves on the notice of the long-suffering entomological public.

It is not the purpose of this article to justify the causes that led to the article in question; this, if necessary, can be left to other competent individuals; we would merely in the following notes give our own views on the points of synonymy as laid down by Dr. Dyar, for we fear that in several instances his desire to swell the list of synonyms has led him to be a little hasty in his judgment.

*Contributions, Vol. II, part 4, 1913.

C. obliquata B. & McD.

Dr. Dyar is correct in making this a synonym of *laguncularia* Dyar. We overlooked the branching of vein 8 close to the apex of the wing in our examination of the single type specimen.

Acidaliodes eoides B. & McD.

This is not *Pseudcraspedia basipunctaria* Wlk. As stated in our article, the venation is that of *Acidaliodes*; i.e., vein 7 is free and veins 8, 9, 10 and 11 of primaries are stalked, and not 7, 8, 9, 10 stalked with 11 free as in *Pseudcraspedia*. We have four specimens from Stemper, Fla., which agree in venation with Hampson's definition, and may be either *basipunctaria* Wlk. or *penumbrata* Hlst., neither of which species we know. There is great superficial likeness between our species and the Stemper specimens, and we are not surprised that Dr. Dyar should have failed to recognize the points of difference especially as Mr. Grossbeck, to the best of our knowledge, had captured no specimens of *eoides*.

Aresia parva B. & McD.

Having no knowledge of exotic *Lithosiidæ*, as Dr. Dyar has been kind enough to state, we naturally fell back on Hampson's "Keys" published in the Cat. Lep. Phal. Brit. Mus. and arrived at the conclusion, rightly or wrongly as the case may be, that we were dealing with a Noctuid; finding in Hampson's work, the latest on the subject, no genus suitable for the occasion, we were rash enough, in our wild haste for publicity, to create the genus *Aresia*, which Dr. Dyar promptly makes a synonym of *Afrida* Mœsch. We regret that the original generic definition is not before us, but if Hampson be correct, we would point out that, in *Aresia*, vein 5 of secondaries is lacking, a mere fold occurring in its place and 8 is only joined to cell at base of wing; whereas in Hampson's venation figure vein 8 is from middle of cell and 5 is present. Dr. Dyar, in his paper on the genus *Afrida*, calls attention to the fact that in his specimens 8 is only joined to cell at base, but makes no mention of vein 5. He neither gives any generic characterization, nor did he have any specimens of the generic type before him. It remains therefore to be proven by examination of specimens of the generic type, *tortriciformis* Mœsch, whether these two genera are synonyms.

Regarding the position, Dr. Dyar himself states in the introduction of his article on *Afrida*: "I think the genus very doubtfully placed in the Lithosiidæ; I should rather think it a noctuid." If an authority like Dr. Dyar, whose knowledge of exotic Lithosiidæ is evidently profound, should be led to such a statement, then surely we may be pardoned for having actually included *Aresia* in the Noctuidæ. We accept Dr. Dyar's reference of *parva* to *ydatodes* Dyar; the specimens mentioned from Brownsville, Texas, in our original description would fall under *minuta* Druce according to Dr. Dyar's paper.

Anomis serrata B. & McD.

We bow before Dr. Dyar's decision and make *serrata* a synonym of *xanthindyma* Bdv. We had based our supposition that we were dealing with a new species on Dr. Dyar's recent paper on Cotton Moths in the January number of his publication, in which, under *Cosmophila erosa*, no mention is made of the two forms of the ♂ antennæ; we had, unfortunately, no means of consulting the publications on exotic species. We are glad that Dr. Dyar's opinion at least coincides with our own as to the specific distinctness of the two forms.

Psychidæ

Dr. Dyar's remarks under this head, and his reference of our species *nigrita* and *pygmæa* as "grass" and "tree-trunk" forms of *Platoeceticus gloveri* Pack., we are not at all prepared to accept. In Europe, where the *Psychidæ* have for years been the subject of special study, the larval cases are recognized as one of the best means of specific identification. We would commend to Dr. Dyar's perusal the introduction to the *Psychidæ* by Dr. Rebel in Spuler's "Schmetterlinge Europas," where, among other things, it is stated "Der Sack ist sehr verschieden gestaltet, immer aber für die Art charakteristisch gebaut and bekleidet, so dass sie sich schon an dem Sack meist erkennen laesst." The sacks of our two species are as different from each other as they well could be; the one (*nigrita*) is broader towards the opening and heavily thatched with minute particles of lichen; neither bears much resemblance to Packard's figure of the sack of *gloveri*, which we also found on orange trees in Florida, but which failed to produce the imago;

these sacks differed in various ways from those found on grass. Regarding the venation, it is a well-known fact that in this family the venation is variable and individuals with extra veins frequently occur, usually one of the median or radial branches being involved; but we query greatly whether the venation be of "no value"; our studies of Psychid venation have been very limited, but when such a worker as Hampson divides this family into three subfamilies (Moths Brit. Ind. Vol. I). *Oeceticinae*, *Psychinae*, and *Chaliinae* on the basis of vein 1b of primaries sending several, one, or no branches to the internal margin, we are apt to regard such work as authoritative; it at least forms a better basis for classification than such a system as Dr. Dyar would apparently have us adopt where all species with black wings are lumped together, regardless of size, larval sack or venation. Hampson's system, as stated in our paper, would throw *Manatha nigrita* into the *Psychinae* and *Prochalia pygmaea* into the *Chaliinae*. With regard to *Platoeceticus* Packard (Ent. Amer. III, 52) distinctly states that the venation of the secondaries is as in *confederata* Grt.; i.e., with vein 6 absent; an examination of a long series of *nigrita* from both Florida and Brownsville, Texas, has failed to show a single specimen in which all the veins on the secondaries were not present; the presence of eight veins can surely then be accepted as the normal condition. This, combined with a marked difference in sack and food plant, would point to a specific distinctness. Dr. Dyar has frequently (*Megalopygidae*, *Phycitinae*) erected new genera based on much weaker characters than the above. His remark, that he has examined five specimens of *carbonaria* and found no two alike in venation, proves nothing unless these five specimens have been bred from similar sacks collected on similar food-plants. If this be not so, then it would only show that the Psychidae of the National Museum are in need of a careful revision. Further, Dr. Dyar is very careful not to state in just what particulars these five specimens differ from one another. We do not know whether the specimens referred to by Dr. Dyar, as collected by Dr. F. M. Jones at Biloxi, Miss., are those described as *Eurycttarus tracyi* (Ent. News 22, 194). In any case, our *nigrita* could not be confounded with this insect, which is much heavier and stouter, besides differing in venation.

Stenoptycha solanis B. & McD.

We reserve our decision as to whether this species is synonymous with *pterophoralis* Wlk. or not, until we have had a chance to compare specimens with Walker's type. Certainly nothing definite can be ascertained from the original description.

Storteria unicolor B. & McD.

Our type, a very fresh specimen, certainly shows long hairs on the median vein of secondaries, and this fact led us to place the genus in the Crambinae. We agree, however, with Dr. Dyar, that the species shows great affinity to *albinella* Cram. and are quite ready to sink the generic term as a synonym of *Rupela* Wlk.

Davisia singularis B. & McD.

We learn from Prof. T. D. Cockerell that the genus *Davisia* is preoccupied by Preston, 1910, for a genus of Mollusks. We, therefore, propose the name *Neodavisia* in its place.

Jocara perseella B. & McD.

Dr. Dyar lists this as a synonym of *incrustalis* Hlst. We might note that Hulst's species was described from a single ♀ from Colorado, a locality where we imagine the Alligator pear (*Persea*) would scarcely occur. The description of the larva of *incrustalis* Hlst. given by Dyar in Proc. U. S. Nat. Mus., 1900, p. 284, gives *Nectandra* and *Persea* as food-plants. This larva is presumably referable to our species, but a careful comparison with Hulst's type will be necessary before one can definitely assume the two names to be synonymous, even in spite of the fact that one of Dyar's bred specimens was identified by Hulst; this gentleman's determinations were often erroneous. It is, of course, possible that the locality label was incorrect.

Tetralopha querciella B. & McD.

The fact that this species is labelled *subcanalis* Wlk. in the Nat. Mus. Collection is not final, as without a direct comparison with the type Walker's species are impossible to identify. Dr. Dyar might at least have given us the benefit of the doubt.

Homoeosoma differtella B. & McD.

We can express no opinion as to whether this species is synonymous with *electella* Hlst. from Texas without a careful examination of the types.

A NEW FOSSIL SAWFLY FROM FLORISSANT, COLORADO.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

During the latter part of August, of the present year, Dr. J. H. Todd and his son, Dr. J. C. Todd made a small collection of fossils in the Miocene shales at Florissant. On looking over the material, I found one new species, which they kindly presented to the Museum of the University of Colorado.

***Tenthredella toddi*, n. sp.**

Length about 8 mm. or a little more (apex of abdomen missing); anterior wing 7 mm.; head and thorax black; abdomen pale (probably green in life), with a dorsal black band which is broad basally, sending a branch on each side to or nearly to the anterior lateral corners of the abdomen, posteriorly rapidly tapering, soon becoming a mere narrow stripe; wings clear, nervures dark; venation as in MacGillivray's figure of *Tenthredella flava* (*Tenthredo flava* Poda) in almost every respect, except that the anal or lanceolate cell of hind wings is petiolate apically (petiole 96 microns long), and the lanceolate cell of anterior wings is joined by the transverse median nervure considerably beyond the middle of the distance from the cross-nervure to the apex. The marginal cell is also decidedly deeper. The following measurements are in microns: *Anterior wing*, depth of stigma, 400; end of stigma to end of marginal cell, 1950; second submarginal cell on marginal, 1025; third submarginal on first marginal, 530; third submarginal on second marginal (beyond cross-nervure of marginal), 400; basal nervure, 530; first discoidal on second, 800, and on third, 640. *Posterior wing*: Depth or width of lanceolate cell in middle, 480.

Among the species described from the Florissant shales, this can only be associated with *Tenthredella submersa* (*Tenthredo submersa* Ckll.), which is about 13 mm. long, and differently coloured. In the present fauna of Colorado, species of this genus differ in the shape of the third submarginal cell; thus *Tenthredella flavomarginis* (*Allantus flavomarginis* Norton) has this cell short, the upper side no longer than the outer; whereas *Tenthredella ferrugineipes* (*Tenthredo ferrugineipes* Cresson) has this cell much longer. In *T. toddi* the cell is of the longer type.

NOTES ON THE POSITIVE HYDROTROPISM OF *GERRIS*
MARGINATUS SAY AND *DINEUTES*
ASSIMILIS AUBE.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

Wingless forms of *Gerris marginatus*, which is quite common throughout New Jersey, when removed from a pond containing some three thousand square feet of water and liberated at distances of one, two, three, four, five, six, seven, eight, and nine yards from the water, immediately made their way back to the water without hesitancy. Of course their movements, which consisted of a series of jumps, were more or less clumsy, but all started in the right direction even though purposely headed the wrong way.

When liberated at a distance of ten yards, they had some slight trouble in getting their bearings, but after making several false starts, finally wound up by going in the direction of the water. At a distance of fifteen yards, a longer time and more moving around were required before the right direction was located. At thirty and forty yards away, they seemed to lose their bearings completely and moved aimlessly about in all directions. Even at the end of an hour they were no nearer the water.

The actions of *Dineutes assimilis*, which is also quite common in New Jersey, were somewhat more interesting. These beetles, when liberated three or four feet from the water, scrambled back with difficulty owing to the character of their legs, which were not meant for locomotion on land.

At nine or ten feet from the water, after trying rather awkwardly to walk back, they rose to a height of ten or twelve feet and flew towards the pond, both with and against a slight breeze. At 75 feet from the water, they walked in all directions and then rose in irregular circles to a height of 30 feet and flew to the pond.

On several occasions, when a brisk wind was blowing from the direction of the water, they were carried inland in spite of heroic attempts to fly against it. When liberated at a quarter of a mile from the water, after an aimless existence on the ground for half a

hour, they rose in irregular widening spirals to a height of fifty feet and flew off in the direction of the water. It is not known whether these specimens ever reached the pond, inasmuch as trees obstructed the view. Nevertheless they started in the correct direction even against a slight breeze.

BOOK NOTICES.

The Natural History of the Toronto Region, Ontario, Canada; published by the Canadian Institute, Toronto, 1913; 419 pp., with several illustrations and maps.

This work which has been prepared for the members of the Twelfth Geological Congress, which recently met in Canada, and for all who may have an interest in the history and natural history of the Toronto district, is a most interesting and valuable contribution. The twenty-two chapters (there are twenty-three, but the last describes briefly localities for excursions) have all been written by specialists. The titles of the chapters will give a splendid idea of the scope of the work. These are: I, Toronto, an Historical and Descriptive Sketch; II, The Indians who formerly Inhabited or Visited the Site of Toronto; III, Geology of the Toronto Region; IV, The Climate of Toronto; V, Life zones; VI, The Seed Plants of Toronto and Vicinity; VII, Ferns and Fern Allies; VIII, Mosses and Liverworts; IX, Mushrooms and other Fungi; X, The Alga; XI, Lichens; XII, Mycetoza, or Slime Moulds; XIII, Insect Galls of the Vicinity of Toronto; XIV, Zoology; XV, Mammals; XVI, Birds; XVII, Reptiles; XVIII, Amphibia; XIX, Fishes; XX, Invertebrates other than Insects and Mollusks; XXI, Mollusca; XXII, Insects and their Allies.

In Chapter XIII Dr. Cosens discusses briefly the various types of galls and follows with lists of gall insects in the various orders. Useful notes are given with each species. Under Hemiptera nine species, are listed, under Lepidoptera four species, under Diptera 12 species under Coleoptera two species, under Hymenoptera 39 species. Dr. E. M. Walker is responsible for Chapter XXII, the largest in the book, comprising pp. 295-403. This chapter, as already mentioned, is devoted to Insects and their Allies. Although the lists presented are by no means complete, as is stated, they are, how-

ever, of extreme value and will, it is hoped, lead to greater zeal in collecting so that many additions may be made. Unfortunately, entomologists are few in Toronto, and comparatively little systematic collecting has been accomplished outside of two or three of the better known orders, and even in these the work has been confined largely to certain families. It is, however, such lists as these which furnish the foundation upon which to build. Altogether 2,448 species are listed, as follows:

Orthoptera.....	61
Dermatoptera.....	1
Plecoptera.....	2
Ephemera.....	12
Odonata.....	60
Hemiptera.....	92
Neuroptera.....	8
Trichoptera.....	5
Coleoptera.....	1076
Lepidoptera.....	619
Hymenoptera.....	263
Diptera.....	249
	2448

At the end of the lists references are given to the more general descriptive works, useful in identification.

ARTHUR GIBSON.

"ENTOMOLOGY WITH REFERENCE TO ITS BIOLOGICAL AND ECONOMIC ASPECTS."

REVIEW OF DR. FOLSOM'S REVISED ENTOMOLOGY.

Dr. Folsom's Entomology is familiar to all students of the subject, holding as it does a place of its own in the field of Entomology. The revised edition, while no larger than the previous editions, presents many new and interesting facts. The Chapter on Evolution has been omitted and one on Transmission of Disease by Insects substituted.

Most text books of Entomology consider it as a subject in itself ignoring its relation to, and dependence upon, the wider

science of Biology. Dr. Folsom, in meeting this want, by presenting the subject primarily from a general biological standpoint, has created an interest for the average student which most text books fail to do.

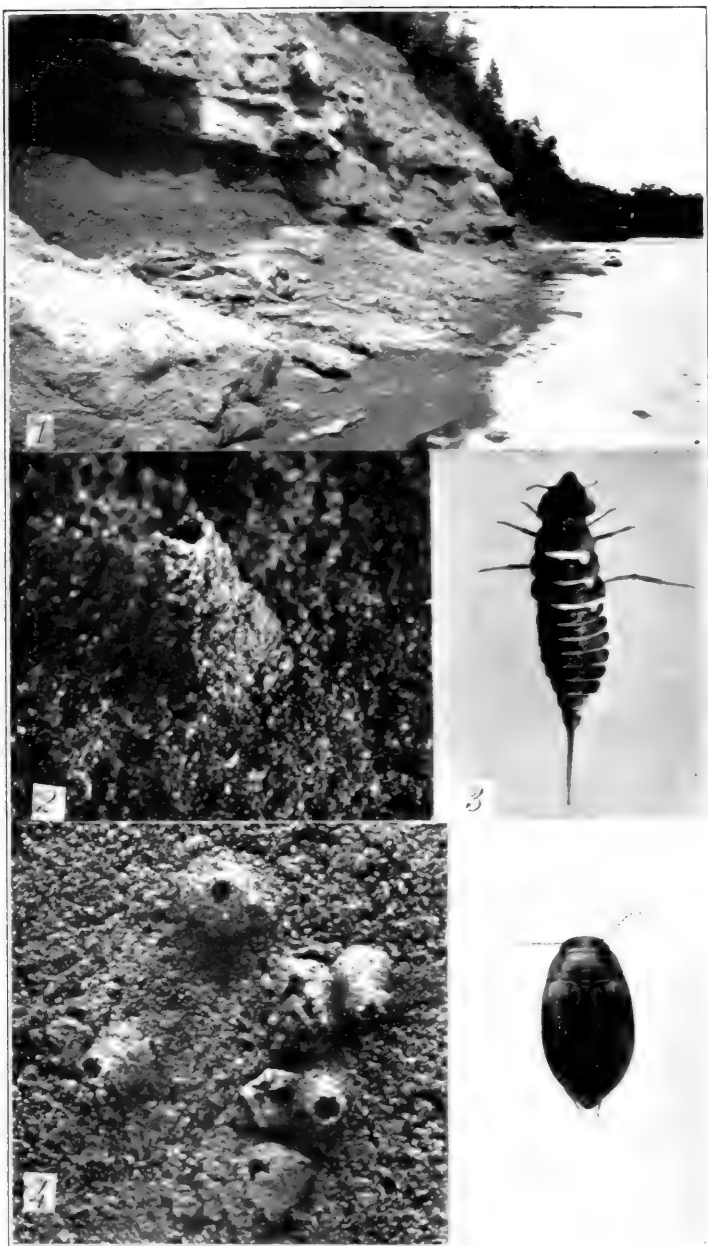
I have long felt that the weakest point in our present system of teaching Entomology has been in the undue importance placed upon the memorization of multitudinous details. For the specialist in Entomology the latter system is a necessity, but for the average student, whose time is limited, the general principles of Entomology, as outlined in Dr. Folsom's book, will give the best basis for private study. Moreover, he will acquire an interest in this subject and in the wider one of which Dr. Folsom shows it to be a part. For instance, in his chapter on colour and coloration he has considered his subject from a general standpoint, dealing first with the sources of colour and then with the conditions which may cause variations in the formation of colour in insects; so that with a knowledge of the general principles, as designated by Dr. Folsom, the student is encouraged to develop reason in lieu of memory.

The new chapter on Transmission of Disease by Insects is a valuable addition. This phase of Entomology is one which is receiving a great deal of attention at the present time, and Dr. Folsom has presented the results of modern research in a concise and interesting manner.

The illustrations throughout are particularly fine and appropriate to the text.

The former comprehensive bibliography has been augmented by the titles of one hundred new works and will be found very useful to the student of Entomology.

TENNYSON D. JARVIS.



HYDROPSYCHE SEPTENTRIONALIS GYLL.

The Canadian Entomologist.

VOL. XLVI.

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No. 2

LIFE-HISTORY OF A DYTISCID BEETLE (*HYDROPORUS SEPTENTRIONALIS* GYLL.).*

BY ROBERT MATHESON, ITHACA, N. Y.

The Salmon River, a small stream which flows close by the Nova Scotia Agricultural College, Truro, N. S., harbours many interesting species of aquatic insects. At this point it flows through a red sandstone region, the high, red rocky walls standing out in clear relief against a green background of grassy turf and coniferous trees (pl. 1, fig. 1). During midsummer the river becomes a small stream trickling lazily over its pebbled bottom, leaving wide stretches of flat red rocks covered with fine sand. Here abound mayflies, stoneflies and numerous small water beetles, besides many others. Along the sandy banks tiger-beetles are abundant, and numerous heads are seen to appear and disappear as one walks slowly along. I was interested in trying to rear some of the more common Dytiscid beetles, but found it a difficult task after procuring the larvæ to provide the proper conditions in order to secure continued larval development, pupation, and finally the coveted adult.

While collecting one day last summer (August 7, 1913), I was delighted to find on turning over some flat rocks several beautiful white pupæ quietly resting on their backs in rather wonderfully constructed pupal chambers. Furthermore, there were several different, not only species, but families represented, not all, however, in such peculiar pupal chambers. I was not long in finding representatives of the Carabidæ, Dytiscidæ, Hydrophilidæ and Parnidæ, oftentimes all under the same large flat stone. Unfortunately, other pressing work did not give me opportunity to make as full notes on as many of the species as I could wish. However, there is one interesting form, the life-history of which, in part at least, I wish to present in this short paper.

*This species was kindly determined for me by Mr. John D. Sherman, Jr.

On turning over numerous flat stones I found the pupæ of this species (*Hydroporus septentrionalis* Gyll.) rather abundant in some places. They were found abundant under stones lying on soft, damp, fine sand overlying the broad flat rock-bed now above the water. These were abundant on August 7, 1913, when I discovered this insect, and I at first despaired of finding the larvæ, but on turning over numerous stones I was soon rewarded by finding all stages, larvæ, pupæ and adults. The larvæ construct rather peculiar pupal chambers. These pupal chambers consist of the fine, damp sand, lying over the red sandstone rock which forms the river channel, built into peculiar mounds, usually with a small opening at the top. These mounds are turret-shaped, measuring 6-7 mm. wide at the base, 5-6 mm. high, with an apical diameter of about 2.5 mm. One of these is shown on pl. 1, fig. 2. They are rather beautiful, and when abundant, as they often are under

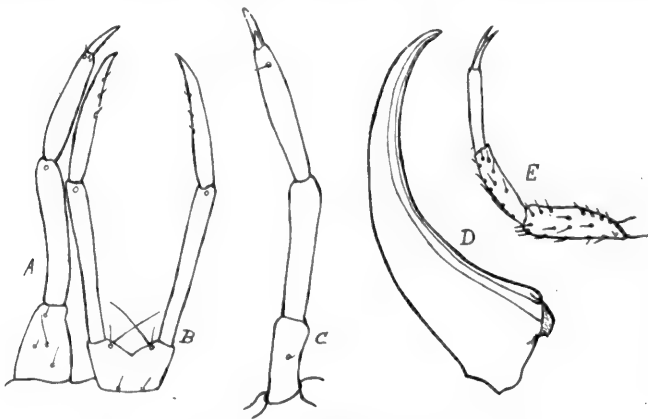


Fig. 9.—*Hydroporus septentrionalis*, larval structures.

flat rocks, they present, grouped thus together, the appearance of a miniature mud village (pl. 1, fig. 4). I was fortunate enough to observe through the opening in the top one of the larva construct part of its domicile. Round and round it moved within, gradually deepening, and at the same time widening, the interior of the future pupal home. It would turn over and over, smoothing out the sides. I did not observe the beginning of any of these pupal chambers, but I presume the larva began at first to

mine into the soft sand, and by continual turning round and round or moving back and forth gradually construct its chamber.

Although I was fortunate enough to find all the stages of this beetle, I did not learn anything of its ways in the nearby river. They must have been abundant, for the pupal chambers were observed at various places for nearly a mile along the river bank.

Description of larva.

Full-grown larva (pl. 1, fig. 3) ready to pupate, measures 5.3 mm.; caudal setæ 2 mm. additional; head 1.04 mm.

General colour brown above, nearly pure white beneath. Head yellowish brown, a V-shaped brown spot on vertex, the apex directed caudad. Head measures 1.04 mm. long and .9 mm. at its widest part just behind the eyes. Rostrum .16 mm. long, rounded in front, smooth and without setæ on margin. Antennæ yellowish brown, 4-jointed; 1st joint, .12 mm.; 2nd joint, .2 mm.; 3rd, .2 mm.; 4th, .08 mm. A few scattered setæ present on the head, the lateral margins just behind the eyes bearing several larger setæ. Mandibles are long, sickle-shaped, perforated to their upturned tips, which rest against the lower surface of the rostrum, yellowish at base, becoming brownish yellow at their tips. The perforations run along the inner sides of the mandibles (fig. 9, D). The maxillæ (fig. 9, A) are greatly reduced, consisting only of a 4-jointed palpus; 1st joint, .33 mm.; 2nd, .65 mm.; 3rd, .5 mm.; 4th, .2 mm. The labium (fig. 9, B) is small, quadrangular in shape, emarginate in front, with 4 setæ, two long ones arising from the inner surface and two shorter ones on the lower surface, just mesad of the point of origin of palpi. The palpi are two-jointed and arise from the outer angles of the labium, 1st joint, .76 mm.; 2nd, .5 mm. Eyes 6 in number, arranged in two transverse rows.

The prothorax is yellowish brown in colour, with a dark brown spot on each side of the middle line, near the posterior margin. The remaining segments are yellowish brown in colour, with a lateral row of lighter yellow spots on each side of the middle line, extending back to the seventh abdominal segment. These spots

are irregular in shape, larger on some segments than others. The seventh and eighth abdominal segments are light yellowish brown in colour. Each segment bears a fringe of setæ on its posterior margin, while numerous smaller setæ are scattered over their dorsal surfaces. The setæ constituting the fringe are much shorter than the segments. The cerci consist of two long, slender, two-jointed appendages. They are 2 mm. long, much longer than the seventh and eighth abdominal segments taken together. The 1st segment measures 1.2 mm., while the long seta-like terminal joint measures .8 mm. The basal segment is studded with numerous small setæ. Three long, fine setæ arise at the distal end of each basal segment, and are about half as long as the second segment of the cerci.

The legs are almost white in colour. The coxæ are shorter than the femora. The femora and tibia are armed with stout spines on their ventral surfaces. There are but few setæ on the tarsi and swimming fringes are lacking. The tarsal claws are long and sharp.

The pupa

The pupa is pure white in colour, except the eyes, which are black. It rests upon its back in the pupal chamber. Length 3.5 mm. The head lies incurved upon the prosternum, and is rather abundantly provided with strong, short setæ, which prevent the tender pupa from coming in contact with the fine sand grains. The anterior margin of the pronotum is provided with a row of strong setæ, while numerous smaller setæ are present on the dorsal side of all the thoracic segments. The posterior margin of each abdominal segment is considerably elevated and is provided with a row of strong setæ. The abdomen ends in a pair of large ventral spines measuring .5 mm. By the aid of these spines the pupa is enabled to move about in the chamber, and at the same time prevent injuring itself from coming in contact with the small grains of sand. I do not know how long the pupal period lasts, but not more than a week or ten days.

The adult is a rather prettily-marked beetle, and is represented in fig. 5.

NEW OR LITTLE KNOWN SPECIES OF APHIDIDÆ.

BY JOHN J. DAVIS, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

Macrosiphum creelii, n. sp.*Wingless viviparous female.* (Fig. 10.—Plate II, figs. 1, 2.)

Entire body pea green, excepting the head, which is a whitish green, and a narrow darker green median longitudinal line on dorsum of abdomen. Segments I and II of antenna concolorous with body; segments III, IV and basal half of V brownish, with darker

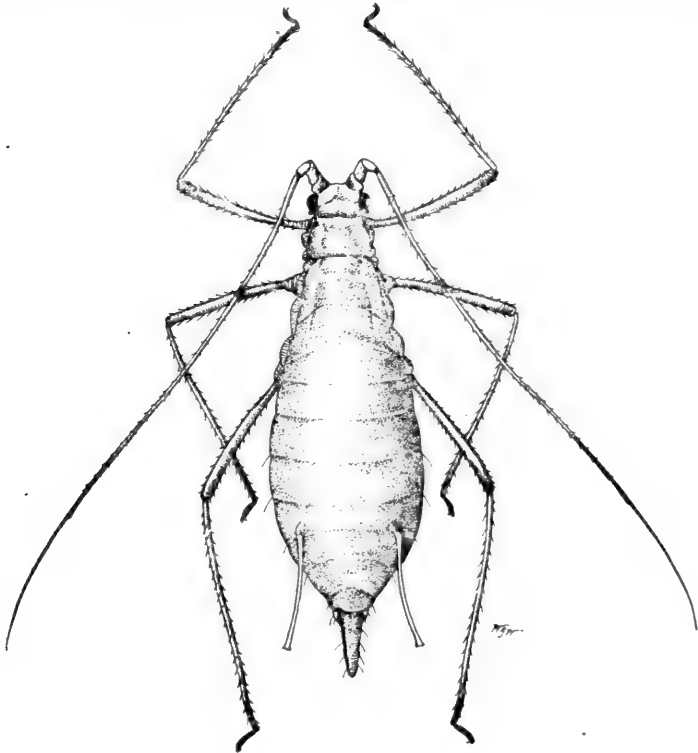


Fig. 10.

tips and the distal half of V and all of VI black; filament of segment VI longest, reaching to or a little beyond tip of body; segment III with 3 to 5 circular sensoria in a row at base, and segments V and base of VI with the usual distal ones. Eyes blood red. Beak barely reaching coxæ of second pair of legs. Legs with femora

pale whitish green with dusky tips, tibiae pale brownish with black tips, and tarsi black; hind tibiae very long, being one-half longer than middle tibiae. Cornicles pale green at basal half, the distal half very pale brownish with blackish tips; reaching a little beyond tip of cauda; narrow and cylindrical, the tip distinctly reticulated. Cauda concolorous with body, ensiform.

Measurements of living and balsam-mounted specimens as follows: Length of body, not including cauda, 2.6—4.0 mm.,* average 3.1 mm. (average of living individuals was 3.3 mm.); length to tip of cauda 3.1—4.5 mm., average, 3.6 mm. (average of living individuals, 3.9 mm.); width 1.04—1.93 mm., average 1.26 mm. (average of living individuals, 1.16 mm.); length of cornicles 1.10—1.31 mm., average 1.23 mm.; length of cauda 0.58—0.71 mm., average 0.64 mm.; length of hind tibia 3.1 mm.; length of middle tibia 2.1 mm. Antennal measurements as follows:

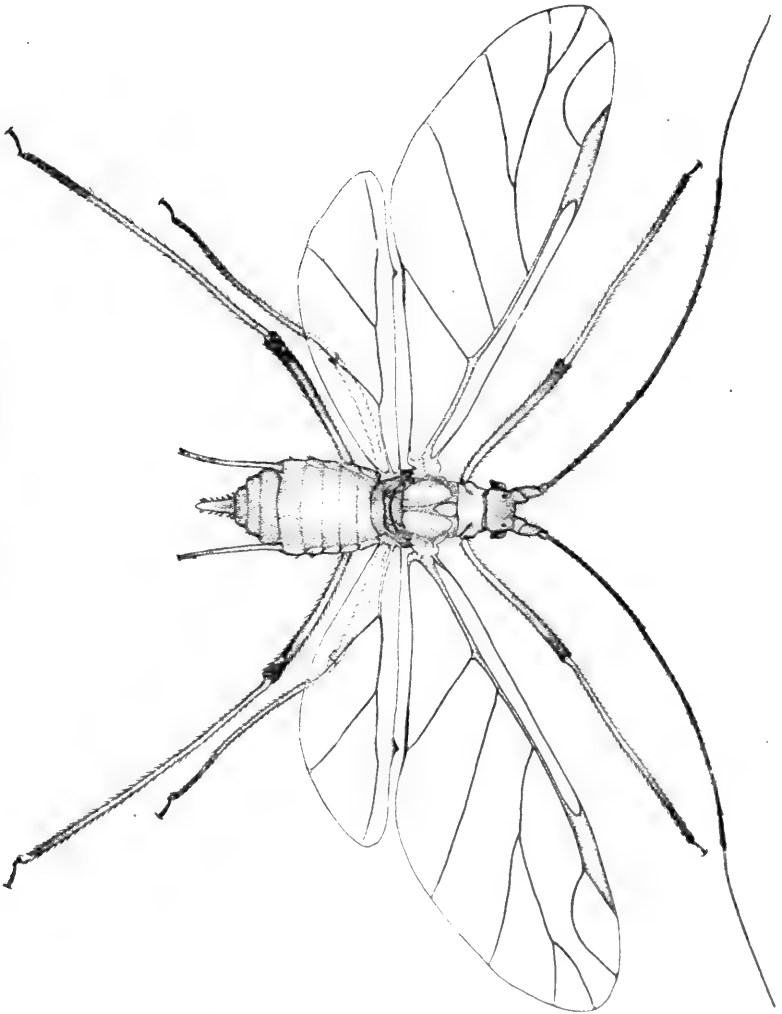
ANTENNAL SEGMENT NO. 1m.

Locality, date, etc	I.	II.	III.	IV.	V.	VI. (base)	VII. (fil't)	Total
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Lovelock, Nevada, May 22, 1911, C. W. Creel	0.232	0.135	1.219	0.948	0.852	0.213	1.393	4.992
La Fayette, Ind. (Utah material) Nov. 22, 1912...	.174	.097	1.219	.987	.832	.213	1.451	4.973
La Fayette, Ind.(1) (Utah material) Nov. 22, 1912...	.193	.097	1.219	.948	.813	.232	1.432	4.934
La Fayette, Ind.* (Utah material) Aug. 23, 1912...	.208	.078	1.130	.904	.817	.208	1.234	4.579
La Fayette, Ind. (Utah material), Aug. 23, 1912...	.191	.087	1.130	.956	.800	.208	1.374	4.746
La Fayette, Ind.(1) (Utah material), Aug. 23, 1912...	.208	.087	1.130	.991	.852	.226	1.460	4.954
La Fayette, Ind.(1) (Utah material), Aug. 23, 1912...	.208	.087	1.113	1.026	.869	.226	1.443	4.972
La Fayette, Ind.(1) (Utah material), Aug. 5, 1912	.174	.097	.987	.987	.755	.213	1.374	4.587
La Fayette, Ind. (Utah material), Aug. 5, 1912...	.174	.097	1.045	.948	.744	.194	1.355	4.587
La Fayette, Ind. (Utah material), Dec 6, 1911	.....	.....	1.219	1.064	.929	.251	1.471	.....

(1) Measurements from living specimens.

*An unusually large specimen collected by Creel in Nevada.

Fig. 11.—*Macrosiphum crechii*, winged viviparous female.



Winged viviparous female. Fig. 11.—Plate II, figs. 3, 4.

Head pale greenish yellow. Antennæ black excepting segments I and II, which are pale dusky; filaments of segment VI longest, reaching beyond tip of body; segment III bearing 14 to 21

circular sensoria in a row and usually on basal two-thirds or three-fourths; segments V and base of VI with the usual distal sensoria. Eyes blood red, ocelli brownish. Beak reaching nearly to coxæ of second pair of legs. Thoracic plate yellow or orange yellow. Wings large, with narrow but prominent dark brownish veins, the venation as shown in illustration. Legs with basal half of femora pale green and the distal half becoming dusky to blackish, tibiae pale brownish with black tips, and tarsi black; hind tibia rather long, being nearly one-half longer than the middle tibia. Abdomen pale green, with a moderately narrow median longitudinal dorsal line of a darker green extending to length of the abdomen; the reddish eyes of the unhatched young often showing through the body wall. Cornicles pale transparent green at basal half, becoming dusky to blackish at the distal end; reaching beyond tip of cauda; cylindrical and rather narrow; the tip distinctly reticulated. Cauda concolorous with abdomen, ensiform.

Measurements of living individuals and specimens in balsam, as follows: Length of body, not including cauda, 2.36—3.56 mm., average 2.72 mm.; length to tip of cauda 2.71—3.83 mm.; average 3.21 mm.; width of body 0.85 to 1.47 mm., average 1.02 mm.; length of wing, average 4.84 mm.; width, average, 1.66 mm.; cornicle, average, 1.75 mm.; cauda, average, 0.46 mm.

Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m

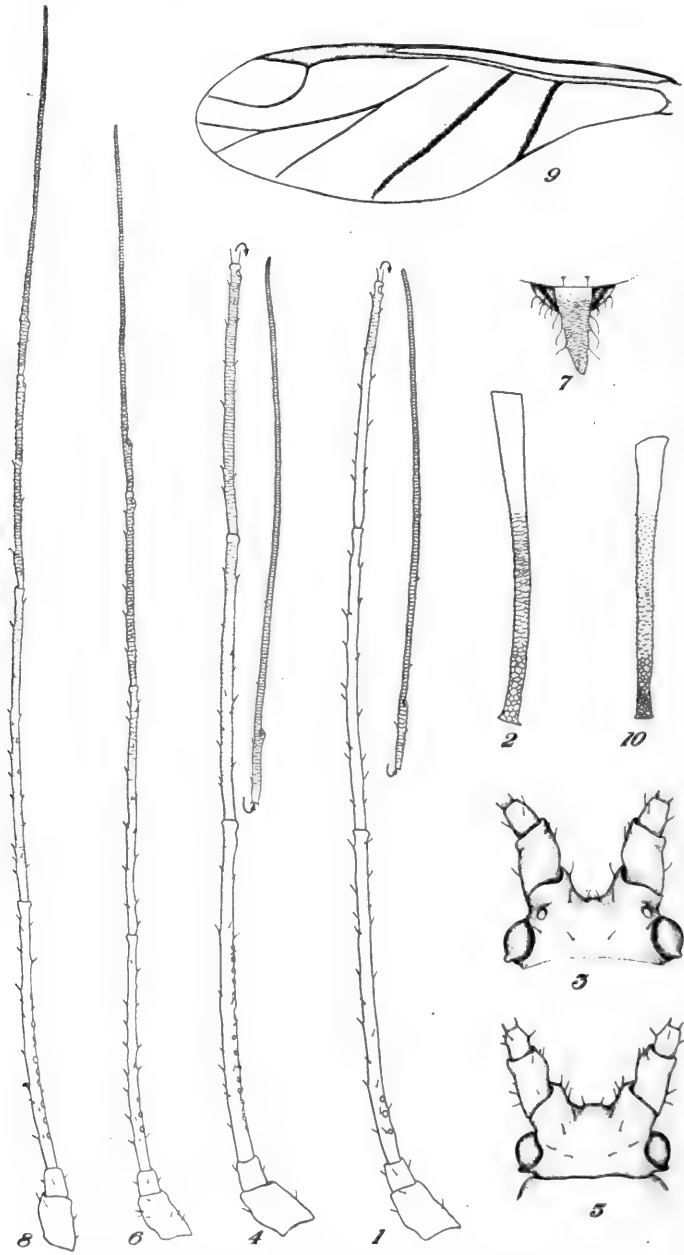
Locality, date, etc	I.	II.	III.	IV.	V.	VI. (base)	VII. (fil't)	Total
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Lovelock, Nevada, May 22, 1911, C. W. Creel.....	0.174	0.097	1.084	0.871	0.774	0.193	1.161	4.354
Lovelock, Nevada, May 22, 1911, C. W. Creel.....	.174	.116	1.045	.890	.793	.232	.....	.....
La Fayette, Ind. (Utah material), Nov. 6, 1912....	.174	.097	1.239	1.122	...	....	....	....
La Fayette, Ind. (Utah material), Nov. 6, 1912....	....	....	1.200	1.103	.832	.213	1.355	....
La Fayette, Ind. (Utah material), Nov. 7, 1912....	.155	.097	1.142	1.006	.832	.232	1.374	4.838

ANTENNAL SEGMENT NO. 1m.

Locality, date, etc	I.	II.	III.	IV.	V.	VI. (base)	VII. (fil't)	Total
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
La Fayette, Ind. (Utah material), Nov. 7, 1912....	.155	.097	1.161	.968	.813	.213	1.374	4.781
La Fayette, Ind. (Utah material), Nov. 15, 1912....	.174	.037	1.161	1.064	.929	.213	1.548	5.186
La Fayette, Ind. (Utah material), Nov. 15, 1912....	.174	.097	1.161	1.064	.929	....	....	....
La Fayette, Ind. (Utah material), Nov. 15, 1912....	.174	.116	1.084	.909	.871	.290	1.374	4.818
La Fayette, Ind. (Utah material), Nov. 15, 1912....	.174	.116	1.054	.909	.852	.213	1.393	4.711
La Fayette, Ind. (Utah material), Nov. 22, 1912....	.155	.096	.968	.909	.852	.232	1.393	4.605
La Fayette, Ind. (Utah material), Nov. 22, 1912....	.155	.096	.987	.909	.832	.213	1.374	4.566
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.155	.096	1.054	.890	.832	....	....	....
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.155	.096	1.103	.871	.871	.251	1.103	4.450
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.174	.096	1.200	.987	.909	.232	1.471	5.009
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.174	.096	1.200	1.026	.909	.232	1.451	5.098
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.174	.096	.938	.909	.832	.271	1.122	4.342
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.174	.096	1.006	.909	.852	.251	1.122	4.410
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.174	.096	.987	.968	.929	.232	1.471	4.857
La Fayette, Ind. * (Utah material), Dec. 6, 1911....	.174	.096	1.006	1.006	.948	.232	1.509	4.971
†La Fayette, Ind.* (Utah material), Jan. 23, 1913....	.193	.096	1.161	1.064	.929	.232	....	....
†La Fayette, Ind.* (Utah material), Jan. 23, 1913....	.193	.096	1.161	1.045	.890	.232	1.355	4.872

* On alfalfa in greenhouse.

† Measurements from living specimens.



MACROSIPHUM CREELII AND *M. CORYLI*.

Pupa.

General colour pale green, the head thorax and distal half of abdomen appearing to be scantily pulverulent, giving these parts a slight whitish tint; the rather prominent median longitudinal dorsal line of a darker green colour than that of the body and extending the entire length of the abdomen and thorax. Segments I and II of the antenna whitish green; the remaining segments pale, with a slight brownish tint, excepting the extreme tip of III and IV, the end of V, and all of VI, which portions are blackish. Eyes red. Legs with femora pale green, with an apparently light pulverulence; tibiae of a very faint brownish tint, the tips dark brown; tarsi black. Basal one-half or one-third of cornicle pale green, the remainder with a pale brownish tint, and the tip darker. Cauda concolorous with abdomen.

Oviparous female.

In a lot of live specimens received from Mr. G. I. Reeves, November 20, 1911 (collected on alfalfa at Salt Lake City, Utah, November 15, 1911), two wingless females with typical oviparous female characters, namely, swollen hind tibiae bearing numerous sensoria, were found, but upon closer examination one of these was found to be filled with young and no eggs, while the others appeared to contain no eggs and the eye spots of a single young within the body were to be seen. Later on specimens from this lot were reared which proved to be both physiologically and morphologically oviparous, but specimens were not preserved. These females differed from the usual wingless viviparous females by bearing 75 or more small, rather inconspicuous sensoria on the hind tibia and by having 7 to 11 circular sensoria on segment III of antenna.

The eggs are deposited on the foliage of alfalfa and from all observations the aphidid occurs on alfalfa, which is evidently its prime host, the year round.

This large green *Macrosiphum*, which so closely resembles the destructive pea aphid (*Macrosiphum destructor* Johns.) was first received from Mr. Cecil W. Creel of this bureau, who found it very abundant on alfalfa at Fernley and Lovelock, Nev., May 20 and 22, 1911. From reports this species is already a more or less troublesome pest on alfalfa in Utah and Nevada, and may become

as great a pest in the West as the destructive pea aphid is to peas in the East. This aphidid has been received from Messrs. G. I. Reeves, T. H. Parks, H. S. Smith, and E. J. Vosler, who collected it on alfalfa at Salt Lake City, Utah. It has also been collected by Mr. J. A. Hyslop on alfalfa at Pullman, Wash., May 25 and 26, and June 4 and 9, 1909.

Macrosiphum coryli.

Wingless viviparous female. (Fig. 12.—Plate II, figs. 5, 7.)

Head orange-red to brownish. Antennæ black, excepting segments I and II, which are concolorous with head; placed on

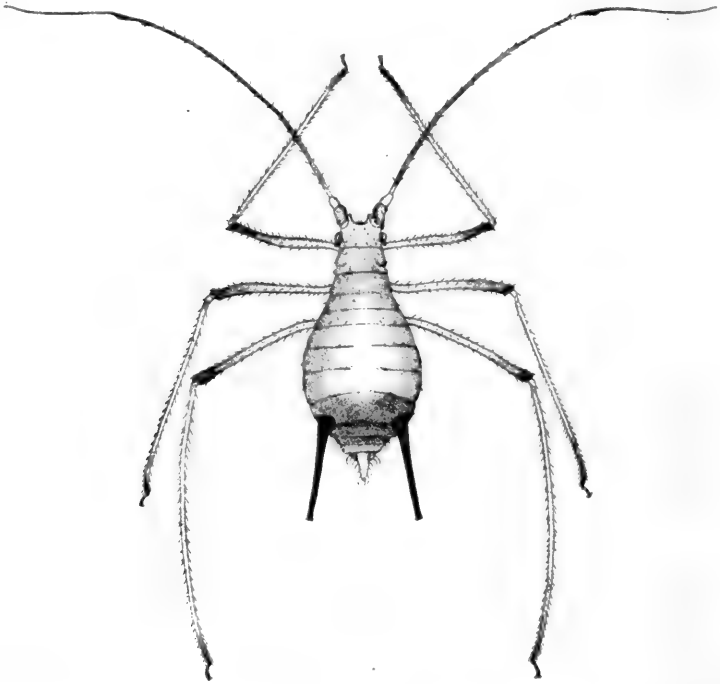


Fig. 12.

conspicuous frontal tubercles; sparsely hairy; very long, being about one-half longer than the body; filament of segment VI the longest; segment III with 3 or 4 circular sensoria in a row near the base; segments V and base of VI with the usual distal sensoria. Eyes dark red to reddish brown. Beak almost wholly black and

reaching to slightly beyond coxæ of third pair of legs. Prothorax concolorous with head; the mesothorax and metathorax brownish, the latter sometimes greenish, especially toward the posterior margin. Legs with femur pale yellowish brown, the tip blackish, tibia pale brown with black tip, and tarsus black; the hind tibiæ very long. Abdomen pale greenish, with a few pinkish dots which indicate the eyes of the embryos within; dusky patches around bases of cornicles; sides of abdomen usually more or less brownish to blackish, although this coloration is sometimes almost wholly wanting; dorsum of the last three abdominal segments usually more or less dusky. Older females have a slight pinkish tint intermixed with the green colour of the abdomen. Cornicles black, cylindrical, the distal fifth strongly reticulated, and very long, reaching the length of the cauda beyond the tip. Cauda pale to whitish green, moderately covered with long hairs, ensiform, and scarcely more than one-third the length of the cornicles.

Measurements from specimens preserved on slides in balsam: Length of body to tip of abdomen 1.74–2.21 mm., average 1.95 mm.; width of body 0.81–1.08 mm., average 0.97 mm.; length of middle tibia 1.80 mm.; length of hind tibia 2.4 mm.; length of tarsus 0.097 mm.; length of cornicle 0.83–1.00 mm., average 0.90 mm.; length of cauda 0.30 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. (filament)
mm.	mm.	mm.	mm.	mm.	mm.	mm.
.....	.....	0.956	1.061	0.783	0.174	.....
.....	.....	.852	.869	.695	.164	0.991
.....	.....	.852	.939	.695	.164	.982
0.174	0.096	.852	.939	.748	.174	.....
.174	.096	.852	.947	.730	.191	.....
.....	.....	.991	1.104	.748	.174	.....
.....	.....	.956	1.026	.765	.164	.991.
.174	.096	.921	.921	.713	.157	1.113
.174	.104	.921	.956	.721	.157	1.165
.157	.096	.765	.800	.643	.157	1.043
.157	.096	.765	.783	.609	.157	1.009

Winged viviparous female. (Plate II, figs. 8, 10.)

Head pale to reddish brown, sometimes with a faint greenish tint, especially at the margins. Antennæ brownish to black, excepting segments I and II, which are dusky; sparsely hairy; filament of segment VI the longest; total length much more than body length; 9 to 13 (usually 9 to 10) circular sensoria in a row on III and the usual ones on V and base of VI. Eyes dark red. Thorax pale brown. Fore wings with the usual twice-branched media; first anal and cubitus conspicuous and with a prominent border. Legs as in the wingless form. Abdomen pale green, with a blackish ring on the dorsum surrounding each cornicle and a dusky area extending across the dorsum posterior to the cornicles. Cornicles black, cylindrical, gradually tapering toward the apex, which is about one-half the diameter of the base, extending much beyond tip of abdomen, and with the tip reticulated. Cauda pale yellowish green, ensiform, and moderately hirsute.

Measurements from specimens on slides: Length of body 1.62-2.05 mm., average 1.9 mm.; width of body 0.70 to 0.90 mm., average 0.79 mm.; length of fore wing, average, 3.17 mm.; width of fore wing, average, 1.08 mm.; length of middle tibia, average, 1.82 mm.; length of hind tibia, average, 2.34 mm.; length of hind tarsus, average, 0.097 mm.; length of cornicle, average, 0.87 mm.; length of cauda, average, 0.25 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. (filament)
mm.	mm.	mm.	mm.	mm.	mm.	mm.
0.156	0.087	0.852	0.887	0.678	0.156	1.009
.156	.087	.852	.974	.678	.174	1.009
.156	.096	.904	1.026	.713	.174	.....
.156	.087	.782	.817	.678	.156	.....
.156	.087	.748	.782	.678	.156	.....
.156	.087	.835	.817	.661	.156	1.009
.156	.087	.956	.974	.756	.165	.....
.156	.087	.904	1.026	.782	.174	.....
.156	.087	.782	.819	.696	.174	1.026
.156	.087	.748	.800	.678	.174	1.061

Immature individuals are entirely pale green.

This species lives gregariously on the underside of the leaves and tender terminal shoots of hazel (*Corylus americana*). Described from specimens collected at La Fayette, Ind., July 5, 1912. The writer has also collected this aphidid at Chicago, Ill., May 20 and July 10, 1908.

(To be continued.)

WISCONSIN BEES OF THE GENUS PERDITA. GEOGRAPHICAL DISTRIBUTION AND RELATIONS TO FLOWERS.

BY S. GRAENICHER, PUBLIC MUSEUM, MILWAUKEE.

In 1896 Prof. T. D. A. Cockerell¹ published a paper on this genus, containing a vast amount of information, and dealing with the various aspects of taxonomy, variation, distribution, relations to flowers, etc.

The centre of distribution is located in the arid region of the Southwestern United States, New Mexico having an especially large percentage of species in its fauna. Prof. Cockerell states "that in the main we have to do with an austral series of types, which have spread northward and become largely differentiated into species since the glacial epoch." A splitting up into a great variety of forms is evident, and, as Prof. Cockerell puts it, "we have indeed the process of evolution going on under our eyes, the puzzling forms being those which have only lately segregated themselves, and have not yet developed striking peculiarities."

Another characteristic feature of this genus lies in the fact that all of the species, so far as their habits are known, are oligotropic, i.e., most of them depend for their pollen-supply on a single species of flower, and those that collect pollen from a number of plant species, favour closely related forms, belonging either to the same genus, or at least to the same family. New Mexico and Colorado offer extremely favourable opportunities for the study of the close relations between the various forms of *Perdita* and the

1. Proc. Acad. Nat. Soc. Phil., Vol. 48, pp. 25-107. Two years ago the author published "A list of the bees of the genus *Perdita* Smith" in *Psyche*, Vol. 18, pp. 134-143 (1911).

various forms of flowers, and Prof. Cockerell's paper referred to above is full of details on this particular subject.

At the time of its publication only two out of a total of seventy-one species were known to inhabit the States east of the Mississippi River, viz., *P. octomaculata* (Say.), a northern species, ranging according to the records then on hand from Illinois to New Hampshire, and *P. obscurata* Cr., a southern species, occurring in Georgia and Florida. None had been reported from Wisconsin. Our present knowledge brings the number of eastern species up to twelve, the following six of which belong to the Wisconsin fauna: *pallidipennis* Græn., *bruneri* Ckll., *maura* Ckll., *maculipennis* Græn., *citrinella* Græn., and *gerhardi* Vier.

P. pallidipennis Grænicher. This was described² from specimens taken in Burnett Co., Wis., at various places on the St. Croix River, a tributary of the Mississippi, which forms throughout the greater part of its course the boundary between Wisconsin and Minnesota. It has since been found at a number of points on the Mississippi River as far down as Rutledge in the southwestern corner of Wisconsin. I have also come across this species in the Waukegan-Kenosha dune region along Lake Michigan in northeastern Illinois and southeastern Wisconsin. Like the western *P. albipennis* Cr., it favours the sunflower-type of Compositæ, and has been observed gathering pollen from the sunflower *Helianthus occidentalis* Riddell, *Rudbeckia hirta* L. (black-eyed Susan), and *Lepachys pinnata* (Vent.) T. & G. (gray-headed cone-sunflower).

In 1907 Professors M. H. Swenk and T. D. A. Cockerell³ described *P. lacteipennis*, a species from Nebraska, taken most frequently on the common sunflower *Helianthus annuus* L., and of which they state that it "is quite close to *albipennis* but differs at once in its larger size and in a reduction of the yellow markings." Last year Mr. J. C. Crawford⁴ described *P. canadensis* from Medicine Hat, Alberta, Canada. This species forms together with *lacteipennis* from Nebraska and *pallidipennis* from Wisconsin a group of very closely related forms; all of which are to be considered recent offshoots of the sunflower visitor *albipennis*, or at

2. CAN. ENT., Vol. 42, pp. 101-104; 157-160 (1910).

3. Ent. News, Vol. 18, pp. 51-58.

4. CAN. ENT., Vol. 44, p. 359-360 (1912).

least as having arisen from the same stock that produced the latter. Compared with *albipennis* the three species under consideration all show a reduction of the yellow markings, in which the face, the legs and the abdomen are mainly involved; so far as the reduction of the face marks is concerned, *canadensis* has reached the point, where the face is entirely free of yellow.

The species mentioned above favour, so far as their habits are known, flowers that are typical elements of the Prairie Province. According to Pound and Clements⁵ the vegetation centre of the prairies is situated in Nebraska, Iowa, Kansas and the Dakotas, and as one moves away from this centre in a northerly or southerly direction, a decrease in the number of characteristic plant species is noticeable. The Prairie Province, as defined by Pound and Clements forms a broad strip, bounded on the west by the Rocky Mountains, and extending from the Canadian Provinces Athabasca, Alberta, Saskatchewan, Assiniboia and Manitoba down through Montana and North Dakota and the states south of these into Texas. From this strip an arm runs off eastwardly through southern Minnesota and Iowa into southern Wisconsin, northern Illinois and a very narrow portion of western Indiana.

The known range of *albipennis* occupies a part of the vegetation centre (South Dakota and Nebraska), and passes through Colorado and New Mexico into Texas. It occurs, according to Swenk and Cockerell, all over the State of Nebraska, while *lactipennis* covers the western part of that state only. *Canadensis* is an inhabitant of the most northern outposts of the Prairie Province, and *pallidipennis* is a species of the eastern extension of the prairies in Wisconsin and Illinois. As regards the distribution of this species in Wisconsin, attention is called to the fact that floral elements of the prairie extend their range northward to the sandy areas along the St. Croix River, the so-called "pine-barrens." At the mouth of the Yellow River (a tributary of the St. Croix) in the northern part of Burnett Co. (latitude about 46°) there is quite an assemblage of prairie-plants, and this, the type locality of *pallidipennis*, marks the most northern point at which the bee has been found.

5. Bot. Gaz., Vol. 25, pp. 381-394 (1898).

P. bruneri Cockerell. The type locality of the species is West Point, Nebraska, and it has also been reported by Swenk and Cockerell from Lincoln in the same state. A single specimen of this bee, a visitor of the Compositæ, was collected by the writer from the flowers of *Rudbeckia hirta* near the Kettle River rapids of the St. Croix River in Burnett Co.⁶ It is quite common in the Waukegan-Kenosha dune region of northeastern Illinois and southeastern Wisconsin, where it has been taken mostly at the flowers of *Helianthus occidentalis*, and occasionally at those of *Liatris scariosa* Willd. (Large Button Snake-root).

P. maura Cockerell, a visitor of the ground-cherry (species of *Physalis*) was described from Cedar Bluffs, Nebraska, and has since been reported by Swenk and Cockerell from other parts of that state.

In Wisconsin it was first met with at Milwaukee, and it has been found also at various points along our western border from Hudson on the lower St. Croix River (about 15 miles east of St. Paul, Minn.) down along the Mississippi River to Rutledge in the southwestern corner of the state. In Nebraska it has been observed late in the fall, at a time when the ground-cherries were probably out of bloom, on the flowers of *Aster*, but in Wisconsin I have never seen it visiting the flowers of any other plant except those of the ground-cherries *Physalis heterophylla* Nees, and *P. pubescens* L.

P. maculipennis Grænicer. Just south of the present city limits of Milwaukee, and a short distance from Lake Michigan is a sandy area of small extent, and this is the type locality of the species. In addition to the specimens collected here, and in a sandpit to the west of Milwaukee, a single specimen was taken two years ago in the Mississippi valley near Genoa, Vernon Co., about 12 miles south of La Crosse. Although I have observed this bee in its type locality for a number of years, it was not until last summer that I succeeded in finding the source of its pollen-supply, viz., the flowers of the white melilot (*Melilotus alba* Desv., Fam. Leguminosæ). On account of the fact that this plant has come to us from the Old World not long ago, we are led to the conclusion that *P. maculipennis* depended originally on some native plant of

6. Reported in Bull. Publ. Museum Milwaukee, vol. 1, pp. 221-248.

our region for its pollen, undoubtedly one of the Leguminosæ, and that through the gradual disappearance of that plant from our immediate surroundings, the bee was forced to turn its attention to some other suitable plant. A number of prairie plants still inhabiting this particular area 30 or 40 years ago have been driven out by the change of conditions due to the activity of man; other species have invaded the area, and among these the white melilot has been quite successful.

P. maculipennis was described from the female sex; a description of the male is given herewith.

Male.—Length 5–6 mm. Differs from the female as follows: Flagellum conspicuously light yellow underneath, labrum and face entirely yellow; this colour extends for a short distance above the antennæ, and runs obliquely up along the anterior orbits. A yellow stripe along the posterior orbits, narrow above, and widening out abruptly below. In addition to the yellow marks on tubercles, tegulæ and collar, there is a large yellow spot on the prosternum, a smaller one on the mesosternum, and one on the metapleura; in the smaller specimens these markings are poorly developed. In the larger specimens two yellow interrupted abdominal cross-bands on segments 5 and 6, besides those on segments 2 to 4. Front and middle legs yellow, black only on posterior surfaces of femora and tibiæ. Hind legs black with a broad yellow band anteriorly on the femur, and a narrow one on the tibia. Knees yellow. The black spot in the stigma is very conspicuous, rather more so than in the female.

Four specimens taken June 29, 1913, in the type locality near Milwaukee, Wis., flying around the flowers of the white melilot (*Melilotus alba* Desv.) in search of the females.

P. citrinella Grænicher. This species, a visitor of the flowers of a leguminous plant. *Petalostemum villosum* Nutt. is known from two localities in Wisconsin: North Hudson, St. Croix Co. (type locality), and Prescott, Pierce Co., about 15 miles south of North Hudson. Last year it was reported by Mr. J. C. Crawford (loc. cit.) from Medicine Hat, Alberta, Canada.

It belongs to a group of yellow *Perditas*, and, as has been pointed out in the description of the species, it stands in exceedingly close relationship to two western species. One of these (*perpallida*

Cockerell, Nebraska) visits, like *citrinella*, the flowers of a species of *Petalostemum*; the other (*wootonæ* Cockerell) occurs in New Mexico, Colorado and Nebraska, and is a visitor of *Nuttallia* (Fam. Rosaceæ). A more extended acquaintance with the bees of this group inhabiting the prairies east and north of Nebraska may prove that *citrinella* is simply a colour variety of *perpallida*.

P. gerhardi, Viereck. Up to the present time this species has not been found outside of the Lake Michigan dune region. A visitor of the horsemint (*Monarda punctata* L.), it was described from specimens collected at East Chicago, Indiana, by Mr. Wm. J. Gerhard of the Field Museum of Chicago. Last year several specimens were taken by the writer in the dunes south of Kenosha, Wis., on the flowers of the horsemint. I have come across this plant in the Mississippi Valley as far north as Prescott, Pierce Co., Wis., in some places growing in abundance, but in spite of a sharp lookout for the bee *P. gerhardi*, no specimens were obtained.

This species, a yellow *Perdita*, belongs to the *perpallida*—*wootonæ*—*citrinella* group discussed above; it has, in the female sex (I do not know the male of *citrinella*), very much the appearance of a small *citrinella*, differing from the latter in the size and arrangement of the black markings on the yellow background. We are dealing with a species derived from the same source as *citrinella*, but depending for pollen on the flowers of a plant belonging to a different family (Labiatae) than that visited by *citrinella*, and to a different region; it is a plant of the eastern United States, the western range of which brings it in contact with elements of the prairie region.

SUMMARY

Of the six species of *Perdita* known from Wisconsin, two are visitors of the Compositæ, two of the Leguminosæ, one of the ground cherries (species of *Physalis*), and one of the horsemint (*Monarda punctata*).

They are derived from the bee fauna of the Prairie Province, and have followed in the wake of the floral prairie elements that invaded the Wisconsin area. *Albipennis*, a western form, occupies the centre of vegetation of the prairies, and ranges southward to Texas. Grouped around this are three forms, one of which, *lactepennis*, occurs together with *albipennis* in western Nebraska; the

other two inhabit, according to our present information, the outskirts of the Prairie Province, *canadensis* being known from the northern end of that province in Canada, and *pallidipennis* from the eastern extension of the prairies in southern Wisconsin and northern Illinois. *Pallidipennis* and *bruneri*, both of them oligotrophic bees of the Compositæ favour the sunflowers (species of *Helianthus*), and flowers of the same structural type, such as *Rudbeckia* and *Lepachys*.

Maura visits in Wisconsin *Physalis*, the same as in Nebraska.

Citrinella and its Nebraskan representative *perpallida* are both prairie-clover visitors, the former favouring the flowers of *Petalostemum villosum*, and the latter those of *P. violaceum*.

In its type locality in the vicinity of Milwaukee, *maculipennis* obtains its pollen from the white melilot, a species of Leguminosæ introduced from Europe. This means, of course, an adaptation to new conditions brought about by the fact, that the native plant or plants visited originally by this bee do not occur in the type locality at the present time. In all probability the bee will be found in some other part of its range at the flowers of some small-flowered species of Leguminosæ of the genera *Petalostemum*, *Amorpha* or *Lespedeza*.

While *citrinella* has remained true to a plant of the prairie region (*Petalostemum*), *gerhardi*, a near relative of the former has entered into relations with the horsemint (*Monarda punctata*), a species of eastern distribution.

PROSOPOTHRIPS COGNATUS, A NEW NORTH AMERICAN THYSANOPTERON.

BY J. DOUGLAS HOOD,

U. S. Biological Survey, Washington, D. C.

The genus *Prosopothrips* was erected by Uzel in 1895 for the reception of a single Bohemian species of anomalous structure, to which he gave the specific name *vej dovskyi*. The species is now known only from females taken in Bohemia (Uzel), Finland (Reuter), and Italy (Buffa). Consequently, the occurrence in North America of what appears to be a second species of the genus, and the discovery of the male, are matters worthy of record, especially since Mr. E. O. G. Kelly, who collected the

species, says in a recent letter that he has worked up an interesting paper on its economic importance. It is regretted that specimens of *P. vejdoskyi* could not be secured for comparison with the American form.

***Prosopothrips cognatus* sp. nov.** Figs. A and B.

Female.—Length about 1.2 mm. Head and prothorax dark chocolate brown, nearly black; pterothorax and abdomen orange yellow, the last abdominal segment and the anterior angles of the mesothorax tipped with brown or gray; antennæ yellow, darkened with brown beyond middle of segment 6; fore legs largely brown, middle and hind legs yellow.

Head about 1.4 times as wide as greatest exposed length, prominently reticulate-rugose, with a dark chitinous line bordering the eyes within; vertex sulcate, two prominent projections overhanging the basal segments of the antennæ; cheeks swollen, but without spine-bearing tubercle; no macrochaetae present. Eyes not prominent, not protruding, slightly flattened laterally. Ocelli wanting. Antennæ

one and two-thirds time as long as width of head; segment 1 short, distinctly shorter than 2 and very broad; 2 unusually large, narrowed toward apex and with short, slender pedicel; 3-5 slender, equal in length, similar in form, each with about four encircling lines of sculpture; 6 slender, longest in entire antenna, with about six encircling chitinous lines; 7 and 8 short and slender, forming a stylus; segment 1 brownish yellow; 2 orange; 3-5 yellow; 6

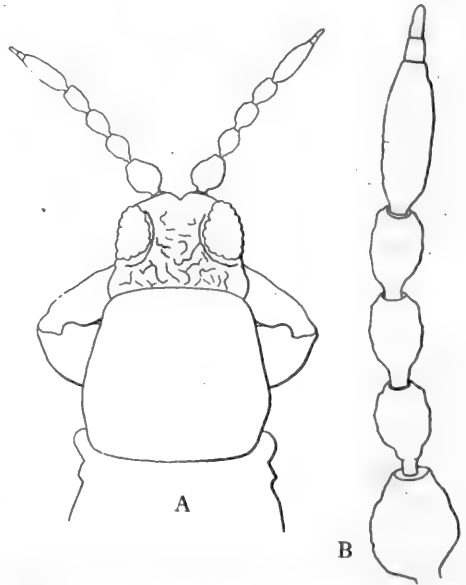


Fig. 13.—*Prosopothrips cognatus* Hood. A—Head and prothorax, female. B—Right antenna, female.

yellow in basal half or third, beyond nearly black; stylus nearly black.

Prothorax very slightly broader than long and about one and one-fourth times as long as width of head, broadest at posterior third; surface roughened; bristles short, scattered. Meso- and metathorax yellow, without differentiated dorsal plates, the former with anterior ventral angles darkened with brown or gray. Wings totally lacking. Legs short, stout, rugose; fore femora brown, fore tibiae yellow apically and along middle, tarsi yellow; middle and hind legs yellow.

Abdomen rather large and heavy, about 1.6 times as wide as prothorax, broadest at segment 6; segment 10 with a longitudinal dorsal suture; all bristles very short and inconspicuous.

Measurements of holotype: Length 1.16 mm.; head, length of exposed portion .108 mm., width .150 mm.; prothorax, length .192 mm., width .204 mm.; pterothorax, width .220 mm.; abdomen, width .324 mm. Antennal segments: 1, 27 μ ; 2, length 42 μ , width 34 μ ; 3, length 36 μ , width 22 μ ; 4, 36 μ ; 5, 36 μ , 6, 56 μ ; 7, 10 μ ; 8, 13 μ ; total length of antenna, .26 mm.

Male.—Much like female, but smaller (length .7 mm.). Segment 9 of abdomen with two pairs of dorsal spine-bearing tubercles, the posterior pair more widely separated than the anterior.

Measurements of allotype: Length .696 mm.; head, length of exposed portion .090 mm., width .116 mm.; prothorax, length .138 mm., width .152 mm.; pterothorax, width .160 mm.; abdomen, width .196 mm.

Described from two females and one male, taken at Wellington, Kansas, August, 1910, on wheat, by E. O. G. Kelly.

Though apparently very close to *P. vej dovskyi* Uzel, an uncommon European species, it differs in several important respects from the description and figures given by Uzel in his "Monographie." *Cognatus* has much stouter antennae, with the first segment completely hidden in dorsal aspect by the vertical protuberances; the eyes are less prominent; the genal tubercle is flattened and the spine borne conspicuously at the tip in *vej dovskyi* is greatly reduced in size in *cognatus*; and, finally, the mesothorax of *cognatus* is yellow instead of black.

A NEW GENUS OF *SCELIONIDÆ* FROM AUSTRALIA.

BY ALAN P. DODD, NELSON, QUEENSLAND.

Subfamily *Balinæ*.**Acolomorpha**, nov. gen.

♀.—Head transverse, a little wider than the thorax; mandibles broad, tridentate; maxillary palpi 2-jointed. Antennæ 6-jointed (really 7-jointed since a small ring-joint is present), scape, pedicel, 3 funicle joints and a solid club. Thorax and forewings as in *Acolus* Forester. Abdomen broadly sessile, no wider or longer than the thorax; first and second segments short, transverse; third segment occupying two-thirds of the abdominal length.

Type: *Acolomorpha minuta* described herewith.

Acolomorpha minuta, n. sp.

♀.—Length 0.75 mm.

Shining black; legs and antennæ black.

Head and thorax with very fine polygonal sculpture. Abdomen with first and second segments striate; third segment smooth. Antennæ short; scape equal to pedicel and funicle joints combined; pedicel one-half longer than wide; first funicle joint as wide as the pedicel and almost as long; second and third much narrower than the first, short, transverse; club large, one-half longer than wide, as long as the scape. Forewings reaching some distance beyond apex of abdomen; narrow, infuscated; longest marginal cilia equal to two-fifths the greatest wing width; discal cilia fine and dense; submarginal vein attaining the costa about the middle of the wing; marginal vein as long as the stigmal, which is short, a little oblique; basal vein rather short, perpendicular.

[From 1 specimen $\frac{2}{3}$ inch objective, 1 inch optic, Bausch and Lomb.]

Habitat: North Queensland (Nelson, near Cairns). Described from one ♀ caught by sweeping in forest, 12th August, 1913 (A. P. Dodd).

Type: In the South Australian Museum, a female on a slide.

NOTES ON THE WINTER AND EARLY SPRING
COLEOPTERA OF FLORIDA, WITH DES-
CRPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

In 1911, and again in 1913, I spent the time from January 10 to April 15 in Central and Southern Florida, collecting especially Coleoptera, Orthoptera and Hemiptera, but also taking what came readily to hand in other orders. In the Canadian Entomologist for November, 1912, and January, 1913, I made mention of the places where I collected the first trip and described with notes a number of apparently new species.

In 1913 I made my headquarters at Dunedin, a small town on the Gulf Coast about twenty miles northwest of Tampa, and the bulk of my collecting was done in the immediate vicinity of that place. However, on February 18, a companion and I placed a small boat in Lake Tohopekaliga at Kissimmee, and with tent, cooking outfit and supplies, made our way down through three or four lakes, the largest of which was Lake Kissimmee, then down the river of that name to Lake Okeechobee, around the northern and eastern sides of that large body of water, then across it and down the Caloosahatchee River to the Gulf Coast below Fort Myers. Our trip occupied twenty-six days and was somewhat hurried, as my companion was a fisherman and hunter, little interested in entomology. As a consequence, most of my collecting was done in early morning, at the noon stops, and in the evenings after the camp duties had been completed. However, I had one full day at Kissimmee, three on the west shore of Lake Istokpoga, and a like number on the southwestern end of Pelican Bay, Lake Okeechobee, just east of Kreamer Island.

From the town of Kissimmee to the upper end of Lake Okeechobee the distance, as the crow flies, is about eighty miles; but, as the river runs, it is 240, the channel winding its way back and forth across a swamp, twenty to twenty-five miles in width, for the whole way. In only a few places are the banks of this river and Lake Okeechobee five to eight feet above the water, in most places not averaging that many inches. Cypress and bay trees, with branches thickly loaded with the long pendent "Spanish moss," scrub live oak, elbow brush and swamp elder, covered with

semi-tropical vines of many kinds, form the prevailing vegetation along the banks, while pickerel weed, water hyacinth, arrow heads, sawgrass and spatterdock fill the marshes. Along Lake Okeechobee a custard apple and wild papaw become plentiful, while here and there a rubber tree with spreading branches rears its head above the underbrush. My main collecting was done by beating and by overturning drift along the shores, though in a few places I was able to do some sweeping and sifting.

At Dunedin, and later on at Sanford, Eustis and Ormond, collecting was done in all possible ways. Of the insects taken during the trip of 1913 only the Coleoptera have been mounted and studied. About 900 species of these were secured during the two seasons. Could I have remained through May, probably as many more could have been taken, as the spring broods were just coming out in numbers when I had to leave.

Brief notes on the occurrence of a few of the rare or little known species will be given in this and a succeeding paper, together with descriptions of a number of forms apparently hitherto undescribed.*

209.**—**Pasimachus strenuus** Lec. A single example of this large Scaritid was taken near Ormond, March 24, from beneath a chunk in open pine woods. Length 37.5 mm.

Scarites californicus Lec. A half dozen or so from beneath logs half buried in the beach sand. St. Petersburg, January 23; Dunedin, January 20. Smaller than *subterraneus* Fab., much more shining and with the striæ of elytra almost obliterated. The two can be separated at a glance, though *californicus* is not recognized in our lists. Length 15—17 mm.

535.—**Pterostichus morio** Dej. A single specimen at Dunedin, January 17, from beneath chunk near border of lake.

536.—**Pterostichus faber** Germ. This was the most common species of *Pterostichus* taken, having been secured in six widely separated localities. Schwarz lists it as "very rare." It occurs singly or in pairs beneath rubbish along streams or ponds. Of this genus and *Ecarthrus* I took but five species in the two winters,

*Notes on 55 other species of Coleoptera taken by me at Ormond in the early spring of 1899 will be found in the appendix to my "Nature Wooing at Ormond by the Sea."

**The numbers are those of the Henshaw Check List and Third Supplement.

and Schwarz lists but six, three of which are identical with mine. In Indiana thirty species have been taken, while in individuals they are here among the most common of the Carabidæ.

Diplochila nupera Casey. A single example from the border of Arch Creek (eight miles north of Miami), March 21. Readily distinguished by its small size and the rectangular hind angles of thorax. Length, 10 mm.

719.—**Dicælus quadratus** Lec. One specimen at Fort Myers, March 6.

720.—**Dicælus carinatus** Dej. One specimen from near St. Petersburg, January 17. Both this and the preceding from beneath chunks in low damp woods.

935.—**Pinacodera platicollis** Say. A number were beaten from large bunches of "Spanish moss" (*Tillandsia usneoides* L.) at Dunedin, Lake Okeechobee and Ormond.

992.—**Chlænium herbaceus** Chev. Twenty or more specimens of this beetle, usually regarded as very rare, were taken from beneath boards, etc., along the borders of some small fresh water lakes just back of Dunedin. January 21-April 1.

1132.—**Selenophorus fossulatus** Dej. Common beneath dried cow dung in open pine woods near Sarsota. February 15—March 2.

1152.—**Acupalpus longulus** Dej. Taken by sifting at Dunedin, Lake Okeechobee and Sanford, January 24—March 30.

Canthydrus floridanus, sp. nov.

Short, ovate, strongly convex. Head and thorax reddish-yellow, with a blackish or fuscous cloud on occiput and middle of apical half of thorax; elytra dark brown; antennæ, under surface and legs pale reddish-yellow. Head and thorax without punctures except a few coarse ones along the basal half of latter. Elytra with numerous irregularly placed, very shallow punctures. Length 2—2.2 mm.

Described from five specimens taken from beneath rubbish at Kissimmee and on the southeastern shore of Lake Okeechobee, February 16—March 6.

Shorter and more strongly convex than either *gibbulus* Aube or *puncticollis* Crotch. Prosternal process between the front coxæ narrower and elytral punctures finer and more shallow than in either.

Caelambus princeps, sp. nov.

Broadly oval, subdepressed above, strongly convex beneath. Head, elytra and narrow front and hind margins of thorax dark reddish or piceous brown; disc of thorax, under surface and legs pale reddish brown; antennæ and palpi still paler. Eyes very finely granulate, separated by one and one-third times their own diameters. Clypeus broadly rounded, finely but distinctly margined. Head and thorax finely, sparsely and irregularly punctured; elytra conjointly one and one-fourth times longer than wide, a little more coarsely, more regularly and aciculate punctate; both they and the under surface very finely and indistinctly alutaceous. Meso- and meta-sterna and abdomen finely, sparsely and irregularly punctate, the punctures shallow. Length 4.5 mm.; width 2.8 mm.

Described from a single example taken March 6 from beneath decaying water hyacinth on the southeast shore of Lake Okeechobee.

Mr. John D. Sherman, Jr., of Mount Vernon, New York, a special student of the Dytiscidæ, to whom the specimen was sent for examination, says, "It is undoubtedly a new and very striking species, in size and shape reminding me of *Pachydrus brevis* Sharp from Porto Rico."

1661.—**Helopeltis larvalis** Horn. One, March 4, from beneath chunk half buried in the mud of a tide-water marsh near Sarasota.

Megilla fuscilabris decepta, var. nov.

Form of the common *fuscilabris* Muls. (*maculata* DeG.,) but smaller. Ground colour above a paler red. Head wholly black; thorax with four small black spots on the basal half, these arranged either obliquely in pairs in the form of a little crown, or with the front pair united behind to form a small V, or with all four united making an irregular crescent which encloses a small red spot in front of scutellum; elytra with the subapical spots of *fuscilabris* usually united to form a common spot on the suture; tibiæ more or less reddish, especially so near base. Length, 5 mm.

Swept from low herbage. Sanford, March 28; Ormond, April 14. Mr. Chas. W. Leng, of New York City, has nine specimens from the Angell collection taken at Key West, Fla., without date. Both *fuscilabris* Muls. and *floridana* Leng have a large pale triangular

spot on head, this very rarely wanting in the former. *Fuscilabris* has two common sutural spots and four spots on each elytron; *floridana*, one sutural spot and five spots on each elytron, while *decepta*, in all but one or two of the known specimens, has three sutural spots (scutellar, postmedian and subapical) and three spots on each elytron. The spots are much larger than those of *floridana* and, excepting the scutellar one, more subequal in size than in either of the other forms. The upper surface is much less distinctly alutaceous than in either. I found *floridana* to be quite common in February on the spatter-dock (*Nymphæa advena* Soland.) along the Kissimmee River.

***Neoharmonia venusta dissimila*, var. nov.**

Differs from the typical *venusta* in being more rotund; in having the head wholly black, the black spots of thorax enlarged and coalesced to form a single large three-lobed discal blotch, the median lobe of which reaches the front margin; and in the four median black spots of elytra being wholly wanting, thus leaving the two basal spots on each, and the common irregular subapical cross-bar. Length 6.5 mm.

One specimen beaten from elder blossoms on the southeast shore of Lake Okeechobee, March 6. Mr. Wm. T. Davis, of New Brighton, Staten Island, New York, reports that he has a specimen of var. *dissimila* very similar to the one above described, but having the thorax coloured as in typical *venusta*. It was beaten from the black willow (*Salix nigra* L.) on the shore of Plummer's Island, Maryland. June 25, 1911.

***Neoharmonia notulata* Muls.** One beaten from oak shrubs on Istokpoga Creek, February 26. It has the thorax coloured as in the above variety of *venusta*, the elytra black with a large irregular red spot on middle of each.

***Psyllobora 20-maculata pallidicola*, var. nov.**

Smaller and paler than *20-maculata*, not alutaceous and much less distinctly punctate; thorax wholly pale, without the spots seen in that and other described forms. Elytra without common sutural spots, the others rather large and well defined, with three near middle of disc more or less connected. Length 1.8—2 mm.

Beaten from foliage of the wax-myrtle or bayberry (*Myrica cerifera* L.), Dunedin, January 18; Lake Istokpoga, February 25; Ormond, April 13.

I have followed Leng in making this a variety of *20-maculata* Say, though it is my opinion that in time all the more southern non-alutaceous and finely punctate forms will be recognized as distinct from that common northern species, though closely related among themselves.

3086.—**Axion tripustulatum** DeG. Quite common on oak and myrtle near Dunedin; also at Bassenger, Arch Creek and other places. January 24—March 30.

9906.—**Novius cardinalis** Muls. Five examples of this introduced species were beaten from wild grape along the borders of a large orange grove near Dunedin, January 20.

Aditoma bifida Casey. This peculiar Colydiid was taken in small numbers both at Sanford and near Oneca, January 13—February 10. It occurs beneath the bark of dead pine in open woods.
Trogoderma fascifera, sp. nov.

Oblong-oval, robust. Black, feebly shining; elytra with a common broad dark red antemedian band, the hind edge of which is concave on each elytron, and the front one more broadly and obliquely so; tibiæ, tarsi and basal joints of antennæ reddish-brown. Eyes entire, rather small, widely separated. Antennæ of male serrate from the fourth joint. Head finely and densely reticulate-punctate. Thorax nearly twice as wide as long, as wide at base as elytra, sides feebly rounded into apex; disc with middle third finely and sparsely punctate, its sides punctate like the head. Elytra sparsely and finely punctate, each puncture bearing a short, prostrate grayish hair. Pro- and meso-sterna with large shallow variolate punctures; abdomen finely and rather densely articulate-punctate. Length 4.5 mm.; width 3 mm.

Described from a single male taken February 25 by sifting on the west shore of Lake Istokpoga. Readily known by its large size and the reddish cross-band of elytra which reaches from the middle more than half way to base, and sends a spur along each side of suture nearly to the scutellum. The prosternal process is feebly concave and finely carinate for its entire length, and the antennal fossæ are wider and more shallow than in our other species.

(To be continued.)

THE CASE OF *VANESSA CALIFORNICA*.

BY E. J. NEWCOMER, STANFORD UNIVERSITY, CAL.

The controversy between Prof. F. M. Webster and Dr. J. McDunnough over the occurrence of *Vanessa californica* in Northern California and Southern Oregon, and regarding its larval food plants, has interested me because I was in the region affected during a large part of July, 1911. Their articles appeared in the Canadian Entomologist for April, July and October of last year. Without antagonizing either gentleman by remarks concerning his statements, let me give an account of what I saw and recorded.

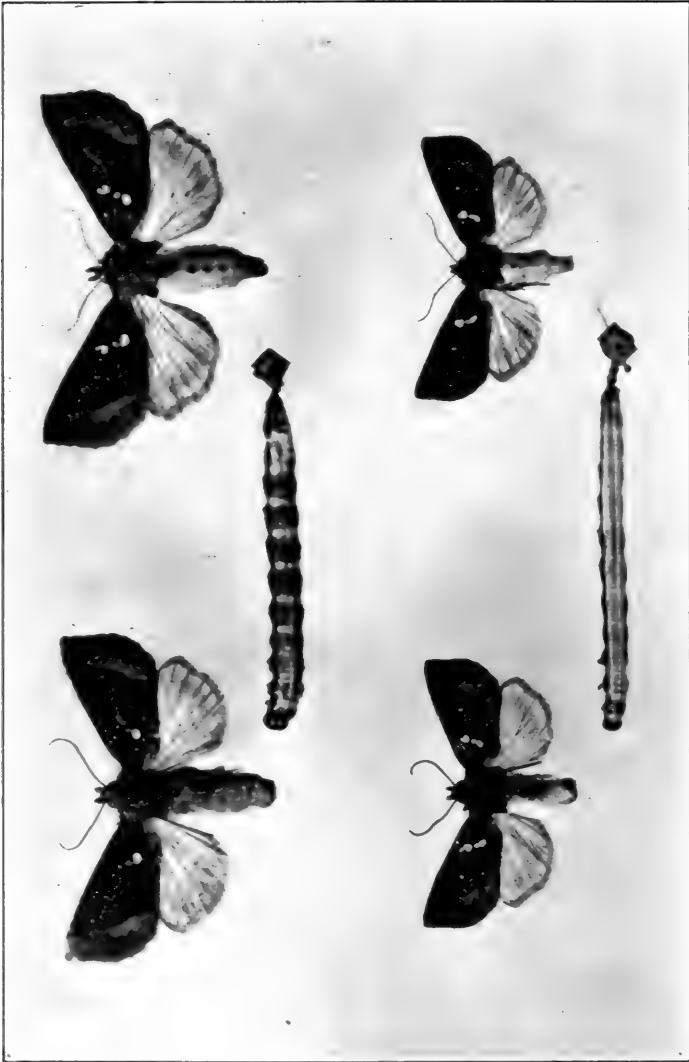
I spent two weeks, from the twelfth to the twenty-seventh of July, 1911, near Susanville, in Lassen Co., California, only a hundred miles or so south of Lakeview, Oregon, and in exactly the same sort of region—namely, open, arid country, irrigated and devoted largely to the raising of alfalfa, and bounded on the west by the wooded range of the Sierra Nevada. At the end of the two weeks, I went south through the Sierras for a hundred and fifty miles.

At Susanville, during the early part of my stay, I found numerous patches of "buck brush" or "snow brush" (*Ceanothus* sp.) in the timbered regions literally alive with the black, spiny, half-grown caterpillars of *Vanessa californica*. Frequently the bushes would be practically stripped, and the caterpillars would be found migrating in search of other bushes. By the time I was ready to start south, many of the caterpillars had pupated, and there were a few adults flying about. I saw numbers of skeletonized bushes with chrysalids suspended from their branches, and if a bush were shaken or disturbed, the chrysalids immediately started swinging back and forth, and would continue this motion for several seconds, producing a curious rattling sound. As I went farther south, I saw more of the butterflies, but I did not observe any large swarms, though a week or so later there were accounts in various newspapers concerning these swarms, and they were described to me by several persons who saw them.

Now for the worms which attacked the alfalfa and other field crops. While I was at Susanville, a farmer, hearing that I knew

something about insects, asked me to come down to his alfalfa patch and see what the worms were that were destroying the alfalfa. On the way I noticed considerable numbers of the butterfly *Colias eurytheme* flying about over the alfalfa, and I thought the worms might be the larvæ of this species, but an examination of the alfalfa failed to show any of them. However, on arriving at the farm house, I was taken out to a large field where the first crop of alfalfa had been cut and was lying on the ground in piles. The farmer turned over one of these piles, and beneath it were hundreds of half-grown cutworms, smooth, and of a greenish or gray colour, with some dark markings. By carefully looking around, I was able to find some of these scattered about the open field, but most of them were congregated under the piles of hay. The young shoots of the second crop of alfalfa, which begin to grow as soon as the first crop is cut, were being eaten back as fast as they grew, and it was evident that there would be little, if any, second crop. The field looked as dry and barren as a stubble field. Such were conditions in this particular patch. In the next field, which was separated from the first by an irrigating ditch, the second crop was flourishing and the field quite green. I failed to find more than a few cutworms in this field. Apparently but few eggs had been deposited here, and the worms in the adjacent land were unable to cross the ditch. During the same day I saw and heard of several other fields badly ravaged by the cutworm, but, though where present it was very numerous, it was by no means universally distributed through the alfalfa region in the vicinity of Susanville. The worms were without doubt cutworms or army-worms of the family *Noctuidæ*. I brought specimens to Stanford University, but was unable to determine the species. As I remember them, however, they were very similar in appearance to the common army-worm.

The farmers were at a loss to account for the sudden appearance of this pest, as they had not noticed the worms until they were half-grown, and one of them ventured the suggestion that they had come down in the last rain storm. He also suggested that a heavy roller passed over the field would kill many of the worms, and this, combined with a careful use of poisoned baits, would undoubtedly be the most effective means of controlling the pest.



PAPAPEMA LYSIMACHIAE AND P. PURPURIFASCIA.

NEW SPECIES AND HISTORIES IN PAPAPEMA SM.
(LEPID.)

BY HENRY BIRD, RYE, N.Y.

(Continued from Vol. XLV, p. 126.)

More than ten years ago the writer encountered a *Papaipema* larva at Rye boring Loosestrife, *Lysimachia quadrifolia*, and in the interim a wide occurrence of its work has been noted. At that time the imago was successfully reared, and there was surprise that it appeared to be but a small form of the well-known *P. purpurifascia* G&R, which was known to have an indigenous foodplant in Columbine, *Aquilegia canadensis*. In 1902 (Can. Ent., vol. XXXIV, p. 118) attention was called to a difference between these larvæ, but the moths seemed so nearly identical except in size, it was believed the small diameter of the Loosestrife stems might account for the reduced size of the resultant moth.

As the years go by and more extended observations on the habits of the genus accrue, it is noticed how the Columbine feeders begin to emerge weeks in advance of the other, being one of the earliest of the local species in that respect. True, it continues to emerge for over a month and overlaps the Loosestrife feeder but there seems always two weeks difference with the earliest ones of the respective forms. The *Papaipema*, as with most mid-season moths, are quite prompt on the dates of their first appearance, and as these two larvæ often flourish within a few feet of each other, such discrepancy was a point to be considered. It is found the latter is much the commoner and more generally diffused, due doubtless to a more widespread foodplant. Finally, a familiarity with a large series of moths, resultant of personal field work from southern Canada to Delaware, makes clear the points of difference that are constant with the imago, and careful comparisons of the larvæ through their various stages, establishes the fact that we have clearly to do with two well-defined species. Of some weight in a general summing up, the Loosestrife feeder is found to be kept down by a parasite all its own, while *purpurifascia* falls to the general ones, mainly the *Hemiteles* and a *Ceromasia* fly, that are common checks throughout the genus.

Before considering more specifically this smaller, narrower winged species, which is clearly the more primitive of the two, it

is important to refer to the synonymy, since they have been always confused.

In 1862 Harris described the Columbine feeder as *Gortyna leucostigma*, (Ins. Inj. Veg., p. 440), but this name was preoccupied. Grote and Robinson advanced the name *purpurifascia* in 1868 (Trans. Amer. Soc., vol. I, p. 341), describing from two specimens, and they clearly had both forms before them. They first, and at much length, described the Columbine form, a female, and their figure (plate 7, fig. 51), confirms what they clearly intended as representing their species. They described their other specimen, a male, last and in a few words, noting, however, the differences of ornamentation that are distinguishing features between the two forms. While it seems very clear, lest future questions arise, the name *purpurifascia* G&R, is herewith restricted to the above-mentioned female type of their description. This will accord agreeably to later interpretations and uses of the name, in the more important references where figures have been given. Slingerland, Can. Ent., vol. XXIX, 161; Holland, Moth Book, pl. XXVI, fig. 7; Hampson, Cat. Lep. Phal. Br. Mus., pl. CXXXVIII, fig. 25, all figure the Columbine borer as *purpurifascia*.

For the Loosestrife borer the following specific name is proposed:

***Papaipema lysimachiae*, n. sp.**

Size small, form and pattern typical, sexes similar. Head reddish purple, white scales at base of ciliate antenna; thoracic tufts and patagiæ edged in deeper purple. Abdomen of the luteous yellow of the secondaries, the tufts minute. Primaries rich yellow powdered with red brown, the basal, subterminal and median shade lines defined with the latter colour, and of usual delineation, the post median line double, the inner very finely drawn with red brown, the outer rather fasciate, dark purple or blackish, its course inwardly oblique and quite rigid after a sharp turn below the costa; subterminal line lunulate, fine, outwardly dentate on veins, emphasized as defining the glistening purplish subterminal space from the redder terminal area; a marginal line at base of purplish cilia. Basal spots, median field and apex of the bright yellow ground colour, the inner basal area and subterminal space reddish purple, the latter darkest and rather iridescent, but contrasts are not strong. The orbicular and double claviform show as three super-

imposed, pure white spots, united, except where cut by median vein, and linear, longer than with near ally. Reniform is of ground colour, inwardly marked at top and bottom by a white dot, never wholly white. Secondaries pale, luteous yellow with rows or purplish reflection that deepens in a marginal band. Beneath powdery, shaded with purplish. Size is very constant with no disparity in the sexes. Expanse, 27.5 to 31 mm. The male genitalia conform to the usual type pattern of the yellow species, the irregular, spinulated cucullus, the long curved harpe, dorsally edged in part with fine teeth, indicate the common generic features here. Habitat: Southern Canada and eastern United States generally through range of foodplant. Montreal and north shore of Lake Erie, Can.; Webster, N.H.; Buffalo, Albany, Staten Island, Rye, West Chester Co., N.Y.; Fairfield Co., Conn.; Newfoundland, N.J.; New Brighton, Pa.; Wilmington, Del. Type locality: To meet the desired exactitude, the locality of the particular male type example thus labelled is Polly Park Wood, N. 42 deg. W. 530 meters intersection of Purchase St. and Polly Park Road, Town of Harrison, West Chester Co., N.Y., U.S.A.

Twenty specimens showing equally the sexes are at hand. Paratypes will be placed in the U. S. National and British Museums; the male type with the author.

The larval period extends from the first week of June to Aug. 15, the larva hatching from the hibernated egg. As an instance of disparity, early *purpurifascia* moths begin to emerge by this last date. By the second larval stage the continuous dorsal stripe is conspicuous, that alone being unbroken. The colour is a warm shade of brown seemingly deeper on the middle by reason of the absence of side lines. In these early features it is similar to a dozen other species.

Stage IV.—Characteristics normal; head golden yellow, side marking not always present; body cylindrical, colour sienna brown, lines cream white, dorsal alone entire, a wide well-defined stripe; tubercles brown, IV the largest, about three times the size of spiracle, on joint ten III and IIIa tend to coalesce, IV large and low down, IVa above the line of spiracle and smaller.

Stage V.—Similar, the proportions cylindrical and attenuated.

Penultimate stage.—Little change, the ground colour lighter

and more of a pinkish hue, the cream-coloured lines hold their prominence, the subspiracular strong on thoracic joints; tubercles the same.

Maturity.—An exceedingly cylindrical larva of small diameter; the colour fades to a yellowish translucence, the demarkation of the lines is lost. Thoracic and anal plate of usual proportions, the former edged with black; tubercles have deteriorated in size, except on joint eleven I and II are the merest dots, IV holds its prominence, on ten IVa is sometimes wanting, but III and IIIa usually coalesce, on eleven their union is more clear. Setæ are weak and unnoticed without a lens. Larval length for the above stages: 24, 28, 31, 39 mm., respectively. General dates for pupation are August 12 to 18; for emergence, September 5 to 20.

The pupa is small and slender, light brown and shining, the white spots easily seen when about ready to disclose the moth; the cremaster is two fine spines curved at the point. Length 15 to 18 mm.

Lysimachia larvæ differ from *purpurifascia* in the character of the dorsal line, the size and colour of the body, while the tubercles of the latter are larger and black. The dorsal stripe is a larval character in the genus offering ready aid in differentiating certain sections. This line may be broken abruptly on the first four abdominal segments; it may cross this as a mere thread, or it may be a broad even stripe in its entirety. The Loosestrife borer is of the latter class, while *purpurifascia* has a narrow, thread-like line, indistinct and reduced on the joints in question especially in the earlier stages. They differ more autotypically than the larvæ of such dissimilar species in the moth state, as *necopina* and *harrisii*. Throughout the month of June particularly the browned foliage of the Loosestrife here and there point out the presence of this larva where a stem has been bored, and died. It is always the upland, whorled, or four-leaved species, *quadrifolia*, that is selected by this larva, *L. terrestris*, a frequenter of wet places not being infested, though its stem would be more commodious. The latter is often bored by a stragglng *cataphracta* or *marginidens*, but my experience is negative as concerns *lysimachia*. The former is very persistent, its running rootstocks often matting an area to the exclusion of other plants. The even whorled foliage massed in clumps quickly catches the eye, and forms a background on which

the leathery brown leaves of the bored stem stand out strongly. So one may note the presence of this borer in new territory, even from trolley car or railway train. The principal and only parasite found so far subsisting on this species has not yet been obtained in the imago. There are two or more broods of them surely, since as early as stage four many of the borers have succumbed and the parasites hatched by June 30. The parasitic larvæ that mature by August 10 hibernate after spinning up in a tough cocoon. It is an hymenopterous species, with a larva in miniature like that of *Sphecius*, having pointed, extensile, anterior segments, and attacks the host externally. They attain a length of four millimeters, subsist on the juices of the dead host, and mature rapidly, a necessity under the circumstances. From two to ten may infest one host, and they spin their flattened, tapering cocoons together in a mass in a nearby portion of the larval tunnel. At a late date in the fall they are yet unchanged to a pupal form. In our rather extended breedings of this group heretofore this parasite has not been encountered with any other species.

BOOK NOTICE.

THE BOMBIDÆ OF THE NEW WORLD.—Transactions of the American Entomological Society, XXXVIII, pp. 177-486, issued Feb. 4, 1913; XXXIX, pp. 73-200, issued July 17, 1913; 22 plates. By H. J. Franklin, Ph. D.

That this extensive monograph of the genera *Bombus* and *Psithyrus* has taken its turn as one of the regular series of papers published by the American Entomological Society, and has therefore appeared without any flourish of trumpets, will not obscure the fact that it is not only a work of great merit, recording the author's painstaking investigations into structural and other characters whereby the species of this somewhat difficult group are well separated with the aid of the material at his disposal—about 5000 North American and about 1000 South American specimens comprising many public and private collections, but also a work that is of especial value to Canadians because of the important position that bumble-bees occupy in the insect fauna of Canada. Of the 47 species of *Bombus* recorded from the region north of Mexico 37 have been found north of the United States

(*B. morrisoni* may be added, for it has been taken by the Rev. W. M. Roger at Ashcroft, B.C.), while no less than eleven of these have not been taken south of Canada. It can almost be said that no part of this vast country is without the bumble-bee, for the author mentions that *B. kirbyellus* Curtis has been taken at Port Foulke in $78\frac{1}{4}$ North Latitude. The same species has been met with on a high peak in New Mexico. In the Andes *B. opifex* has been taken at an altitude of 4000 metres and *B. coccineus* at 13,600 feet. Franklin says these are the highest New World records.

Like other modern workers on the Bombidæ, Dr. Franklin finds his classification mainly upon the structure of the genitalia of the males and finds that the New World species of *Bombus* fall into seven groups:

1. The Terrestris group, containing four species, the best known being *terricola* Kirby of the east and *occidentalis* Greene of the West, both energetic and prolific forms, as is *terrestris* in the palearctic. *Terricola* is probably heavily parasitised—it might more truly be said dragooned—here, as *terrestris* is in Europe by *Psithyrus vestalis* (sens. lata), of which the American form *ashtoni* Cr. has a similar distribution to that of *B. terricola*, though, as Franklin states, "there is not yet a single true New World account of a *Psithyrus* having been found in a *Bombus* nest."

2. The Borealis group, better known in Europe as the Subterraneus or Distinguendus group, comprising *borealis* Kirby in the northeast and *appositus* Cr. in the northwest.

3. The Dumoucheli group, containing four species north of Mexico, including the common Eastern species *pennsylvanicus* De Geer (= *americanorum* Fab.), which does not extend far into Canada, and the widely distributed *fervidus* Fab.

4. The Kirbyellus group, including five arctic and sub-arctic species.

5. The Pratorum group, containing no less than 23 species, or apparently distinct forms, in Canada and the United States.

The remaining two groups are made up of the species in which the males have bulging eyes, for which Robertson in 1903 erected the genus *Bombias*; (6) The Auricomus group comprising *auricomus* Robt. and *nevadensis* Cr. and (7) The Fraternalis group, consisting of seven species, of which only three have occurred in

Canada, *separatus* Cr., *morrisoni* Cr., and the widely distributed and chameleonic *rufocinctus* Cr.

A second part of the work treats of the species south of the United States. Here we find as many as twenty species of the *Dumoucheli* group, if we include the four northern forms, of which two have already been taken in Mexico, sixteen of the *Fraternus* group, only four of the *Pratorum* group, and no representative of any other group.

Dr. Franklin follows five of his groups into the Old World, but thinks that the *Auricomus* and *Fraternus* groups are not certainly known to be represented there. He has probably not seen the male of *Bombus cullumanus* Kirby, a rare and little known European species, of which *rufocinctus* appears to be the nearctic representative. The name *dumoucheli* Rad. is not employed by European workers, but it appears to be synonymous with *armeniacus* a Central Asiatic form allied to *pomorum* Panzer, the type of a well known group in Europe. Reference is also made by Dr. Franklin to five other groups occurring in the Old World, but, so far as is known, absent from America.

The author treats the genus *Psithyrus*, consisting of the parasitic bumble-bees in the same thorough and liberal manner as *Bombus*. Eleven forms of *Psithyrus* have been separated in the region north of Mexico, but three of these are unpaired sexes. The only record of a *Psithyrus* from South America is that of F. Smith from Brazil, but Dr. Franklin doubts if it was ever taken there.

In his work Dr. Franklin introduces new names for six *Bombid* species north of Mexico and for ten species south of the Mexican border. In the case of some forms the relationships are so close that Dr. Franklin considers "it must be entirely a matter of personal opinion whether they should be given full species rank or considered only a subspecies," a view with which none at this date will quarrel. The author also buries as synonymous a large number of old names. That he is well qualified to do this is evident from the fact that he has seen and examined "practically all of the types of species described by the New World workers on the group."

The twenty-two plates consist of illustrations of various structures, chiefly camera-lucida drawings of the genitalia and of

the hidden seventh and eighth ventral segments of the males of the different species. These two segments are called by Franklin the inner and outer spathæ, a term to discover the meaning of which a new reader anxious to determine specimens may spend a minute or two.

Painstaking monographs of a small group such as this—Swenk's *Bee Genus Colletes* may be cited as another though much smaller example—in which structure is used as the basis of specific distinction and careful descriptions are freely supplemented by good drawings, published without either undue haste or delay, constitute construction work of the best kind, and entomologists must accord Dr. Franklin a hearty vote of thanks for the results of several years of patient labour. Who will treat in a similar manner other groups of bees and wasps now calling for revision, and thus help to reduce the heaps of half-worked ore that have accumulated in hymenopterology to ingots of bright metal? Careful investigators who undertake such work should receive the liberal support of collectors and curators. But to follow the suggestion of a speaker at the recent Convention of the American Association for the Advancement of Science at Cleveland, who proposed that a committee should be formed to apportion to each scientific investigator his task, would be to rob such work of its main attraction.

Dr. Franklin hopes at a later date to present a further paper on the Bombidæ, dealing chiefly with habits and phylogeny. This will be eagerly looked for.

F. W. L. S.

We regret to learn that PROFESSOR JOHN HENRY COMSTOCK, who has been for thirty-nine years instructor and professor of Entomology at Cornell University, and the author of various text-books and works on the subject, will retire from duty at the end of the present academical year. His many friends throughout America join in wishing him many years of rest from educational duties, while no doubt he will continue his scientific work.

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No. 3

NEW OR LITTLE KNOWN SPECIES OF APHIDIDÆ.

BY JOHN J. DAVIS, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

(Continued from page 51.)

Wingless viviparous female. (Pl. IV, figs. 11-13.)

Macrosiphum venæfuscæ, n. sp.

Body uniformly pale green. Antennæ blackish, excepting segments I, II, and the extreme base of III, which are pale greenish brown; placed on prominent frontal tubercles; sparsely setose; 1 to 3 circular sensoria in a row on basal portion of segment III; filament of segment VI longest; total length greater than that of body. Beak just reaching to coxæ of third pair of legs. Eyes black.—Basal half of femur with a slight greenish tint, the distal half pale brown; tibia and tarsus blackish. Cornicles black, reaching to or a little beyond tip of cauda; distal end plainly reticulated and noticeably constricted; gradually tapering, the tip being much narrower than base. Cauda approximately one-half the length of cornicles, ensiform, and sparsely hairy.

Measurements from specimens mounted on slides in balsam: Length of body 2.55—2.75 mm., average 2.67 mm.; width of body 1.20—1.35 mm., average 1.30 mm.; length of middle tibia 1.70—2.24 mm., average 1.98 mm.; length of hind tibia 2.44—3.02 mm., average 2.76 mm.; length of hind tarsus 0.135 mm.; length of cornicles, average 0.942 mm.; length of cauda, average, 0.516 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

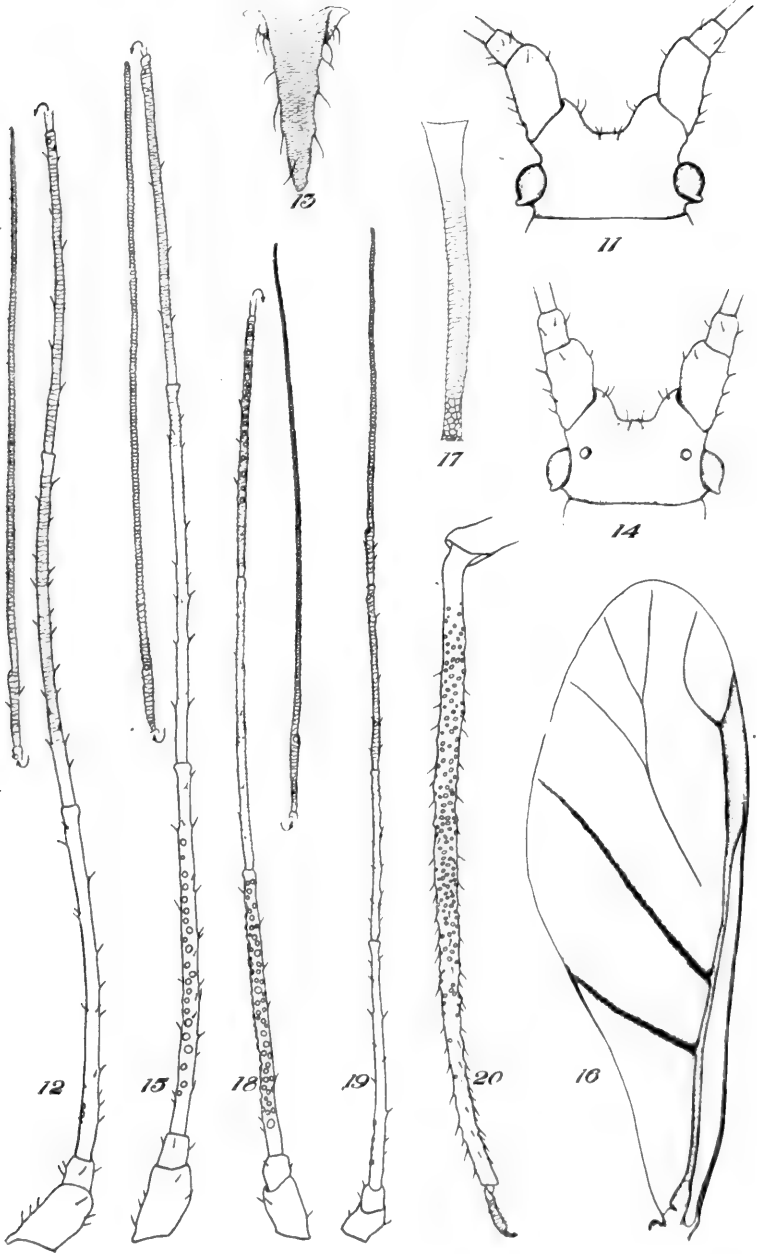
I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm. 0.209	mm. 0.104	mm. 1.043	mm. 1.026	mm. 0.922	mm. 0.191	mm. 1.391*
.209	.096	1.043	1.043	.956	.200	1.565
.191	.087	.922	.835	.713	.....	.....
.226	.096	1.069	1.061	.922	.191	.....
.217	.096	1.069	1.078	.922	.191	.....
.209	.104	1.113	1.078	.930	.217	.....
.217	.096	1.113	1.018	.922	.209	.....
.226	.096	1.165	1.165	.922	.209	.....
.....	.....	1.061	1.078	.904	.200	1.391†
.....	.....	1.069	.974	.887	.191	1.465†

*Slightly shriveled at extreme tip.

†Extreme tip apparently broken off.

Winged viviparous female. (Pl. IV, figs. 14—17.)

Head and thoracic plates very pale yellowish brown. Antennæ placed on prominent frontal tubercles; very long, being about one and one-half times the length of the body; sparsely setose; black, excepting segments I, II, and extreme base of III, which are concolorous with head; filament of segment VI longest; 14 to 24 (usually about 19) circular sensoria more or less in a row on segment III, and the usual distal ones on segments V and base of VI. Eyes black. Fore wings with the first anal and cubitus blackish, with a conspicuous fuscous border; other veins brownish and slender; media 1 and media 2 normally branching at one-half the distance where media 3+4 branches to the tip of wing. Femur pale green, excepting distal third, which is dark brown; tibia dark brown, with the tip black; tarsus black. Abdomen pea green in colour. Cornicles black, reaching to a little beyond tip of cauda, cylindrical and tapering toward tip, the base being nearly twice the diameter of the apex; distal end reticulated. Cauda concolorous with abdomen, ensiform, sparsely hairy, and approximately one-half the length of cornicles.



MACROSIPHUM VENAEFUSCAE, n. sp.

Measurements from specimens mounted in balsam on slides: Length of body 2.13—2.63 mm., average 2.38 mm.; width of body, average, 0.98 mm.; length of forewing, average, 4.10 mm.; width of forewing, average, 1.47 mm.; length of middle tibia, average, 2.05 mm.; length of hind tibia, average, 2.87 mm.; length of hind tarsus, average, 0.117 mm.; length of cornicles, average, 0.93 mm.; length of cauda, average, 0.45 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm.	mm.	mm.	mm.	mm.	mm.	mm.
0.226	0.035	0.956	1.026	0.817	0.203	.....
.217	.037	.947	1.043	.....	.....	.....
.226	.037	1.026	1.113	.922	.182	.....
.217	.087	1.026	1.139	.956	.....	.....
.226	.035	.991	1.026	.904	.191	.....
.226	.104	1.036	1.113	.974	.191	1.803
.203	.087	1.078	1.113	.991	.200	1.731
.217	.037	1.036	1.043	.991	.226	.....
.203	.104	1.036	1.043	.956	.226	.....

Winged male. (Pl. IV, fig. 18.)

Entire body brownish pink to light red. Antennæ black, excepting segments I and II, which are a dusky reddish brown to blackish; very sparsely setose; placed on prominent frontal tubercles; total length greater than that of body; filament of segment VI longest; segment III with 53 to 67 circular, somewhat tuberculate sensoria, irregularly placed; segment IV bare of sensoria; segment V with 17 to 26 sensoria, not including the usual distal sensorium, somewhat regularly placed, and the usual distal ones on segment VI. Eyes blackish; ocelli prominent. Legs black, excepting basal half or third of femur. Wings as in winged viviparous female. Cornicles black, reaching a little beyond tip of cauda, cylindrical, and slightly larger at base than at apex; distal end

reticulated. Cauda concolorous with abdomen, ensiform, sparsely hairy, and about one-third the length of cornicles.

Average measurements from specimens recently mounted on slides in balsam: Length of body 2.23 mm., width 0.82 mm.; length of wing 4.20 mm., width 1.66 mm.; length of middle tibia 2 mm., of hind tibia 2.48 mm., of hind tarsus 0.116 mm., of cornicle 0.67 mm., of cauda 0.203 mm.

Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm.	mm.	mm.	mm.	mm.	mm.	mm.
0.156	0.087	0.852	0.869	0.782	0.208	1.478*
.....	.....	.843	.869	765	.....	.....
.174	.087	.904	1.026	.869	.200	.....
.156	.078	.895	.974	.878	.191	1.565
.174	.096	.904	.956	.740	.182	.....
.174	.096	.939	.930	.740	.182	.....
.165	.096	.922	1.051	.791	.182	.....
.174	.096	.939	1.069	.835	.191	1.548

* Extreme tip appears to be broken off.

Wingless oviparous female. (Pl. IV, figs. 19-20.)

Colour of head and thoracic segments between pale cadmium yellow and chrome yellow. Antennæ blackish, excepting segments I and II, which are dusky, and extreme base of III, which is pale; sparsely setose; filament of segment VI longest; 4 to 7 circular sensoria in a row on segment III and the usual distal one on segments V and base of VI. Eyes dark red. Beak reaching to coxæ of second pair of legs. Femur pale, becoming dusky at tip; tibia brownish, with the tip black; tarsus black. Hind tibiæ entirely black, conspicuously swollen, and bearing numerous (about 200 to 260) small, irregularly shaped and irregularly placed sensoria on the basal three-quarters; the sensoria are closely placed and

many are coalesced. Abdomen pale green, the segments posterior to the cornicles usually concolorous with thorax. Cornicles concolorous with abdomen at extreme base, the tip black, and the remainder brownish to blackish; not reaching to tip of cauda; cylindrical, the top only slightly narrower than base; the distal end reticulated. Cauda concolorous with abdomen and with a slight duskiness, the tip blackish; ensiform; very sparsely hairy; less than half the length of cornicles.

Average measurements from specimens on slides in balsam, made soon after mounting: Length of body 2.55 mm., width 1.31 mm.; length of middle tibia 1.31 mm., of hind tibia 1.75 mm., of hind tarsus 0.135 mm., of cornicle 0.80 mm., of cauda 0.35 mm. Antennal measurements as follows:

* ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm. 0.122	mm. 0.078	mm. 0.513	mm. 0.513	mm. 0.547	mm. 0.174	mm. 0.956
.....	.....	.748	.542	.547	.165	.939
.....	.....	.887	.574	.....	.....	.....
.130	.087	.817	.565	.591	.156	.....
.....	.....	.852	.591	.574	.....	.....
.....	.....	.869	.582	.626	.....	.....

Described from specimens collected at La Fayette, Ind., on crested wild buckwheat (*Polygonum cristatum*), September 4 and 6, 1911, and on curled leaf dock (*Rumex crispus*), October 13, 1911, and October 26 and November 19, 1912. We have also collected it on *Polygonum cristatum* at Lancaster, Wis., September 26, 1911, and have received it from Mr. W. J. Phillips, who collected it "from a vine in clover field" at Warsaw, Ind., August 18, 1911. Mr. J. T. Mouell also collected this species at St. Louis, Mo., October 4, 1911, on *Rumex*. The viviparous females occur on the *Polygonum*, while the males and oviparous females occur in the

fall of the year only, on *Rumex*, on which plant the eggs are laid. The details of this migration from *Polygonum* to *Rumex* have not been worked out.

Macrosiphum tiliaë (Monell).

When in Madison, Wis., the past fall (September 10, 1912) the writer found this rather rare species not uncommon on basswood (*Tilia americana*), both green and pink viviparous females, as well as the sexes, being observed. Previous to this collection, he had found this species on only two occasions—July 23, 1908, at Chicago, Ill., only a single winged viviparous female being taken, and July 12, 1909, at the same place, only two wingless viviparous females being obtained.

Winged viviparous female. (Pl. V, figs. 21—23.)

(Described from specimens obtained at Madison, Wis.)

Green Form: Head pale brownish, eyes black. Antennæ placed on prominent tubercles as shown in illustration; black, excepting segments I and II, which are concolorous with head; reaching beyond tip of body; filament of segment VI much the longest, being about twice the length of III; segment III bearing 11 to 16 circular sensoria in a row; segments V and base of VI with the usual distal sensoria. Beak reaching just to coxæ of second pair of legs. Thorax dark green. Wings with narrow brownish veins. Media₁ and media₂ branching at about one-half the distance from where media₃₊₄ branches to tip of wing; this, however, not being a constant character. Abdomen pale green, immaculate. Cornicles black, reaching a little beyond tip of cauda, noticeably widened at base, and slightly constricted near tip; the tip plainly reticulated. Cauda pale green, ensiform, sparsely covered with moderately long hairs, and about one-third the length of cornicles. Anal plate rounded.

Average measurements from four specimens in balsam: Length of body, not including cauda, 2.63 mm., length including cauda 2.79 mm.; width of body 1.01 mm.; length of wing 4.10 mm.; width of wing 1.40 mm.; length of cornicle 0.88 mm., of cauda 0.28 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm.	mm.	mm.	mm.	mm.	mm.	mm.
0.194	0.097	0.890	1.064	0.948	0.251	.....
.194	.097	.871	1.026	.910	.232	1.587*
.194	.097	.871	.948	.890	.232	1.548*
.194	.097	.890	1.045	.968	.232	.....
.213	.097	1.006	1.122	.968	.213	.....
.194	.097	1.006	1.142	.....	.....	.....
.....	.....	.697	.735	.755	.194	.....
.....	.....	.697	.774	.755	.194	1.316†

* Extreme tip broken off.

† Extreme tip is shriveled.

The *pink form* is similar to the foregoing excepting as follows: Thorax dark reddish green and abdomen decidedly pinkish. Cauda concolorous with abdomen.

Wingless viviparous female.

Described from two specimens collected at Chicago, Ill.

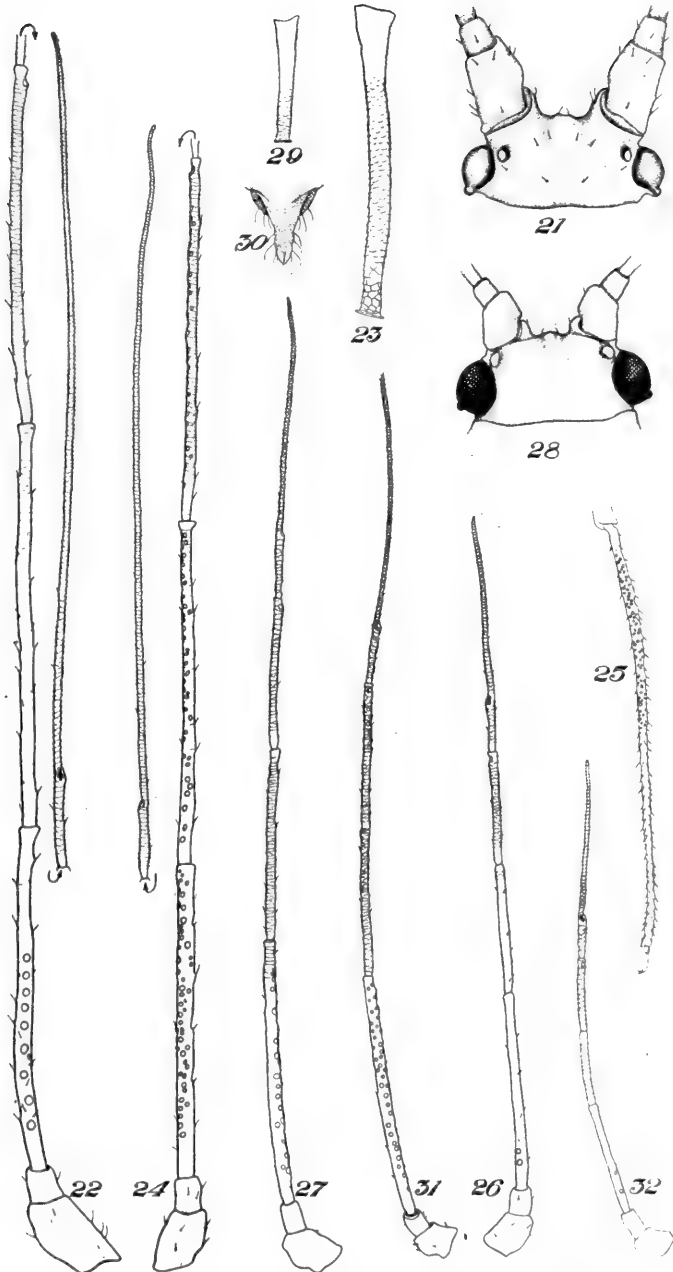
Head yellowish green. Eyes blackish. Ocelli absent. Antennæ black, excepting the two basal segments, which are concolorous with head; the filament of segment VI broken off in all specimens at hand, hence the relative length of segments can not here be given; segment III with two or three small, circular, inconspicuous sensoria near base. Legs with femora pale yellowish, excepting distal end, which is dark brown; tibiæ and tarsi dark brown to black. Abdomen pale green. Cornicles black, excepting at extreme base, where they are pale green; otherwise as in winged form. Style pale yellowish; otherwise as in winged form.

Measurements: Length of body not including style 2.44 mm., to tip of style 2.60 mm.; width 1.04 mm.; length of cornicles 2.2 mm.; of cauda 0.62 mm.

Winged male. (Pl. V, fig. 24).

Described from one specimen collected September 10, 1912, at Madison, Wis.

No colour notes made. This form differs from the winged



MACROSIPHUM TILIAE AND MYZUS LYCOPERSICI

viviparous female as follows: It is a smaller individual. Antennæ much longer than body, relatively longer than in the viviparous form; segment III bears 60 to 70 irregularly placed circular sensoria, segment IV bears from 45 to 50, segment V with 29 to 31, not including usual distal one, more or less in a row, and segment VI bare, with the usual distal ones.

Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm. 0.155	mm. 0.077	mm. 0.853	mm. 0.968	mm. 0.948	mm. 0.175	mm. 1.800
.155	.077	.832	.910	.968	.193	1.800

Wingless oviparous female. (Pl. V, fig. 25).

Described from one specimen collected September 10, 1912, at Madison, Wis.

Head very pale brownish. Antennæ black, excepting segments I and II, which are concolorous with head; total length greater than that of body; filament of segment VI much the longest; segment III with a single inconspicuous circular sensorium near base; the usual sensoria at tips of segments V and base of VI. Thorax and abdomen pale greenish yellow. Hind tibia swollen and bearing a large number of irregularly placed, circular sensoria. Cornicles blackish, pale at base; reaching a little beyond tip of cauda. Cauda concolorous with abdomen. Otherwise as in the wingless viviparous female.

Measurements from one specimen in balsam: Length of body not including cauda 2.17 mm.; length including cauda 2.30 mm.; width 1.006 mm.; cornicle 0.89 mm.; cauda 0.51 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm. 0.193	mm. 0.096	mm. 0.774	mm. 0.794	mm. 0.813	mm. 0.213	mm. 1.490
.193	.096	.794	.813	.832	.213	1.432

Through the kindness of Mr. J. T. Monell the writer has had an opportunity of examining the type slide of this species—Monell No. 151. On the slide are two winged viviparous females, and the head and antennæ of one wingless viviparous female, all mounted in balsam under one cover glass. The data on these specimens follow:

Winged viviparous female: Antennæ with 12 to 15 circular sensoria in a row on segment III and the usual distal ones on V and base of VI. Cornicles reaching beyond tip of cauda, long, cylindrical, widened noticeably at base, slightly constricted near tip; the tip plainly reticulated. Wing veins narrow, the branching media obscured. Measurements as follows: Length of body not including cauda 2.51 and 2.63 mm. respectively; length of cornicles 0.968 mm., of cauda 0.278 mm.; length of hind tibia 2.98 mm. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm. 0.193	mm. 0.037	mm. 0.968	mm. 1.045	mm. 0.987	mm. 0.232	mm.
.193	.037	.948	1.045	1.006	.232	.....
.193	.097	.948	1.084	.968	.213	1.761
.....	.....	.987	1.084	.968	.213	1.703*

* Shriveled at tip.

Wingless viviparous female. Segments III of the two antennæ bear 3 and 5 small circular sensoria respectively, near the base, and the usual distal sensoria on V and base of VI. Antennal measurements as follows:

ANTENNAL SEGMENT NO. 1m.

I.	II.	III.	IV.	V.	VI. (base)	VI. filament
mm. 0.193	mm. 0.097	mm. 1.064	mm. 1.026	mm. 0.968	mm. 0.232	mm.
.193	.097	1.064	1.045	.929	.232	1.819

NOTES ON THE WINTER AND EARLY SPRING
COLEOPTERA OF FLORIDA, WITH DESCRIP-
TIONS OF NEW SPECIES.

BY W. S. BLATCHLEY, INDIANAPOLIS, IND.

(Continued from p. 66).

Ora hyacintha, sp. nov.

Elongate-oval, strongly depressed. Nearly uniform testaceous, feebly shining, the thorax, scutellum, front tibiae and apex of hind femora in some specimens more or less infusate. Head broad, finely and sparsely punctate; eyes small, coarsely granulate, separated by more than twice their own diameters; antennae slender, half the length of body, the second joint much stouter and slightly longer than third, the two united shorter than fourth, which is subequal to those which follow. Thorax twice as wide as long, sides broadly rounded, base bisinuate; front angles rounded, hind ones obtuse, disc finely and sparsely punctate and with a small irregular impression each side of middle. Elytra conjointly one-half longer than wide, distinctly wider than thorax, margins strongly flattened and reflexed; disc widely, shallowly but obviously bisulcate, finely, sparsely and irregularly punctate. Prosternum with a very thin, blade-like process between the front coxae; middle and front femora stout, hind ones greatly enlarged; under surface minutely and rather densely punctate, very finely pubescent. Length 5.5—6.5 mm. Width 3.5 mm.

Described from 16 specimens taken from the southeastern shore of Lake Okeechobee, March 6 and 7. They were found only in and beneath the hollow stems of decaying water hyacinth (*Piaropus crassipes* Mart.) next to the water's edge. When the stems were broken open the beetles would emerge and jump about in a grotesque manner. Supposing they were some form of Halticini, I recorded them at the time as "flat jumping Chrysomelids." From other described species of *Ora* they differ especially in the uniform dull yellow colour and more distinct sulcations of elytra.

The genus *Ora* is closely allied to *Scirtes*, differing mainly in the prosternum being prolonged in a very thin lamina between the front coxae, and in the margins of the thorax and elytra being strongly flattened and reflexed. The hind coxae are also separated posteriorly by an intercoxal process.

Cyphon perplexus, sp. nov.

Oblong-oval, subdepressed, rather thickly clothed with short, suberect yellowish hairs. Uniform pale brownish yellow, feebly shining; elytra each with an indistinct oblique dusky spot on basal fourth. Antennæ with five outer joints dusky, second joint stouter and slightly shorter than third, the two together equal to or slightly longer than fourth. Head finely and rather densely granulate-punctate; eyes small, widely separated. Thorax twice as wide as long, sides straight and parallel, hind margin bisinuate, front one less strongly so, all the angles distinct but obtuse; disc very finely, evenly and rather sparsely punctate. Elytra more than one-half longer than wide conjointly, one-third wider at base than thorax, sides parallel for two-thirds their length, thence gradually converging to apex; disc punctate like the thorax, the punctures somewhat coarser. Under surface very finely and rather densely punctate. Length 2—2.5 mm.; width 1.5 mm.

A common insect on the flowers of an Ericad (*Andromeda nitida* Bart.) also beaten from oak, myrtle, etc. Described from 36 specimens taken at Dunedin, January 19–March 21; Lake Istokpoga, February 25; Kissimmee River, February 19; Sanford, April 4; Eustis, April 6; Ormond, April 14.

Smaller and paler than *C. variabilis*, sides more parallel, upper surface much more finely, sparsely and evenly punctate. The second and third joints of antennæ are each distinctly shorter than the fourth, while in *variabilis* the three joints are subequal in length.

4608.—**Buprestis sulcicollis** Lec. One specimen beneath bark of dead pine. St. Petersburg, January 20.

4617.—**Melanophila notata** Lap. & Gory. One beaten from pine. Ormond, April 6.

4658.—**Chrysobothris chrysoela** Ill. Single specimens of this small and very handsome species were beaten from oak at Lake Istokpoga, February 25; Fort Myers, March 10; Sanibel Island, February 25.

Plateros flavoscutellatus, sp. nov.

Elongate-oblong, depressed, wider behind. Black, feebly shining; thorax yellow with a large subquadrate black spot which is divided along the middle by a very narrow yellow line, this line extending back along the edges of the suture to beyond the middle

of elytra; scutellum, narrow side margins of elytra from humeri to or beyond the middle, and bases of front and middle femora, also yellow. Antennæ strongly compressed, the second joint very small, one-third the length of the third, the latter as broad at apex as long, one-half the length of fourth. Thorax subpentagonal, concave, sides straight, strongly reflexed and slightly diverging from apex to base, the hind angles acute and prolonged beyond the union of basal and side margins; disc irregular, the median line distinct only on basal half. Elytra as wide at base as thorax, feebly but distinctly widened behind the middle; alternate intervals but slightly elevated; cells small, subquadrate, males with the sixth ventral widely and deeply emarginate and the antennæ more distinctly serrate than in the female. Length 5.5—7 mm.

Described from 14 specimens taken by beating at Dunedin, March 27—April 1; Sanford, April 3; Eustis, April 6; Ormond, April 11—13.

While our species of *Plateros* are, in most collections, badly mixed and, as LeConte says, "are almost undistinguishable," this one is easily separated from all others by the colour as described, especially the yellow scutellum, and by the greatly prolonged hind angles of the thorax. According to Mr. Schwarz, to whom specimens were sent for examination, it is "a common Florida species which stands in the U. S. National Museum as *P. timidus* var.?"

4824.—**Pyractomena borealis** Rand. On the evening of Feb 19, while at our second camp, which was on an island in Kissimmee Lake, I noted a firefly or two over a damp meadow near the tent. Getting my net, I sallied forth, eager for prey. The only specimen which I was able to capture was one which, instead of flashing its light intermittently, turned it on apparently to stay and flew in a wide half circle out over the lake and back within twenty feet of where I stood. I traced its entire flight by the steady constant light. It is a male, the only specimen of its kind I took, and seems to be the same as our northern specimens of the above name. I can find no record of a firefly thus emitting a constant instead of an intermittent light. This it continued to do while in the bottle until it succumbed to the fumes of the cyanide.

Attalus zebraicus, sp. nov.

Oblong, subdepressed, distinctly dilated behind. Occiput and

major portion of thorax black, shining; front of head and a large triangular space each side of base of thorax reddish; elytra dull yellow, each with an oblique black stripe reaching from humerus to near the suture at middle, and an oblong lateral black spot on apical third; antennæ dusky, legs dull yellow, abdomen blackish. Length 2.3—2.5 mm.

Taken by sweeping at Sanford, March 29; Ormond, April 3-6. Allied to *scincetus* Say but shorter, more dilated behind and with distinct and constant colours as described. The oblique black stripe of elytra is curved outward at its posterior end and in some specimens almost touches the lateral black spot.

5170.—**Enoclerus lunatus** Spin. Four specimens from flowers of the thistle (*Carduus horridulus* Pursh.). Sarasota, February 16—March 4; Sanford, March 24.

Catorama porosum Fall. A dozen or more specimens were taken by beating oak when the trees were in blossom. Dunedin, March 21—30; Sanford, March 29; Ormond, April 13. One of the Ormond specimens is 4 mm. in length.

5325.—**Eutylistus tristriatus** Lec. One specimen beaten from Spanish moss. Dunedin, March 21.

Eutylistus fallax Fall. One taken by sweeping. Lake Istokpoga, February 23. This and the two preceding species were identified for me by Mr. H. C. Fall.

Rhipidandrus fulvomaculatus Dury (Mss.) Sixty or more specimens of this, about 30 of *Cis hirsuta* Casey, several of *Cis creberrimus* Mellie and *Ceracis sallei* Mellie were sifted from decaying woody fungi at the base of a pine. Dunedin, January 24.

5485.—**Euparia castanea** Serv. Three specimens from a nest of small brown ants, beneath the bark of a decayed oak stump. Sanford, January 16.

Aphodius campestris Bl. A third specimen was taken near Dunedin, February 11. The two types were from Sarasota.

5560.—**Aphodius concavus** Say. A single example of this large species was taken at Sanford, January 13. I cannot find that it has been before recorded from Florida.

5928.—**Cremastochilus squamulosus** Lec. One from beneath bark of pine log in company with several red and black ants. Sarasota, March 3.

6106.—**Ancylocera bicolor** Oliv. Four examples of this handsome Cerambycid were taken by beating oak when in blossom. Bassenger, February 28; Sanford, March 28; Eustis, April 6.

6134.—**Æthecerus hornii** Lac. One from flowers of the farkleberry (*Vaccinium arboreum* Marsh). Ormond, April 6.

Euryptera flavatra, sp. nov.

Elongate, slender. Head yellow, the occiput and labrum piceous; thorax yellow with a black median stripe; scutellum piceous; elytra, basal two-thirds yellow, apical third black; basal joints of antennæ and under surface black; apical half of antennæ and legs piceous, the coxæ and tibiæ paler. Eyes large, broadly and deeply emarginate on the inner border. Antennæ half the length of body, second joint very small, third twice as long as fourth. Thorax bell-shaped, flattened above, as wide at base as long, hind angles scarcely prolonged, the black median stripe finely pubescent and densely granulate-punctate, the sides densely clothed with long prostrate yellow hair. Elytra coarsely and rather densely punctate, the yellow portion with long, semi-erect yellow hairs, the black portion with similar black hairs. Side pieces of meso- and meta-sterna finely and densely punctate; abdomen minutely and very sparsely punctate. Hind coxæ contiguous. Length 7.5 mm.

One specimen swept from the flowers of the hoary lupine (*Lupinus diffusus* Nutt.) near Dunedin. March 19. Very different from all other described Lepturids by the colour. The transition from the bright yellow basal to the shining black apical portion of elytra is abrupt.

6462.—**Lysimena fuscata** Lec. One beaten from a dead oak near Eustis, April 7.

6562.—**Lema cornuta** Fab. One swept from hoary lupine near Dunedin, March 29.

Chlamys nodulosa Bl. This species, described in the Canadian Entomologist, January, 1913, I found to be quite common at Dunedin, Lake Istokpoga and Sanford. It, therefore, probably occurs throughout Central and Southern Florida on oak, myrtle and other foliage. February 25—April 14.

(To be continued.)

A NEW SPECIES OF ORTHOPTERA, FORMING A NEW GENUS AND FAMILY.

BY E. M. WALKER, TORONTO.

While collecting on Sulphur Mountain, Banff, Alberta, on June 29th, 1913, Mr. T. B. Kurata and the writer captured two specimens of a peculiar wingless thysanuriform insect, which at once struck me as very remarkable on account of their possessing an ovipositor like that of the Tettigonidæ (Locustidæ). The two specimens, both females, are of about the same size, and, judging by the size and appearance of the ovipositor, are probably mature. They were found running about like centipedes under the stones of a talus-slope at an altitude of about 6500 feet. Considerable search was made for more specimens, but without success.

A study of these specimens shows that they are genuine Orthoptera, but of a very generalized type and cannot be placed in any of the known families of this order. Their appearance is somewhat suggestive of the termites, or, still more, of the nymphs of the Plecoptera, but that they are true Orthoptera is at once apparent, in spite of the total absence of wings, on an examination of the mouth-parts, the cervical and thoracic sclerites and the ovipositor.

This insect forms the type species of a new genus, *Grylloblatta*, and a new family, *Grylloblattidæ*.

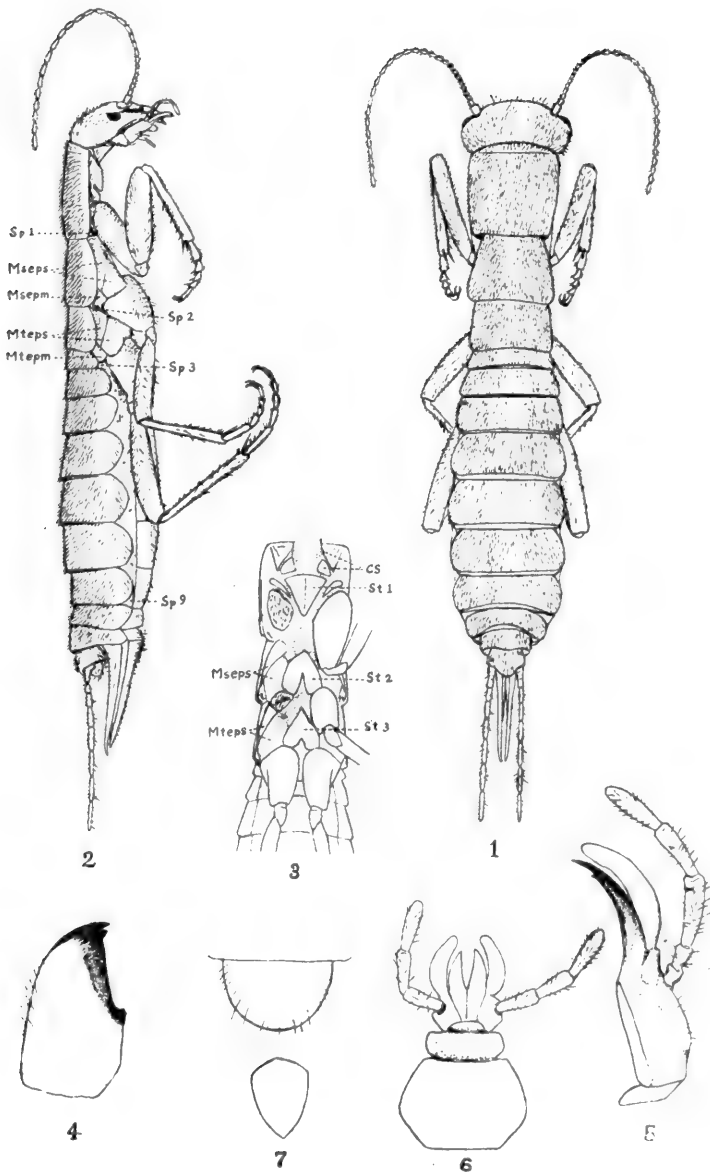
Grylloblattidæ, new family, and **Grylloblatta**, new genus.

Body elongate, slender, depressed, thysanuriform; head blattoid, somewhat flattened, obliquely attached to the prothorax; epicranial suture distinct; antennæ arising close to the fronto-clypeal suture, shorter than the body, with 26 to 29 segments; eyes small, widely separate; ocelli absent; labium with glossæ and paraglossæ separate and well differentiated. Thoracic nota flattened, quadrate, decreasing in size caudad; meso- and meta-episterna well developed, oblique, each with a horizontal fold, apparently dividing it into two parts; epimera small; sternal plates small, separated by considerable areas of soft cuticle; thoracic stigmata two, the first close to the hind margin of the prothorax, the second upon the mesepimeron. Legs cursorial; coxæ large, especially the first pair; femora, tibiæ and tarsi with a few slender scattered spines, tibial spurs two, an outer

and inner, the latter the larger; tarsi 5-jointed, without pulvilli. Abdomen with 10 segments; tergites not overlapping the sternites, separated by a well-developed pleural membrane; abdominal stigmata on the pleural membrane of segments 1-7, very minute and difficult to see; cerci about as long as the hind tibiae, slender, cylindrical, 8-jointed; ovipositor exerted, composed of 3 pairs of elongated processes or valves, the upper pair slightly longer, the middle pair slightly shorter than the lower pair; inner valves exposed in lateral view, each valve fitting into a groove on the corresponding valve of the lower pair, but not connected with the upper pair.

***Grylloblatta campodeiformis*, n. sp.**

Body uniform honey-yellow, covered with minute pubescence. Head flattened, rounded, nearly as broad as long, broadest across the eyes, which are ovo-triangular, about as broad as long and distant from the lateral margin by a little less than their transverse diameter; facets about 70, slightly irregular in size and arrangement; antennae reaching back to about the hind margin of the metathorax, filiform, very slightly tapering; first segment somewhat flattened, about two-thirds as wide as the eye and as long as segs. 2-3, which are together equal to segs. 4, 5 and 6, distad of which the segments gradually increase in length to about seg. 16, shortening again slightly towards the apices; clypeus as broad as the space between the middle of the basal joints of the antennae and somewhat more than twice as broad as long, lower margin nearly straight; labrum semi-ovate, the free margin regularly convexly curved; mandibles with a basal, apical and subapical tooth (maxillae and labium, see pl. VI, figs. 5, 6). Pronotum transversely feebly convex, slightly longer than broad, anterior margin gently arcuate, posterior margin nearly straight and subparallel, antero-lateral angles slightly rounded, postero-lateral angles rectangulate; a straight transverse groove just behind the anterior margin. Mesonotum scarcely three-fourths as long as the pronotum, somewhat constricted at base, expanding slightly caudad, the straight posterior margin somewhat greater than the length, the lateral margins deflected, arcuate in lateral view; postero-lateral angles well rounded. Metanotum almost four-fifths as long as the mesonotum, somewhat less than twice as broad as long, feebly expanding



GRYLLOBLATTA CAMPODEIFORMIS, n. gen. et sp.

caudal; lateral margins and postero-lateral angles as in the mesonotum. Prosternal plate triangular, mesosternal and metasternal plates somewhat V-shaped, all separated by considerable areas of soft integument, which is covered by the large coxæ. Front coxæ stout, slightly shorter than the pronotum and longer than the middle and hind coxæ, the middle pair being the shortest; each coxa with a distinct ridge separating the ventro-anterior and postero-lateral surfaces. Fore and middle femora and tibiæ all of nearly the same length, each being about as long as the pronotum; front tarsi slightly shorter, middle tarsi slightly longer than the corresponding tibiæ; hind femora, tibiæ and tarsi of nearly the same length, distinctly longer than the corresponding parts of the other two pairs of legs. Abdomen widening from base to segment 5, which is slightly wider than the head, narrowing again rapidly in the last 3 segments. Cerci with 8 cylindrical segments, which gradually lengthen distad. Ovipositor slightly shorter than the hind femora, somewhat compressed, in profile tapering rapidly from the base, the basal depth being about one-third of the length; upper valves nearly straight, lower and inner valves distally up-curved, apices of all acute.

MEASUREMENTS (lengths in millimetres).

	Body	Ant-enn.	1st fem.	1st tib.	1st tar.	2nd fem.	2nd tib.	2nd tar.	3rd fem.	3rd tib.	3rd tar.	Ovip.
Type.....	30	8.5	2.8	2.25	2.6	2.5	2.5	2.75	3.4	3.6	3.4	3.0
Cotype.....	30	9.0	2.6	2.25	2.6	2.5	2.3	3.0	3.2	3.5	3.4	3.3

Type ♀ and cotype ♀: Sulphur Mt., Banff, Alta., 6500 ft., June 29th, 1913, in the collection of the University of Toronto.

The family Grylloblattidæ differs from all the other families of non-saltatorial Orthoptera in the possession of a large exerted ovipositor of the Tettigonid type. Among other differential characters possessed by these families are the following:

In the Hemimeridæ the tarsi are 3-jointed, the coxæ small and widely separated, the cerci unjointed, and the abdominal sternites are overlapped by the tergites.

In the Blattidæ, the general form of the body is much broader, the head is scarcely visible from above and is much narrower than the pronotum, which is usually broader than long; the antennæ are longer than the head and thorax, setaceous and generally consist of

a larger number of small segments; the cerci are flattened and distally tapering.

In the Mantidæ, the eyes are larger and much more prominent, the antennæ setaceous, the front legs raptorial and the front femora nearly always spinose along the outer edge; the prothorax is usually elongated and the cerci are much shorter than the hind femora.

In the Phasmidæ the prothorax is smaller than the mesothorax, the meso- and metathorax are both greatly elongated, the coxæ small and short, pulvilli are present and the cerci are unsegmented and shorter than the hind femora.

From the families of saltatorial Orthoptera the Grylloblattidæ differ in the generalized structure of the hind legs, the five-jointed tarsi and the jointed cerci.

Gryllobatta is thus seen to combine characters possessed by several different Orthopterous families, but to be amply distinct from all of them. On the whole, it appears to be most nearly related to the Blattidæ, though the general form of the body is most like that of the Forficulidæ. It resembles the Blattidæ very closely in the form of the head, the depressed body and cursorial legs, but the form of the body is less specialized and the peculiarities of the blattid leg, such as the greatly enlarged and closely approximated coxæ with the correlated reduction of the sternal plates, though present in *Gryllobatta*, are much less marked than in the cockroaches. The scattered tibial spines and five-jointed tarsi are also characters that are common to both families. The simple antenniform cerci recall those of *Campodea*, and are probably of a more primitive type than the short flattened cerci of the Blattids.

The position of the base of the antennæ close to the frontoclypeal margin is another primitive character in which *Gryllobatta* resembles the Plecoptera.

On the other hand, *Gryllobatta* appears to be more specialized than the Blattidæ in the absence of styli and the presence of the Tettigonid type of ovipositor. Apart from these latter features this genus is distinctly more primitive than any of the other families of Orthoptera, as far as external features are concerned.

Of the three families of saltatorial Orthoptera, *Gryllobatta* is most like the Gryllidæ in the depressed form of the body and shape

of the head, but resembles the Tettigonidæ much more closely in the structure of the ovipositor the inner valves of which, as in this family, are nearly as long as the other two pairs. The antennæ, however, in length and in number, size and form of the segments are most like those of the Locustidæ (Acrididæ).

The presence of the Tettigonid type of ovipositor in so primitive a form as *Grylloblatta* seems to indicate that this type of ovipositor was present in the earliest saltatorial Orthoptera and that the Tettigonidæ are therefore, in this respect, the most primitive of the modern saltatorial families.

If this conclusion is not accepted, then one at least of the following assumptions must be made:

- (a) That *Grylloblatta* is a degenerate descendant of saltatorial forms, which, like the mole-cricket, has secondarily lost its power of leaping.
- (b) That the adaptations for leaping have been independently acquired in the Tettigonidæ on the one hand, and the other families of saltatorial Orthoptera on the other, i.e., *Grylloblatta* and the Tettigonidæ represent a distinct line of descent from those which have culminated in the Gryllidæ and Locustidæ.
- (c) That the resemblance between the ovipositors of the Tettigonidæ and *Grylloblatta* is due to convergence.

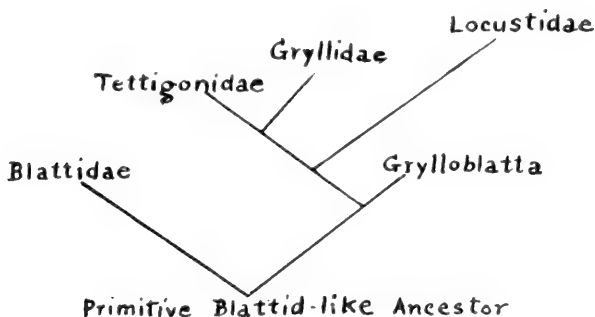
The first assumption is clearly untenable on account of the evident relationship between the Grylloblattidæ and the other non-saltatorial Orthoptera, particularly the Blattidæ, with which they share the 5-jointed tarsi and jointed cerci, both of these being primitive characters not present in any of the saltatorial Orthoptera.

The second assumption is equally inadmissible, as the families of saltatorial Orthoptera form a decidedly natural group, the Gryllidæ and Tettigonidæ being particularly closely allied to one another.

The third assumption is less improbable, but the resemblance between the ovipositors of *Grylloblatta* and the Tettigonidæ is very close, and it seems more natural to regard them as truly related in this respect.

I am thus inclined to regard the ovipositor of *Grylloblatta* as nearly representing that of the common ancestor of the three families of saltatorial Orthoptera, the Tettigonidæ having departed least from the original type as regards this structure. *Grylloblatta* has been derived from some primitive type of Blattid or Blattid-like ancestor.

These relationships are expressed graphically in the accompanying diagram.



EXPLANATION OF PLATE VI.

Fig. 1. *Grylloblatta campodeiformis*, ♀ type, dorsal view.

Fig. 2. Same, lateral view.

Fig. 3. Same, ventral view of thorax and base of abdomen (front and middle legs of right side removed).

Fig. 4. Same, mandible.

Fig. 5. Same, maxilla.

Fig. 6. Same, labium.

Fig. 7. Same, labium (above), hypopharynx (below).

Sp.1, Sp.2, Sp.3, Sp.9, Spiracles; Mseps mesepisternum; Msepm, mesepimeron; mteps, metepisternum, mtepm, metepimeron, C. S., cervical sclerites; St₁, St₂, St₃, pro-, meso- and metasterna.

ANOTHER MIGRATION OF *ANOSIA PLEXIPPUS* FAB.

In the Canadian Entomologist, Vol. XLIV, pp. 366-367, 1912, the writer gave some observations on the autumn migratory bands of this butterfly witnessed by him in various parts of the country.

On October 28 and 29, 1913, these insects were present in myriads clinging to the limbs of trees about Fort Moultrie, on Sullivan's Island, near Charleston, S. C. The weather was cool for the latitude, but the butterflies did not seem to pay any attention to the temperature, winging their way about in the sunshine as is their habit farther north, finally drifting away. Judging from the numbers observed dead and cast up on the beach by the sea, not all of the migrants passed onward in safety. As usual, there were numerous individuals flying about after the migrating band had passed onward.

F. M. WEBSTER.

PROHIBITION OF THE IMPORTATION OF NURSERY STOCK INTO CANADA BY MAIL.

By an order in Council of December 4th, 1913, the Regulations under "The Destructive Insect and Pest Act" were amended as follows:

In Regulation 3, line 14, the words "Importations by mail shall be subject to the same Regulations" have been struck out and the following New Regulation, No. 18, has been passed:

"18. The importation of all nursery stock, including trees, shrubs, plants, vines, grafts, scions, cuttings, or buds, through the mails is prohibited, excepting greenhouse-grown florists' stock, cut flowers, herbaceous perennials, and bedding plants, which will be admitted provided that a detailed statement of the contents is attached to such parcels."

This Regulation will take effect on and after the first day of March, 1914.

C. GORDON HEWITT,
Dominion Entomologist.

Department of Agriculture,
Ottawa, Ont.,
December 10th, 1913.

THREE DIPTERA FROM THE MIOCENE OF COLORADO.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO, BOULDER.

***Atrichops hesperius*, n. sp. (Leptidæ).**

Length 6 mm., wing 5 mm.; robust, of the usual form: tarsi microscopically hairy, not at all bristly or spiny; wings clear or almost, the venation as preserved pale reddish. Venation as in *Atrichops crassipes* (Meigen), except as follows: Auxiliary vein reaching costa distinctly before middle of wing; end of subcostal cell larger; base of second posterior cell more oblique; anal cell not so broad. The anal cell is closed a short distance before the wing-margin. The long second submarginal cell has its lower side measuring about 2560 microns. The anterior cross-vein is about 290 microns from basal corner of discal cell. Florissant; Station B 13 (*S. A. Rohwer*).

The shape of the wings and the details of the venation place this species in *Atrichops* Verrall, rather than in *Atherix*. *Atrichops* has hitherto contained a single living Palæarctic species, so it is interesting to find it in the Miocene of America. It is less pubescent than *Atherix* (and in this the fossil also agrees) and the venation is on the whole less specialized.

***Xylomyia moratula*, n. sp. (Leptidæ).**

Length 6 mm., wing about $5\frac{1}{2}$; of the usual form; head and thorax black, abdomen light reddish; legs reddish brown; tibiæ and tarsi not at all spinose or bristly; wings hyaline; venation as preserved light reddish. Venation like that of *X. maculata* (Meigen) with the same wide open second submarginal cell and arched upper side of second posterior cell, though the latter feature is not quite so extreme as in *X. maculata*. The anterior cross-vein is near to the base of the discal cell as in *X. maculata*; the closer fourth posterior cell is relatively narrow apically as in *X. marginata* (Meigen), but its side on the third posterior, though long, is shorter than its side on the discal cell, the reverse being true of *marginata*. The insect is therefore entirely of the type of *X. maculata*, as opposed to that of *X. marginata*, which is perhaps hardly congeneric.

The following wing measurements are in microns: Length of lower side of second submarginal cell about 1695; base of second submarginal to anterior cross-vein about 1570; level of end of upper

side of second submarginal basad of level of end of lower side, 400, and width of cell at this point 530; width of second submarginal 640 from end of lower side, 432; width of first posterior cell at apex 640, of second at apex 320, of third at apex 1250; discal cell on first posterior 960, on first basal 225; basal side of second posterior 160, of third posterior 272; closed apex of fourth posterior to wing margin about 240, of anal to wing margin apparently over 320, but margin at this point not visible; width of anal at level of basal corner of fifth posterior 480. Florissant; Station 13 (*S. A. Rohwer*.)

This genus has been referred by Osten-Sacken, Verrall and others to the Stratiomyidæ, but Williston places it in Leptidæ. The genera *Arthropeas* and *Arthropiella*, which Meunier places in a distinct family, are apparently related; they occur in Baltic amber. Verrall states that the larva of *Xylomyia* shows that it belongs with the Stratiomyidæ rather than with the Leptidæ. On the whole, it seems probable that *Xylomyia*, *Glutops*, *Arthroceras*, and probably the two amber genera, should together form a distinct family.

***Saropogon oblitescens*, n. sp. (Asilidæ).**

Wing about $7\frac{1}{2}$ mm. long; fourth posterior and anal cells closed; small cross-vein from base of second submarginal cell 1040 microns, but second submarginal cell over 1440 long (apex gone); second submarginal cell, so far as visible, narrow, parallel-sided, its width (depth) about 290 microns; small cross-vein 1230 microns from base of discal cell, and 800 from its apex; separation of second and third veins 1230 microns from origin of their common stem from first; fourth posterior cell closed about 130 microns from margin, anal the same distance, but apex of anal a much smaller angle than apex of fourth posterior; apical sides of discal cell very unequal, that on second posterior cell twice as long as that on third; apical angle of discal cell very much greater than a right angle. Wing clear, venation dark brown. Compared with *Saropogon dispar*, the fossil differs in having the fourth posterior and anal cells closed well before the margin, and the second posterior distinctly narrower, but otherwise the venation is about the same. The venation is in general very like that of *Selidopogon diadema*, but that has the second posterior cell more widely open, and the subcostal cell larger. Florissant (University of Colorado Expedition).

NEW GENERA AND SPECIES OF TENTHREDINIDÆ:
A FAMILY OF HYMENOPTERA.*

BY ALEX. D. MACGILLIVRAY, UNIVERSITY OF ILLINOIS, URBANA, ILL.

The following descriptions of new genera and species are a continuation of those of a previous paper:

Empria costata, n. sp.—Female: Body black with the collar, tegulæ, the legs beyond the knees for the most part, and the caudal margin of the abdominal segments, white; head with the post-ocellar area uniformly convex, the interocellar and ocellar furrows distinct; the clypeus tridentate, the median tooth as long as the lateral angles, broadly, shallowly emarginate at middle, the lateral angles rounded, the median ridge low, not reaching the dorsal margin of the clypeus; the third segment of the antennæ longer than the fourth; the sawguides slightly convex above, broadly, convexly rounded below at apex to a blunt point above, wings hyaline. Length 6 mm.

Habitat.—New Haven, Connecticut. B. H. Walden, collector.

This species falls near *cava*, from which it differs in lacking the broad, convexly rounded median ridge of the clypeus and from *calda* in having the clypeus tridentate with the median tooth as long as the lateral angles.

Pseudoselandria, n. gen.—Front wings with the radial cross-vein, the media-cubital cross-vein, the free part of R_5 , and the free part of R^4 present; the free part of the second anal vein wanting; media not strongly angularly bent, the first abscissa of cubitus distinctly longer than the free part of M_4 ; costa dilated at apex; hind wings with the first anal cell distinctly petiolate and shorter than the cell in front of it; media separating from radius distinctly before the origin of the radial sector; claws with a minute erect tooth at base; antennæ with nine segments. Type *Pseudoselandria oxalata*, n. sp.

Related to the genus *Selandria*, from which it differs in that the claws have an erect tooth at middle and the media is not angularly bent at base.

* Contributions from the Entomological Laboratories of the University of Illinois, No. 37.

March, 1914.

Pseudoselandria oxalata, n. sp.—Female: Body black with the following parts whitish; the two basal segments of the antennæ, the labrum, the clypeus, the collar broadly, the tegulæ, the upper half or more of the pleuræ, the legs, the wings at base, and the abdomen except the saw-guides; median fovea deep, ovate, transverse; ocellar basin distinct; third segment of the antennæ as long as four and five together; wings clear with the apex of radius strongly dilated and black. Length 7 mm.

Habitat.—Wisconsin. Dr. S. Gränicher, collector.

Polyselandria, n. gen.—Front wings with the radial cross-vein, the medio-cubital cross-vein, the free part of R_5 , and the free part of R_4 , present; media not strongly, angularly bent; the first abscissa of cubitus distinctly longer than the free part of M_4 ; costa dilated at apex; hind wings with the first anal cell closed at the wing margin and longer than the cell in front of it; media coalesced with the radial sector for a short distance; claws with a minute erect tooth at base; antennæ with nine segments. Type, *Selandria floridana* MacG.

Closely related to *Pseudoselandria*, from which it differs in having the first anal cell of the hind wings closed at the wing margin and in having media of the front wings coalesced with radius for a short distance.

Dolerus tectus, n. sp.—Female: Body black; antennæ with the third segment slightly longer than the fourth; head with the vertical furrows obsolete, the front and vertex uniformly convex, the entire surface punctured, the postocellar area more densely and finely punctured than the posterior orbits, the posterior orbits without ridges or depressions, the antennal furrows indicated only near the antennal sockets; the scutellar appendage smooth, without punctures or striations; the median lobe of the mesonotum and the scutellum more closely punctured than the disk of the lateral lobes, the disk of the lateral lobes almost polished; the pleura closely, coarsely punctured; the impunctate area of the lateral lobes of the mesonotum extending to the median lobe; the wings fuliginous, the veins and stigma black. Length 10 mm.

Habitat.—New Haven, Connecticut. H. L. Viereck, collector.

A black species related to *polysericeus*, from which it differs in having the punctures on the scutellum similar in size to those of the lateral lobes of the mesonotum and from *colosericeus* and *monosericeus* in having the vertical furrows obsolete.

Dolerus inspiratus, n. sp.—Female: Body black with the entire prothorax, the tegulae, the median lobe of the mesonotum, the front legs below the knees, and abdominal segments one to six, rufous; head with a concave furrow from the vertical furrows to the lateral margin of the head behind the compound eyes, a distinct carina between the posterior orbits and the caudal aspect of the head; the postocellar area more closely and finely punctured than the posterior orbits: the posterior orbits with an impunctate area adjacent to the vertical furrows; the vertical furrows punctiform; the antennal furrows not indicated except adjacent to the antennal sockets; the scutellar appendage longitudinally striate; the impunctate area of the lateral lobes of the mesonotum not extending to the median lobe; the median and lateral lobes uniformly punctured, the punctures distant; the scutellum uniformly, closely punctured; the saw-guides slightly exerted, straight above, convex below, and convexly truncated to a point at apex above. Length 9 mm.

Habitat.—New Haven, Connecticut; A. B. Champlin, collector. Eagle Bend, Minnesota; J. P. Jensen, collector.

This species is related to *conjugatus* and *dysporus*, from both of which it differs in the arrangement of the punctuation of the posterior orbits and the postocellar area and also by the transverse brownish band on the prothorax and mesothorax.

Dolerus lesticus, n. sp.—Female and male: Body black with the entire prothorax, the dorsal and lateral portions of the mesopleurae, and the median lobe of the mesonotum, rufous; the third segment of the antennae subequal in length to the fourth; the vertex and the front uniformly and generally punctured; the antennal furrows slightly indicated adjacent to the antennal sockets; the vertex without furrows or carinae; the vertical furrows distinct,

twice as long as broad; the median lobe of the mesonotum and the scutellum uniformly, sparsely punctured; the lateral lobes of the mesonotum uniformly, sparsely punctured, their disk almost smooth; the mesopleura uniformly, coarsely, closely punctured; the saw-guides convex above and below, the two margins converging and obliquely truncated at apex above, the apex with a sparse scopa of long hairs; the wings slightly infuscated, the veins and the stigma brownish; the male differs in having the body entirely black and the ridge between the vertex and the caudal aspect of the head slightly carinated. Length 6 mm.

Habitat.—Durham, New Hampshire; Weed and Fiske, collectors. Hampton, New Hampshire; S. A. Shaw, collector.

A small species related to *collaris*, from which it differs in having the antennal furrows extending only a short distance from the antennal sockets.

Dolerus konowi, n. sp.—Female and male: Body entirely coal-black; antennæ with the third segment slightly longer than the fourth; the vertical furrows indicated only as a broad depression; the vertex with a shallow depression extending from the lateral ocelli behind the compound eyes; the front, the posterior orbits, and the postocellar area uniformly punctured, the punctures fine and close together; the vertex with an impunctate area adjacent to the vertical furrows; the antennal furrow faintly indicated adjacent to the antennal sockets; the appendage of the scutellum finely, transversely striated; the dorsal surface of the mesothorax finely, closely punctured except the disk of the lateral lobes, which contains a few distant punctures; the mesopleura closely and coarsely punctured; the pectus uniformly, finely punctured, not so densely as the head or notum; the body, except the abdomen, covered with short, white pile; the saw-guides straight above and gradually, convexly, obliquely rounded below and at apex to a point above; the saw-guides sparsely hairy below and at apex and densely above; wings infuscated, the veins and stigma brown; the male differs only in being smaller. Length 11 mm.

Habitat.—Olympia, Washington; Trevor Kincaid, collector.

This is a black species, which has been generally confused with the eastern *Dolerus sericeus* Say, which does not occur so far as my experience goes, upon the Pacific Coast. *Konowi* is readily differentiated from *sericeus* by the striations on the scutellar appendage. The difference between this species and *sericeus* was first pointed out to me several years ago by the late Pastor F. R. W. Konow, the German student of the Tenthredinoidea, for whom it is named.

Dolerus grænicheri, n. sp.—Female : Body black with the entire prothorax, the median lobe of the mesonotum, beneath the front wings, and the base of the front wings, rufous; the tegulae black; the antennal furrows hardly indicated adjacent to the antennæ; the vertical furrows short, knife-like cuts; an indefinite furrow from the lateral ocelli to the corner of the compound eyes; no carina on the caudal margin of the head; the punctuation on the postocellar area and the posterior orbits dense and uniform; the scutellar appendage transversely striate; the impunctate area of the lateral lobes of the mesonotum distinct and extending to the median lobes; the scutellum more densely punctured than the median or lateral lobes, the median lobe more densely than the lateral lobes; the saw-guides straight above, convexly rounded below and at the apex to a point above, apex with a dense scopa of long hairs; the wings slightly infuscated, the veins and stigma brownish. Length 7 mm.

Habitat.—Layton Park, Milwaukee County, Wisconsin.

This species is named for its collector, Dr. S. Grænicher, who sent it to me. It is related to *unicolor*, *collaris*, and *lesticus*, from the first it differs in the type of punctuation found upon the head, from the second in the extent of the antennal furrows, and from the third in the shape of the saw-guides.

Astochus, n. gen.—Front wings with the radial cross-vein, the radio-medial cross-vein, the free part of R_4 and R_5 all present; the medio-cubital cross-vein joined to $R+M$ a considerable distance before the origin of M ; the free part of Sc_1 faint, located opposite the medio-cubital cross-vein; the free part of the second anal vein short, erect, transverse; the contraction of the third anal vein in-

licated by an elongate thickening; hind wings with the free part of R_4 present and the transverse part of M_2 wanting; antennæ with nine segments; the clypeus truncate; the compound eyes with their inner margins parallel and distant, the basal plates divided. Type, *Astochus fletcheri*, n. sp.

The broad space between the compound eyes, the margined antennal sockets, the divided basal plates, and the truncate clypeus places this genus near *Bivena* MacG.

The two species described herewith can be differentiated as follows:

Postocellar area longer than broad.....	<i>fletcheri</i>
Postocellar area broader than long.....	<i>aldrichi</i>

Astochus fletcheri, n. sp.—Female: Body black with the antennæ somewhat infuscated, the legs below the trochanters, the abdomen beyond the basal plates, and the wings at base, rufous; the following parts: the clypeus, the labrum, a short, narrow line on the inner orbits, the margin of the pronotum, the tegulæ, a round spot on the mesopleura, two spots above the posterior coxæ, the underside of the front and middle coxæ, the underside and the lateral aspect of the hind coxæ, and the stigma, yellowish-white; the third segment of the antennæ longer than the fourth; the labrum broadly rounded; the ocellar basin an elevated, flat, shield-shaped space; the frontal furrow short, broad, and deep, with the lateral walls high; the postocellar area longer than broad with a median furrow, deeper behind; the head and thorax polished; the wings infuscated behind the stigma; the saw-guides convex above and below, the sides gradually converging, squarely truncated at apex. Length, 10 mm.

Habitat.—Kaslo, British Columbia.

This insect was collected by the late Dr. James Fletcher on the 28th of May, 1906, and by him sent to Dr. J. Chester Bradley for identification and by Dr. Bradley given to me. It is fitting that it should bear Dr. Fletcher's name.

(To be continued.)

A PROTECTED BUTTERFLY.

We are accustomed to reading about certain species being *protected* from their enemies by nature owing to a resemblance to other insects that are distasteful; but *Parnassius apollo* now enjoys the unique distinction of being the only insect in the world whose life is guarded against his most ruthless destroyer—man. According to an interesting item in the Entomologist (London) for October, 1913, Vol. XLVI, p. 289. the capture of this butterfly has been forbidden throughout the German Empire by order of the Government. Owing to overcollecting, the species is said to have been exterminated in the mountains of Silesia and its existence is threatened elsewhere. It is not stated how long the close season is to last, but is to be hoped that in the meantime the market price will not be increased enough to warrant wholesale poaching, and that the men who secured the legislation will be rewarded by seeing this beautiful butterfly again brightening up the landscape it formerly had a place in.

A. F. WINN.

BOOK REVIEWS.

A REVISION OF THE ANTS OF THE GENUS *FORMICA* (Linné) Mayr.
By William Morton Wheeler.—Bull. Mus. Comp. Zool.
Harvard College. Vol. LIII, No. 10. Published Oct. 1913.
186 pages.

This revision of the boreal genus *Formica* by the eminent ant specialist, Dr. W. M. Wheeler, is sure to receive a hearty welcome. In it the author gives extensive descriptions of, and notes upon, all the known New World forms, now numbering 93, several of which are new, consisting of 31 species, 19 subspecies and 43 varieties, and brief descriptions of, and notes upon, the 53 Old World forms.

Seven groups are recognized.—(1) The Sanguinea group, containing thirteen forms of the palearctic and nearctic slave-maker, *sanguinea*, and six other species; (2) The Rufa group, containing eleven forms of the palearctic and nearctic *rufa* (all the nearctic

forms are western), twelve forms of the palearctic and nearctic *truncicola*, and nine other species; (3) the *Microgyna* group, consisting of seven forms of the nearctic *microgyna*, and six other species; (4) The *Exsecta* group, comprising four forms of the nearctic *exsectoides*, seven forms of the palearctic and nearctic *exsecta*, and two other species; (5) The *Fusca* group, including fourteen forms of *fusca*, the typical form of which is widely distributed throughout north and central Eurasia and boreal America, seven forms of the palearctic and nearctic *rufilabris*, nine forms of the palearctic and nearctic *cinerea*, and six other species; (6) The subgenus *Proformica*, including five forms of the nearctic *neogagates* and eight other species, some of them palearctic; (7) A new subgenus, *Neoformica*, erected to include the nearctic *pallidefulva* in its seven forms, and one other species, *F. moki* Wheeler.

Dr. Wheeler believes that North America must be the original home of the genus, because it has nearly double the number of species that Eurasia contains, "especially as it possesses representatives of the Eurasian groups of species besides two peculiar to itself (the *Microgyna* group and the subgenus *Neoformica*). Further, he regards the southern ranges of the Rocky Mountains in the United States as the centre of origin of the genus, for "nearly forty-two per cent. of the New World forms occur in Colorado and the adjacent portions of New Mexico," and the colonies of the individual forms are unusually numerous and flourishing on the mountain slopes of this territory.

Dr. Wheeler modestly makes only short references to the important discovery, in which he took a leading part, that many species, including *rufa* and *exsectoides*, form their colonies by temporary social parasitism in small colonies of *F. fusca* or in a few cases, another species. "The recently fecundated *rufa* female finds a home in a *F. fusca* colony and permits these ants to bring up her young. The *fusca* queen is either destroyed by the intrusive *rufa* or by her own offspring, so that when the *fusca* workers eventually die off a pure colony of *rufa* remains."

ANIMAL COMMUNITIES IN TEMPERATE NORTH AMERICA, as illustrated in the Chicago Region. By Victor E. Shelford, Instructor in Zoology in the University of Chicago. The University of Chicago Press. 380 pages. 8vo. cloth, \$3.22, postpaid.

Until the beginning of the present century the study of animal ecology can scarcely be regarded as having been an organized science, and, although much has since been written upon the subject, most of the literature deals with problems of a more or less specialized character, or with particular groups of forms or types of locality.

The present work is of an unusually broad scope, treating, as it does, practically all the important types of animal communities represented in the Chicago district, the total area investigated being somewhat more than 10,700 square miles. It is a work of great interest and importance to the entomologist, as well as the student of general ecology, as insects play a dominant part in practically all of the land and fresh-water animal communities.

The first four chapters form an introduction to the study of animal ecology in general and to that of animal communities in particular. Chapter I deals with the general subject of the struggle in nature, the effect of man's relation to nature and the production of secondary or man-made communities, as distinct from primary or primeval communities. In Chapter II the general subject of ecology is discussed. The author emphasizes the "inadvisability of attempting to organize ecology on the basis of structure, as structural changes resulting from stimulation by environment are rarely of advantage or disadvantage to the animal, and the structure of motile organisms is not readily modified by the environment." It is the activities of animals that form the basis for the organization of ecology, not the morphological characters of the species, which are ecologically of little or no significance. The subject of animal communities and biota is also discussed at some length and a classification of communities is given. The chapter concludes with a classified list of the chief animal communities of the area investigated.

In Chapter III an analysis is given of the factors that enter into the composition of the animal environment. This includes a

short account of the physiographic history of the region about Lake Michigan and a description of the climate and vegetation of the area. A descriptive list of the localities studied is also given. Chapter IV treats of the conditions of existence of aquatic animals, both chemical and physical.

The special discussion of the various animal communities occupies the remainder of the book, except the last chapter. As the Chicago area lies on the borderland between the eastern forest region and the savanna or prairie region, a great variety of terrestrial communities are represented. Its position on Lake Michigan also gives variety to the aquatic conditions, practically all types of fresh-water communities being found within the area studied.

Much attention is given to the origin and development of each community and its subsequent fate, to the physiographic conditions of the environment, and the interrelations of the various forms which make up the community. At the end of last chapter are useful reference lists of the species of animals collected at the various stations representing the particular type of community discussed.

In the concluding chapter the author returns to the general subject matter and discusses suggestively the laws governing distribution, the relations of different communities to one another, and the relations of ecology to broader geographic problems. An appendix follows in which the general methods employed in the study of environment are described and brief directions given for the making of field observations and experiments. There is also a copious bibliography and a guide map of the Chicago district, and the numerous illustrations, which are of almost uniform excellence, represent a large number of the animals referred to as well as their habitats.

ERRATA.

"GREEN LANES AND BYWAYS," No. 11, Vol. XLV.—On page 358, in line 10, for "Cortiani" read CORITANI. In line 13—For "roads" read ROAD. On page 363—In line 8 for "there" read THEN.

The Canadian Entomologist.

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LONDON, APRIL, 1914

No. 4

A SYNOPSIS OF THE GENERA IN CHLOROPIDÆ, FOR NORTH AMERICA.

J. R. MALLOCH, URBANA, ILLINOIS.

Having had occasion recently to identify species of North America Chloropidæ, I found some difficulty in placing the specimens in their proper genera by the use of the published keys to the family. The most recent paper on the Chloropidæ is that by Becker,* which is a rather unsatisfactory one, lacking in many details, though it purports to be a "monographic" treatise. About a dozen North American species are left out of the paper, and the table of genera in the Chloropinæ is so framed that it is not possible to locate specimens generically. I do not purpose criticising Becker's work, believing that criticism alone is seldom beneficial, and offer the following table, which I hope will prove useful to the extent of satisfactorily locating specimens in the genera to which they belong.

I have to thank Dr. S. A. Forbes for permission to publish this paper

GENERIC SYNOPSIS:

1. Costa reaching to third vein or slightly beyond it..... 2
Costa reaching distinctly to fourth vein..... 13
2. Outer cross-vein absent..... *Elliponeura* Loew.
Outer cross-vein present..... 3
3. Hind femur much thickened, hind tibia bent..... 4
Hind femur not thickened; hind tibia straight, or almost so... 5
4. Third joint of antennæ much elongated, about four times as long as broad; veins 2 and 3 but slightly bent forward..... *Neodiploxa*, n. gen.
Third joint of antennæ but little longer than broad; veins 2 and 3 much bent forward..... *Meromyza* Meigen.

*Ann. Nat. Mus. Hung., 1912.

5. Mid tibia with the apical spur strong and distinctly bent; male hypopygium large, knob-like, curved back beneath abdomen. *Cetema* Hendel.
 Mid tibial spur short and straight; male hypopygium not conspicuous. 6
6. Scutellum flattened on disk, with a distinct marginal rim, the apical scutellar bristles closely approximated; both sexes with an elongated oval, flattened surface (sensory organ) on hind tibia (postero-dorsal surface). *Chloropisca* Loew.
 Scutellum convex, not margined, apical bristles not approximated. 7
7. Sensory organ present on hind tibia, as in
Chloropisca. *Pseudochlorops*, n. gen.
 Sensory organ absent from hind tibia. 8
8. Head very distinctly produced in front; ocellar triangle very broad at vertex, carried forward to above antennæ in a broad prolongation, the centre convex, the sides of frons more or less excavated; third joint of antennæ distinctly longer than broad; arista generally appearing flattened through the presence of thick pubescence. *Ectecephala* Macquart.
 Head only slightly, or not at all, produced in front; frontal triangle triangular, or subtriangular, flat; sides of frons more or less excavated. 9
9. Cross-veins strongly approximated; veins 2 and 3 bent forward. *Diplotoxa* Loew.
 Cross-veins not approximated; veins 2 and 3 almost straight. 10
10. Third antennal joint disc-like; head not produced anteriorly; mesonotum yellow, with black or red stripes, seldom black, and indistinctly punctured or unpunctured. *Chlorops* Meigen.
 Third antennal joint longer than broad, head at least slightly produced anteriorly; or mesonotum black and strongly punctured. 11
11. Mesonotum entirely black, coarsely punctured. *Epichlorops* Becker.

- Mesonotum not strongly punctured, and with distinct stripes 12
12. Head produced anteriorly; third joint of antenna at least $1\frac{1}{4}$ times as long at base **Parectecephala* Becker.
Head not distinctly produced; third joint of antenna but little longer than broad; dull yellow and black, robust species, with black palpi **Anthracophaga* Loew.
13. Hind tibia with a distinct, curved, apical thorn on the anterior side 14
Hind tibia without such thorn 17
14. Frons with distinct orbital setulæ 15
Orbits with, at most, weak hairs 16
15. Scutellum elongated, disk flattened; male proboscis with two long apical hairs *Prohippelates* Malloch.
Scutellum not elongated, convex; male proboscis normal *Pseudohippelates* Malloch.
16. Arista flattened, strap-like *Ceratobarys* Coquillett.
Arista not flattened *Hippelates* Loew.
17. Second vein exceptionally short, third costal division much longer than second *Siphunculina* Rondani.
Second vein not shortened, third costal as long as, or shorter, than second 18
18. Arista either broadened and strap-like, or with distinct pubescence 19
Arista neither thickened nor distinctly pubescent 22
19. Arista more or less distinctly flattened, the pubescence very close, giving the arista a knife-like appearance even when the arista itself is but slightly flattened 20
Arista normal in shape, pubescence rather loose 21
20. Scutellum subtriangular, the marginal bristles situated on small warts *Crassista* von Roser.
Scutellum rounded in outline, the margin without warts *Melanochæta* Becker.
21. Scutellum elongated, the disk flattened *Gaurax* Loew

*The line of demarcation between these genera is very unsatisfactory, and though I am rather inclined to reject *Parectecephala* as entitled to generic rank, I have not sufficient material before me to enable me to decide the matter satisfactorily.

- Scutellum rounded, convex. *Neogaurax*, n. gen.
22. More than two bristles present on posterior part of notapleura. 23
 Only two bristles on posterior part of notapleura. 24
23. Generally four notapleural bristles present; mesonotum with a row of bristles on or near to posterior margin; scutellum with about eight marginal bristles; proboscis not elongated. *Eugaurax* Malloch.
 Notapleural bristles very numerous, the whole mesonotum thickly setulose; scutellum subtriangular, disc thickly setulose, apical bristles approximated; proboscis elongated and geniculated. *Chactochlorops*, n. gen.
24. Outer cross-vein absent. *Dicraeus* Loew.
 Outer cross-vein present. 25
25. Proboscis elongated and geniculated, mouth margin slightly produced and with a hair-like bristle at vibrissal angle. *Madiza* Fallen.
 Proboscis fleshy, very slightly or not at all elongated, vibrissal hair absent. 26
26. Mesonotum with three distinct longitudinal sulci. *Tricomba* Liog.
 Mesonotum not sulcate. *Botanobia* Liog.

From an examination of the material contained in several collections, and the descriptions by many previous authors, I find that in many cases species are placed in wrong genera, and purpose at some future time publishing notes in addition to those presented herewith as a guide to those who may have occasion to identify specimens belonging to this family.

NOTES AND DESCRIPTIONS:

Neodiplotoxa, n. gen.

This genus I have erected for the reception of *Diplotoxa nigricans* Loew. Owing to the fact that this species has the hind femur very much thickened, and the hind tibia bent, it is impossible to locate it except in *Meromyza* by the use of the older keys to the genera. It differs, however, very considerably from *Meromyza* in the structure of the antenna.

Type: *Diplotoxa nigricans* Loew.

Meromyza flavipalpis, n. sp.

Similar in coloration to *pratorum* var. *americana* Fitch, the palpi being entirely yellow. It differs from that species as indicated below:

Length of lower cheek margin barely equal to height of anterior profile of head, and barely two-thirds as long as height of head at vertex; face distinctly retreating in profile..... *flavipalpis*, n. sp.

Length of lower cheek margin about $1\frac{1}{2}$ times height of anterior profile of head, and slightly more than equal to height of head at vertex; face but slightly retreating, concave in centre..... *pratorum* Fallice.

In addition to the above *flavipalpis* is considerably larger than *pratorum*, 4.5-5 mm. as against 2.5-3.5 mm.

Locality of specimens of *flavipalpis*: Champaign, Illinois, June 22, 1888, two males (Marten and Hart).

Type: Illinois State Lab. Nat. Hist. collection.

Chloropisca Loew.

There is present on the postero-dorsal surface of the hind tibia in the species belonging to this genus an elongate oval, flattened area, which occupies about two-thirds of the length of the tibia. This area is slightly depressed and thickly covered with closely set, short hairs, which leads me to consider that this area is the seat of some sensory organ. I have examined examples of the following genera and find that this organ is present in varying extent in: *Chloropisca*, *Pseudochlorops*, *Crassiseta*, *Melanochæta*, and *Botanobia*, and absent in the species I have examined in *Elliponeura*, *Ectcephala*, *Meromyza*, *Neodiptoxa*, *Diptoxa*, *Chlorops*, and *Epi-chlorops*.

The amount of material available to me at present is not such that I can form any distinct idea of the significance of this organ in the classification, nor do I know what the organ may have as its function; but it is not improbable that it may prove of considerable value in classifying this rather closely allied group. It appears rather strange to me that *Chloropisca*, which has very much the general habitus of, and is very similar in food habits to *Chlorops*, should have this organ well developed, whereas the latter

genus so far as I have discovered, should not possess the organ. Possibly the examination of more material, and living examples, may throw more light upon this matter.

***Chloropisca obtusa*, n. sp.**

Female shining yellow. Frontal triangle glossy, brownish black; basal joints of antennæ brown, upper margin of third joint blackened, the lower part yellow; face and cheeks yellow; proboscis palpi, and clypeus yellow; arista brown, yellow at base. Mesonotum with the three glossy black stripes very broad, the area between them suffused with black, giving the disk the appearance of being entirely black, the narrow black stripes before wing base separated from the sub-dorsal stripes except anteriorly; mesopleura with a small black spot; the mark on sternopleura reddish yellow, scutellum yellow; postnotum glossy black. Abdomen with a broad, black, foremarginal band on each segment. Legs yellow; apical three joints of fore tarsi and apical joint of other tarsi blackened; sensory organ not differing from colour of hind tibia. Wings clear, veins brown, last section of fourth vein less distinct than the other veins. Halteres whitish yellow.

Frontal triangle occupying about three-fourths the width of frons at vertex, carried forward of almost equal width for almost two-thirds the length of frons, then gradually tapering to just above antennæ, the apical third leaf like, the sides slightly convex, surface unpunctured, smooth; third joint of antennæ about $1\frac{1}{4}$ times as long as broad; arista about as long as width of frons at anterior margin; face slightly receding; cheek about one-fifth as high as eye; eye distinctly, but not greatly, higher than long. Scutellum distinctly broader than long, not so noticeably sub-triangular as in *glabra* Meigen, the apical bristles present. Legs slender, the fore tarsi not thickened; sensory organ occupying about three-fifths the length of the hind tibia. Wing with discal cell narrow, inner cross-vein well before end of first vein; penultimate section of fourth vein distinctly longer than basal section of third, longer than last section of fifth and about half as long as last section of fourth.

Length: 3.5 mm.

Locality: Champaign, Illinois, "swept from amongst grass and weeds," May 30, 1889 (Marten).

Type: Illinois State Lab. Nat. Hist. collection.

This species may be separated from any previously described form by the obtuse frontal triangle. It is most closely allied to *glabra* Meigen.

Chloropisca glabra, var. **clypeata**, n. var.

This variety may be separated from the type form its by being larger, 3 mm., in having the third antennal joint $1\frac{1}{4}$ times as long as broad, the clypeus yellow, instead of black as in *glabra*, and the sternopleura without the black spot.

Localities: Algonquin, Illinois, September 21, 1894 (W. A. Nason), Urbana, Illinois, swept from catalpa, June 21, 1883 (Marten); Urbana, Illinois, July 15, 1887, in woods (C. A. Hart).

This form may really be a distinct species, but colour alone is not a reliable guide to the separation of species in this genus, and till I see more material, I consider it best to give the form varietal rank only.

Pseudochlorops, n. gen.

The type species of this genus is *Chlorops unicolor* Loew. It differs from *Chlorops* in having a distinct sensory area on the hind tibia, and from *Chloropisca* in having the scutellum convex.

Prohippelates Malloch (Pr. U. S. N. M., 1913).

The type of this genus is *Hippelates pallidus* Loew. This genus and its allies, *Hippelates*, *Pseudohippelates* and *Ceratobarys*, have been dealt with in a paper which I have now in the press.

Pseudohippelates Malloch (Pr. U. S. N. M., 1913).

The type of this genus is *Pseudohippelates capax* Coquillett.

Siphunculina Rondani.

To this genus belongs *Siphonella reticulata* Loew.

Neogaurax, n. gen.

The type of this genus is *Gaurax montanus* Coquillett. It differs, as indicated, in the foregoing table, from *Gaurax* in the

shape of the scutellum and is more closely allied to *Botanobia* than to *Gaurax*, differing from it principally in the distinctly pubescent arista.

Chaetochlorops, n. gen.

The type of this genus is *Siphonella inquilina* Coquillett. The characters given in the foregoing table should suffice for its identification. This is the only species I know which is referable to this genus.

The other changes in generic names I have already dealt with in the Canadian Entomologist, 1913, p. 175.

A PHALANGID DRINKS MILK.

I generally have a cup of milk placed in my room, which I drink after I have finished my nocturnal rounds of my treaced trees.

The other night I saw a very fine specimen of a Harvestman (Phalangid) in the saucer. Wondering what brought him there, I managed to remove the cup without disturbing him, and found that a small quantity of milk had been spilt into the saucer and that the spider was taking a drink.

He first anchored his fourth pair of legs on the rim of the saucer; then gradually—very slowly—lowered his body till it was nearly touching the liquid. It was then tipped forward and downwards, until the mouth was in contact with the milk. After about a minute he raised himself to his ordinary standing height and began to clean his mouth, opening and shutting his mandibles (or whatever they are) like a pair of compasses. I was surprised at their size—far larger and more formidable looking than one expects from the size of the creature. Then he raised one or other of his second pair of legs and used the claw to finish the cleaning process. This done to his satisfaction he took another drink. This he did three successive times, and then, satisfied I suppose, took his departure. I noticed he was most careful to keep his feet out of milk.—E. FIRMSTONE HEATH,

The Hermitage, near Cartwright, Man.

September 6th, 1913.

A NOTE UPON THE FOOD HABITS OF ADULT
TENTHREDINIDÆ.

Whilst collecting insects on the 13th of May, 1913, I was interested to observe an adult *Tenthredo variegatus* engaged in feeding upon the remains of a small Dipterous insect, and was fortunately able to secure the specimen alive and unharmed.

I kept it in confinement for some days and was able to make some observations upon the feeding habits of this species.

It was found to feed greedily upon house flies, which were seized with great violence as soon as they were introduced into the jar in which the *Tenthredo* was confined. A wound was then made in the body, into which the mouth parts were introduced and the contents of the body consumed.

On some occasions an attempt was made to drag the fly from the forceps, which were used to place it in the jar, the saw-fly shewing great excitement, constantly dashing about and jerking its legs and wings in the manner of certain predaceous wasps.

The above note is offered as a contribution to a subject upon which I believe little is at present definitely known.

E. P. VENABLES, Vernon, B.C.

NEW OR LITTLE KNOWN SPECIES OF APHIDIDÆ.

BY JOHN J. DAVIS, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

(Continued from Page 87.)

Myzus circumflexus (Buckton).

(*Siphonophora circumflexa* Buckton).

(*Myzus vincæ* Gillette).

This beautiful *Myzus* was first reported in this country by Mr. F. A. Serrine,* who found it attacking calla lily, cyclamen "dusty miller" (*Senecio cineraria*) and *Spiraxis* in greenhouses, it being especially troublesome to the calla. Prof.

*14th Ann. Rept. N.Y. Agric. Expt. Station, 1896, p. 603.

C. P. Gillette has reported it from liliaceous plants, asparagus fern, *Aquilegia*, *Rumex* sp., and *Vinca* in greenhouses, while the writer has found it common and often injurious to such greenhouse plants as *Vinca*, Asparagus fern, *Adiantum hybridum*, and calla lily, at Chicago, Ill. Specimens of this aphidid have been received from Prof. R. H. Pettit, who collected it on calla lily and *Freesia* in greenhouses at East Lansing, Mich. Recently (February 1, 1913) the writer found this species very common on sprouts of various plants in the cold plant room of the Botany Department of the Purdue Agricultural Experiment Station at La Fayette, Ind. Here it was found breeding abundantly on the following plants: *Anemone cylindrica*, *Aquilegia canadensis*, *Arabis*, *Artemisia dracunculoides*, *Aster dumosus*, *A. multiflorus*, *A. paniculatus*, *Carduus floridanus*, *Malvastrum coccineum*, *Polymnia canadensis*, *Rumex obtusifolius*, *Sambucus canadensis*, *Senecio (foliosa) serra* (?) (so labeled), *Steironema lanceolatum*, *Viola nuttallii*. It was also breeding on the following, but not so abundantly: *Aquilegia flavescens* (so labeled), *Ranunculus acris*, *Rutbeckia laciniata*, and *Solidago missouriensis*. From this it will be seen that this species is capable of living and breeding on a large variety of plants, and in this respect, as well as in its habits, it resembles *Myzus persicae* (in greenhouses) and, in fact, the two species are not infrequently found intermingled in the same colonies. Even in the cold plant room just mentioned, where during the past winter the temperature was often as low as 40° F., no sexual forms were observed.

We have recently received specimens of this species from Dr. Albert Tullgren of Sweden, and are able to identify our American forms as the same as the European. It has, so far as we are able to learn, always been referred to the genus *Macrosiphum* by European students of Aphididae, but it is without doubt a typical member of the genus *Myzus*.

For a complete description of this species see Prof. Gillette's paper on "New Species of Colorado Aphididae, with notes upon their life-habits," in the Canadian Entomologist, volume 40, page 19, 1908.

Myzus lycopersici (Clarke).*(Macrosiphum lycopersici* Clarke.)

This species was first identified by Mr. H. F. Wilson as *Macrosiphum lycopersici* Clarke, from specimens collected on wheat and tomato in Montana, sent him by Prof. R. A. Cooley. The Clarke collection of Aphididæ, which contained all his type specimens, was destroyed in the San Francisco earthquake and fire, and consequently it was not possible positively to identify the species. The fact that the original description of this species agrees fairly well with the species here described, that it was found not uncommon on tomato, the type host, and that it has been found by Mr. Wilson in Oregon, where the fauna is not unlike that of the northern half of California, tend to establish the identity of this species beyond little doubt.

Wingless viviparous female.

(Pl. V, fig. 26.)

Entire body pale lemon-yellow, the head usually whitish yellow, with a more or less distinct longitudinal dorsal median line of pale green colour; also, an area at base of cornicles of a deeper yellow is usually discernible, and often one or more of the red eyes of the young within show through the body wall. Antennæ having segments I and II concolorous with head; the remaining segments whitish semitransparent, excepting a faint duskiness at tips of III and IV, the tips of V and of base of VI and the distal third of filament of VI blackish; segments III and filament of VI subequal; total length less than that of the body; one or two circular sensoria near base of segment III and the usual distal ones on V and base of VI. Eyes very dark reddish brown, apparently black under hand lens. Beak not quite reaching to coxæ of second pair of legs. Legs whitish, the tips of tibiæ brownish and the tarsi dusky to blackish. Cornicles whitish yellow and semitransparent; cylindrical, and reaching a little beyond tip of cauda. Cauda pale yellow or greenish yellow, paler than body colour.

Average measurements from 8 individuals, alive and in balsam, as follows: Length of body, not including cauda, 1.90 mm.;

length, including cauda, 2.05 mm.; width, 0.83 mm.; length of cornicle 0.42 mm.; cauda 0.26 mm.

Antennal measurements as follows:

Locality, Date, Etc.	I. mm.	II. mm.	III. mm.	IV. mm.	V. mm.	VI. (base) mm.	VI. (fil.) mm.	Total. mm.
La Fayette, Ind. (Idaho specimens*) Wheat, Aug. 23, 1912.	0.104	0.069	0.504	0.330	0.332	0.148	0.522	2.009
La Fayette, Ind. (Idaho specimens*) Wheat, Aug. 23, 1912. ....	.104	.069	.539	.348	.313	.148	.522	2.043
La Fayette, Ind. (Idaho specimens) Wheat, Aug. 24, 1912. ....	....	....	.495	.313	.278	.130	....	....
La Fayette, Ind. (Idaho specimens) Wheat, Aug. 24, 1912. ....	.104	.078	.504	.304	.261	.139	.487	1.877
La Fayette, Ind. (Idaho specimens) Wheat, Aug. 24, 1912. ....	....	....	.470	.304	.243	.139	.435	....
La Fayette, Ind. (Idaho specimens) Wheat, Aug. 24, 1912. ....	....	....	.487	.261	.226	.139	.444	....
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912. ....	.096	.069	.495	.330	.269	.139	.495	1.893
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912. ....	....	....	.504	.296	.278	.130	.504	....
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912. ....	.096	.069	.461	.261	.261	.139	.452	1.739
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912. ....	.087	.069	.478	.269	.269	.139	.470	1.781
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912. ....	.096	.069	.487	.296	.296	.148	.504	1.896
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912. ....	.069	.069	.487	.304	.296	.148	.487	1.887
New Richmond, Ind., Oats, Nov. 9, 1912, Female producing. ....	.104	.069	.504	.365	.296	.139	.530	2.016
New Richmond, Ind., Oats, Nov. 9, 1912, Female producing. ....	.104	.069	.522	.382	.313	.139	.574	2.103
New Richmond, Ind., Oats, Nov. 9, 1912, Female producing. ....	....	....	.487	.330	.278	.139	.495	....

* Measurements from living specimens.

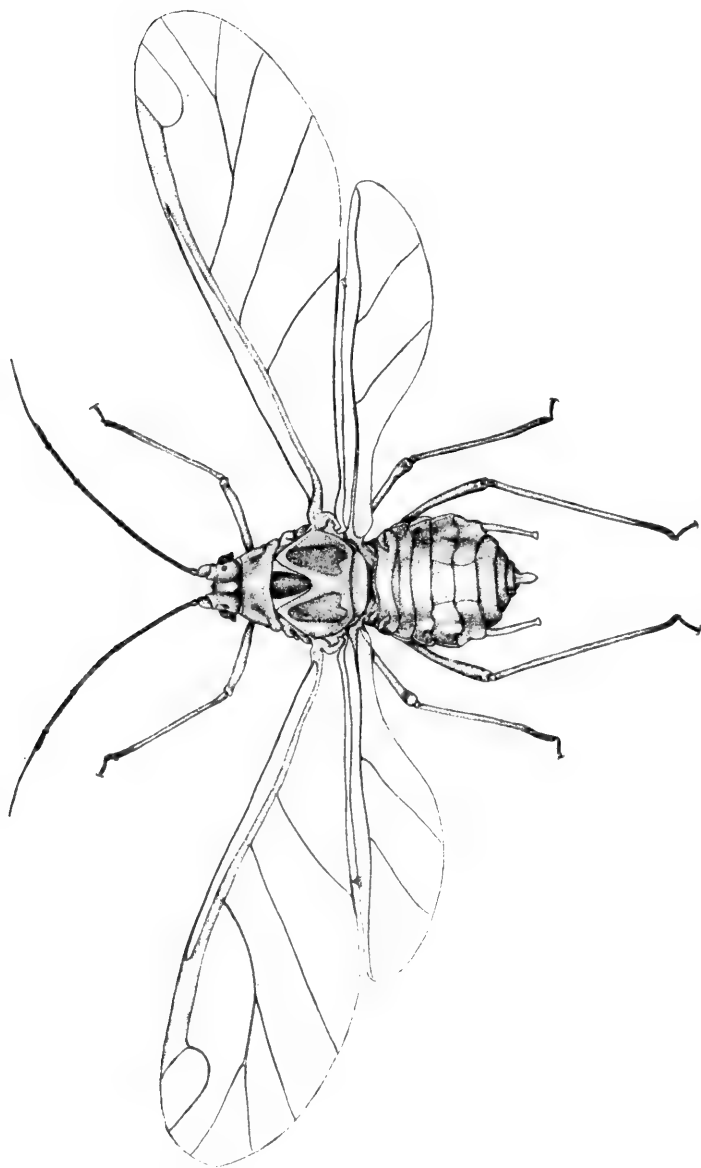


FIG. 14.—*Myzus lycopersici*, winged viviparous female.

Winged viviparous female.

(Fig. 14 and Pl. V, figs. 27-30).

Head pale yellow, with a slight dusky tint near posterior border; the antennal tubercles typical of the genus *Myzus*. Antennæ with segments I and II whitish with a slight yellowish tint, II sometimes faintly dusky, III with extreme base pale and the remainder blackish, IV and V pale with dusky to blackish tips, base of VI blackish and filament of VI pale with blackish tip (in some specimens the entire antenna excepting segments I, II and extreme base of III is blackish); segments III and filament of VI subequal, sometimes the one and sometimes the other being larger; total length less than that of the body; segment III with 18 to 26 circular sensoria, and the usual distal ones on segments V and base of VI. Eyes dark reddish brown, almost black. Ocelli bordered with conspicuous dark wings. Beak reaching only a little beyond coxæ of the first pair of legs. Thorax yellowish, with the thoracic plates yellowish brown and their apices of a darker tint. Wing veins pale brownish and narrow, branching as shown in illustration. Femora whitish, with a faint yellowish or greenish tint, the tip dusky; tibiæ pale brownish with blackish tip; tarsi blackish. Abdomen pale lemon-yellow and with a longitudinal, dorsal median line of a pale green colour, which is often more or less inconspicuous; sometimes the fall forms show three very faint dull-yellowish spots on each side of abdomen, anterior to the cornicles. Cornicles whitish, with a faint yellowish tint and semitransparent, reaching a little beyond tip of cauda, cylindrical and very slightly flaring at tip. Cauda pale yellow, slightly paler than body colour.

Average measurements from 15 individuals in balsam as follows: Length of body, not including cauda, 1.8 mm.; length, including cauda, 1.9 mm.; width 0.66 mm.; length of wing 3.6 mm., width 1.3 mm.; length of cornicle 0.43 mm., of cauda 0.22 mm. Antennal measurements as follows:

Locality, Date, Etc.	I.	II.	III.	IV.	V.	VI. (base)	Vf. (filaments)	Total.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
703. Bozeman, Mont., celerly Aug. 30, 1911, J. R. Parker.	0.104	0.087	0.696	0.530	0.490	0.165	0.591	2.582
709. Bozeman, Mont., celerly Aug. 30, 1911, J. R. Parker.	.104	.087	.713	.487	.417	.165	.574	2.547
707. Bozeman, Mont., wheat Aug. 26, 1912, H. F. Dietz.	.104	.078	.661	.417	.365	.156	.556	2.337
707. Bozeman, Mont., wheat Aug. 26, 1912, H. F. Dietz.	.104	.087	.643	.490	.331	.156	.574	2.355
709. Bozeman, Mont., tomato Aug. 30, 1911, J. R. Parker.	....	.087	.643	.470	.383	.156	.661	....
709. Bozeman, Mont., tomato Aug. 30, 1911, J. R. Parker.	....	....	.626	.487	.383	.156	.643	....
707. Bozeman, Mont., wheat Aug. 26, 1912, H. F. Dietz.	.104	.087	.748	.522	.435	.165	.687	2.748
707. Bozeman, Mont., wheat Aug. 26, 1912, H. F. Dietz.	.104	.087	.765	.530	.443	.165	.721	2.815
Shoshone, Idaho, oats, July 18, 1912, T. H. Parks.	.104	.087	.539	.400	.348	.156	....	....
Shoshone, Idaho, oats July 18, 1912, T. H. Parks.	....	....	.504	.348	.296	.148	.539	....
La Fayette, Ind. (Idaho specimens), Wheat, Aug. 9, 1912. ....	.036	.070	.522	.356	.304	.156	.548	2.052
La Fayette, Ind. (Idaho specimens) Wheat, Aug. 9, 1912. ....	.036	.078	.522	.348	.287	.148	.556	2.035
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 10, 1912. ....	.104	.087	.574	.400	.365	.156	.574	2.269
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 10, 1912. ....	.104	.087	.531	.435	.365	.165	.690	2.347
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 10, 1912. ....	.104	.078	.635	.417	.374	.156	.531	2.364
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 10, 1912. ....	.104	.078	.643	.490	.365	.156	.582	2.346
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 11, 1912. ....	.104	.087	.690	.435	.383	.165	.600	2.383
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 11, 1912. ....	.036	.078	.582	.461	.400	.156	.574	2.347
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 11, 1912. ....	....	....	.622	.443	.383	.165	.600	....
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 11, 1912. ....	....	....	.591	.435	.383	.156	.591	....

Locality, Date, Etc.	I.	II.	III.	IV.	V.	VI. (base)	VI. (fila- ments)	Total.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
La Fayette, Ind. (Idaho specimens) Wheat, October, 1912.....	.113	.078	.696	.513	.400	.174	.643	2.617
La Fayette, Ind. (Idaho specimens) Wheat, October, 1912.....	....	....	.748	.508	.417	.165	.626	....
La Fayette, Ind. (Idaho specimens) Wheat, October, 1912.....	.121	.087	.713	.522	.365	.165	.643	2.616
La Fayette, Ind. (Idaho specimens) Wheat, October, 1912.....	.113	.078	.730	.504	.383	.165	.609	2.583
La Fayette, Ind. (Idaho specimens), Wheat, Oct., 1910, female producing oviparous females.....	.104	.087	.591	.400	.339	.148	.539	2.208
La Fayette, Ind. (Idaho specimens), wheat, Oct., 1910, female producing oviparous females.....	.104	.078	.591	.417	.348	.148	.530	2.216
La Fayette, Ind. (Idaho specimens), wheat, Oct., 1910, female producing oviparous females.....	.096	.078	.522	.348	.313	.148	.522	2.027
La Fayette, Ind. (Idaho specimens), wheat, Oct., 1910, female producing oviparous females.....	.104	.078	.504	.356	.313	.148	.522	2.025

Pupa of Male:

Entire body pale yellowish or cream colour, the abdomen with a faint pink tint in the ground colour. Neck with a decided pink tint. Abdomen with a longitudinal dorsal median area of deep pink, the anterior end of which terminates in a diffused pink area, this extending on to the thorax. Antennæ whitish, excepting V, base of VI and filament of VI (except central area of this segment), which are dusky to blackish. Eyes dark red. Legs whitish, excepting tarsi, which are blackish. Cornicles whitish.

Winged male.

(Fig. 15, Pl. V, fig. 31.)

Head pale at anterior portion, becoming dusky to brownish posteriorly. Antennæ with segments I and II whitish with a slight duskiness, the remaining segments blackish to black; from 48 to 59 circular sensoria, irregularly placed, on III, none on IV, 6 to 10 on V, not including the usual distal one, more or less in a row and

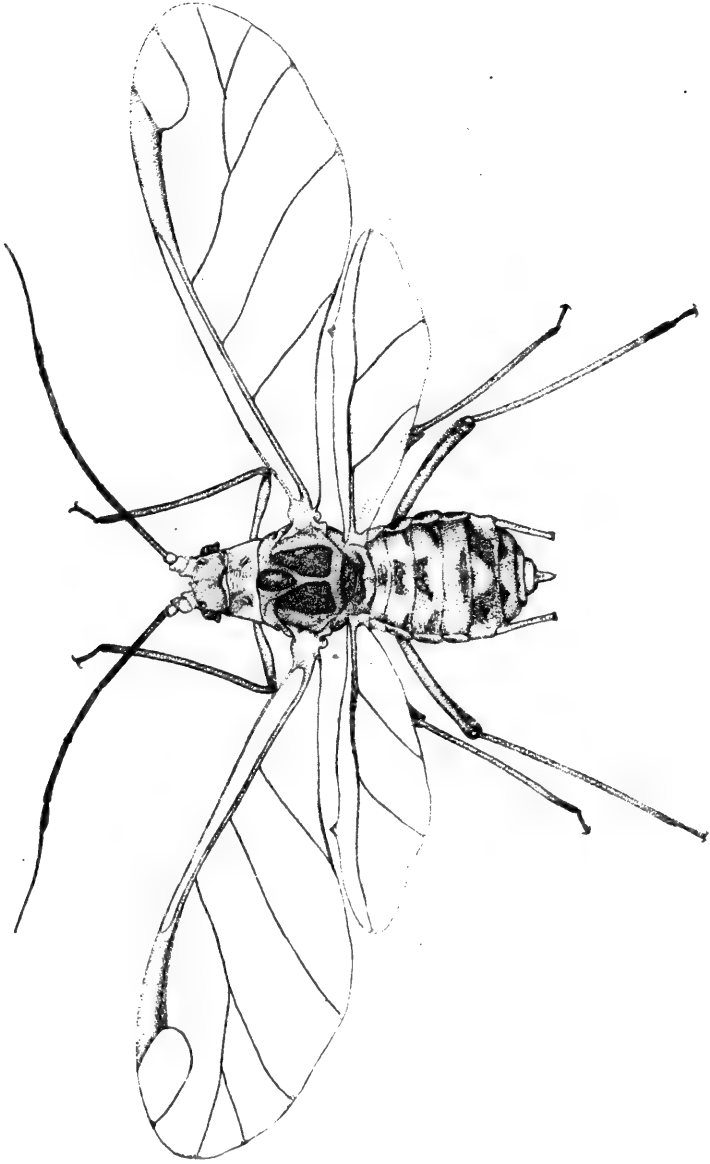


FIG. 15. *Myzus lycopersici*, winged male.

usually on distal half of segment, the usual distal ones on base of segment VI; segments III and filament of VI subequal, the latter usually being slightly the longer; total length greater than that of the body. Eyes dark red; ocelli marked with dark rings. Thoracic lobes brownish or olive brown. Wings with fine blackish veins, the venation as for the viviparous female. Legs pale, excepting tips of femora, bases and extremities of tibiae, and the tarsi, which are dusky to black. Abdomen pale pinkish, with the longitudinal dorsal median area darker and rather conspicuous; the area at base of cornicles yellowish; on each side, anterior to the cornicles, not visible from the dorsal aspect, are three dark spots. Cornicles whitish, semitransparent, with a yellowish tint basally, cylindrical, reaching to or slightly beyond tip of cauda. Cauda pale yellow or cream colour.

Average measurements from 9 individuals mounted in balsam: Length of body, not including cauda, 1.63 mm.; length, including cauda, 1.80 mm., width 0.59 mm.; length of wing 3.6 mm., width 1.35 mm.; length of cornicle 0.36 mm.; length of cauda 0.17 mm. Antennal measurements as follows:

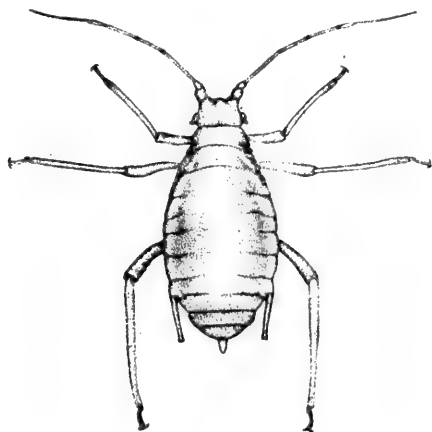
Locality, Date, Etc.	I.	II.	III.	IV.	V.	VI. (base)	VI. (fila- ment)	Total.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
New Richmond, Ind., oats Nov. 15, 1912.....	0.104	0.087	0.714	0.539	0.487	0.191	0.730	2.852
New Richmond, Ind., oats, Nov. 15, 1912.....	.069	.087	.678	.452	.407	.165	.661	2.546
New Richmond, Ind., oats, Nov. 15, 1912.....	.096	.087	.661	.452	.435	.165	.669	2.565
New Richmond, Ind., oats, Nov. 15, 1912.....	.096	.070	.591	.424	.383	.156	.678	2.398
New Richmond, Ind., oats, Nov. 15, 1912.....	.096	.070	.591	.417	.372	.165	.626	2.337
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 21, 1912.....	.104	.070	.650	.435	.435	.156	.678	2.528
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 21, 1912.....	.104	.078	.591	.417	.407	.165	.609	2.371
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 21, 1912.....	.104	.078	.591	.435	.407	.156	.652	2.423

Locality, Date, Etc.	I.	II.	III.	IV.	V.	VI. (base)	VI. (fila- ment)	Total.
La Fayette, Ind. (Idaho specimens) Wheat, Oct. 21, 1912.	mm. .087	mm. .070	mm. .617	mm. .389	mm. .383	mm. .148	mm. .626	mm. 2.319
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 1, 1912. ....	.087	.070	.685	.459	.435	.174	.696	2.606
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 1, 1912. ....	.087	.070	.678	.452	.435	.156	.696	2.574
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 1, 1912. ....	.087	.070	.643	.383	.400	.156	.635	2.374
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 1, 1912. ....	.096	.070	.626	.400	.365	.156	.626	2.339
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 15, 1912. ....	.104	.070	.730	.522	.495	.191	.748	2.860
La Fayette, Ind. (Idaho specimens) Nov. 15, 1912. ....	.104	.070	.713	.522	.495	.....	.....	.....

Wingless oviparous female.

(Fig. 16, Pl. V, fig. 32, and Pl. VII, fig. 33.)

Head and prothorax white, remainder of body a pale cadmium yellow, the last two abdominal segments paler yellow. Antennæ

FIG. 16.—*M. lycopersici*, wingless oviparous female.

having segments I and II concolorous with head, the remaining segments whitish transparent, excepting tips of IV, V, base of VI and distal third of filament of VI, which are dusky; filament of segment VI the longest, being invariably longer than III; total length less than that of the body; segment III with 1 or 2 circular sensoria near base (some specimens appear to have this segment

bare of sensoria) and the usual distal ones at tips of V and at base of VI. Eyes blackish. Beak just reaching to coxæ of second pair of legs. Legs whitish transparent, excepting tips of tibiæ, which are dusky, and the tarsi, which are blackish. Hind tibiæ swollen and bearing 75 or more irregularly placed circular sensoria. Cornicles whitish transparent, not quite reaching to tip of cauda in fully matured individuals. Cauda pale to whitish green.

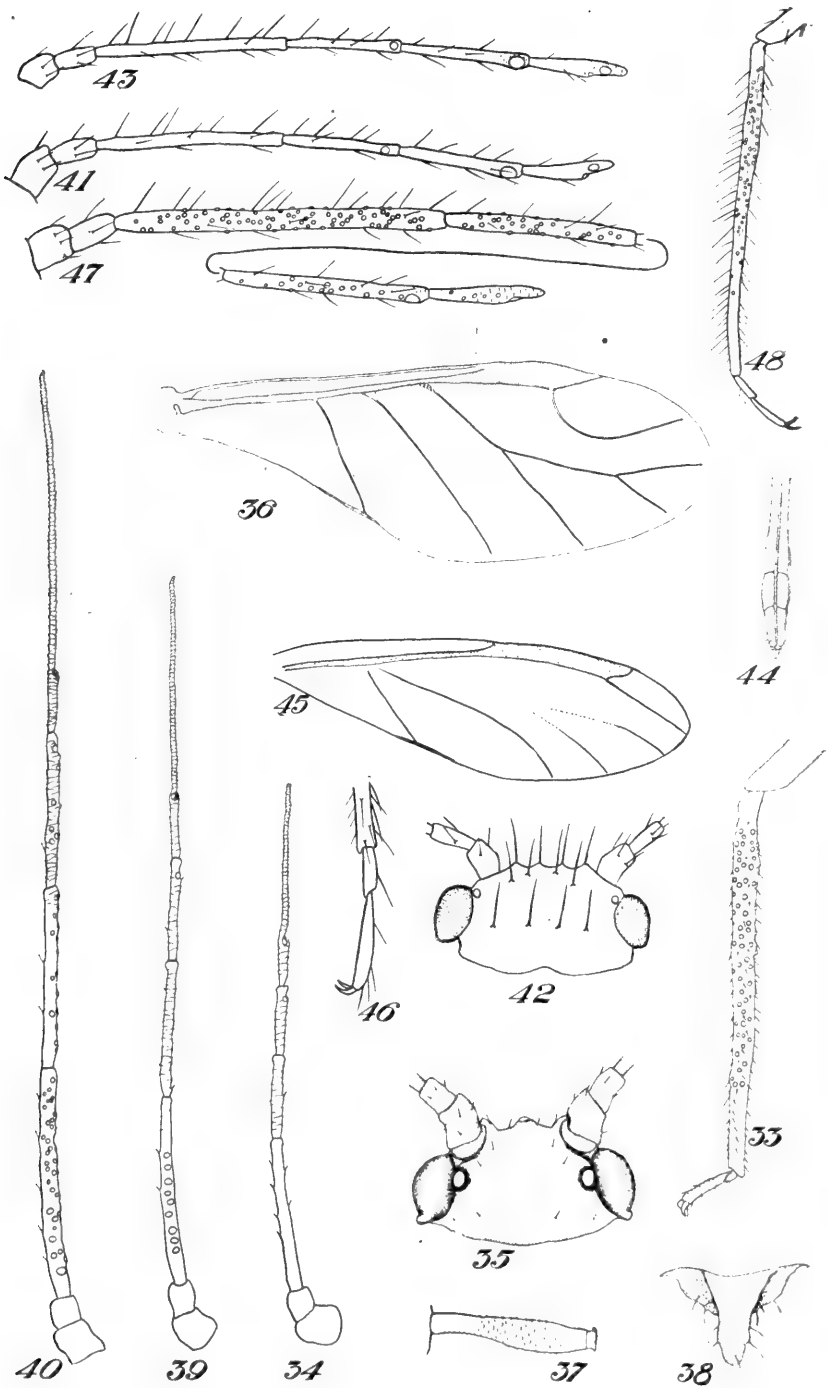
Average measurements from 5 individuals mounted in balsam: Length of body, not including cauda, 1.38 mm.; length to tip of cauda 1.48 mm., width 0.61 mm.; length of cornicle 0.295 mm.; length of cauda 0.16 mm. Antennal measurements as follows:

Locality, Date, Etc.	I.	II.	III.	IV.	V.	VI. (base)	VI. (fila- ment)	Total.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
La Fayette, Ind. (Idaho specimens) Wheat, Dec. 2, 1912 . . . . .	....	....	0.313	0.174	0.165	0.122	0.339	....
La Fayette, Ind. (Idaho specimens) Wheat, Dec. 2, 1912 . . . . .	.087	.070	.296	.191	.191	.113	.391	1.339
La Fayette, Ind. (Idaho specimens) Wheat, Dec. 2, 1912	.087	.070	.296	.200	.200	.113	.490	1.366
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 20, 1912 . . . . .	.087	.061	.339	.243	.209	.113	.383	1.435
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 9, 1912 . . . . .	.087	.061	.356	.243	.209	.113	.409	1.478
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 20, 1912 . . . . .	.087	.061	.278	.209	.226	.104	.374	1.339
La Fayette, Ind. (Idaho specimens) Wheat, Nov. 20, 1912 . . . . .	.087	.061	.287	.191	.217	.122	.400	1.365
New Richmond, Ind. Wheat, Nov. 9, 1912 . . . . .	.087	.061	.348	.252	.209	.113	.417	1.487

Egg:

(Fig. 17.)

The egg when first laid is pale yellowish green colour, later changing to jet black. It measures 0.0678 mm. by 0.3304 mm.



NEW AND LITTLE KNOWN A-HIDIDAE

During oviposition, which requires 14 minutes for the deposition of a single egg, the female holds the cauda perpendicular to the body.



FIG. 17.—*M. lycopersici*.
egg.

This interesting species was first received from Mr. T. H. Parks, of this Bureau, who found it quite common on oats, first at Shoshone, Idaho, July 18, 1912, and later at Blackfoot and Idaho

Falls, Idaho, August 7, 1912. The same species was received from Mr. E. J. Vosler, who collected it on oats at Salt Lake City, Utah. Later in the year (October 8) the writer found the pupæ of viviparous females, as well as wingless viviparous females, which were giving birth to the beautiful and conspicuous pinkish males, in abundance on volunteer oats near an elevator at New Richmond, Ind. Specimens collected at Bozeman, Mont., in August of 1911 and 1912 on wheat, tomato, and celery were received from Prof. R. A. Cooley and Mr. H. F. Dietz. Mr. Dietz informs me that they also found the pinkish males on wheat at the same time, although it was not known then that they and the pale yellow forms on the same plant were specifically identical.

In rearing cages at La Fayette, Ind., pink and yellow young were obtained from wingless viviparous females. The former became winged males, while the latter became winged viviparous females, which in turn gave birth to oviparous females. The winged males were quite restless in the cages containing wheat plants, as were also the sexuparæ, and it was only rarely that the latter could be induced to give birth to an oviparous female on the wheat plants, although most of those born there did feed and mature on the wheat. Mr. Dietz states that in August, at the time his collections were made, the winged forms were apparently migrating to some unknown host. The same was true at New Richmond, Ind., where the species was found in abundance on oats. Thus it seems quite probable that the males and the winged viviparous females (sexuparæ) migrate to some unknown host in the fall of the year, where the oviparous females are born and the winter eggs deposited.

Besides the plants enumerated above, we have reared this species through several generations in the insectary on rye.

(To be continued.)

MEETINGS OF THE TORONTO BRANCH.

During the first part of the present season, up to the end of the year, the Toronto Branch of the Entomological Society of Ontario has made good progress. Four new members have been elected, and there has been a distinct increase in the attendance at the meetings. Three meetings have been held at which very interesting papers have been presented. A little variety has been given by the fact that two of the papers have not been confined strictly to entomology, but have been of a somewhat wider character.

At the October meeting of the Branch, Dr. A. Cosens read a paper upon "Some Captures of the Season," exhibiting a number of specimens taken during the past summer. A considerable number of species of galls had been obtained which Dr. Cosens had not found before.

This paper was followed by an account by Dr. E. M. Walker of a peculiar insect which he found at Banff last summer. Two female specimens had been obtained, which were shown to those present, and which represent not only a new species and genus, but a new family of the Orthoptera, and appear to be of a more primitive type than any of the members of the order known hitherto.*

At the November meeting, Mr. E. Horne Craigie gave a paper entitled, "Summer Work in Scotland." He showed specimens of several species of galls obtained in Scotland during the past season, along with some specimens of similar Canadian species, which were kindly lent by Dr. Cosens. He then went on to describe the work on S. S. "Goldseeker," the scientific cruiser of the Fishery Board for Scotland, on which he spent some time this summer, working in the North Sea and the Faroe, Shetland Channel. The paper was illustrated by lantern slides and specimens.

At the December meeting Mr. Kenneth F. Auden gave an address upon "Arthropoda of the Bahamas," illustrating his remarks by specimens which he had brought from the Bahamas this summer. About one hundred insects and a large number of crustaceans, etc., were exhibited.

Dr. E. M. Walker then addressed the meeting upon the subject of "Primitive Insects," pointing out just what the term implied, and describing some of the primitive characters of certain of the

**Grylloblatta campodiformis* Walk., Can. Ent., 46, pp. 93-99.

Thysanura and Collembola, particularly of the genera *Machilis* and *Japyx* of the Thysanura. These were compared with *Scolopendrella*, the typical genus of the class Symphyla, and the closest living relative of the insects. Specimens of these forms were shown, in which most of the features referred to were pointed out.

The Branch was favoured with the presence at this meeting of Mr. Arthur Gibson, Chief Assistant Entomologist of the Division of Entomology, Ottawa, who gave an interesting outline of the work of the Division both at Ottawa and in the field. He stated that since the new Division had been established in 1908, under the direction of Dr. Hewitt as Dominion Entomologist, the work had increased very rapidly. This was largely due to the finding of nests of the Brown-tail Moth in importations of nursery stock from Europe, which necessitated the passing by Parliament of the Destructive Insect and Pest Act (under the provisions of which nursery stock entering Canada is inspected by inspectors of the Division) and the establishment of Field Stations in the different Provinces. The field work in Nova Scotia and New Brunswick in connection with the Brown-tail Moth was discussed and many questions asked by members present. Mr. Gibson spoke of his own and Mr. Strickland's work in Alberta in the control of a Cutworm (*Porosagrotis orthogonia*) which during the past three years had devastated many wheat fields. A preliminary report on the investigation was presented at the recent meeting of the Association of Economic Entomologists. E. HORNE CRAIGIE, Sec.-Treas.

CANADIAN ENTOMOLOGICAL SERVICE.

Mr. R. Neil Chrystal, B.Sc., of the University of Edinburgh, has been appointed a Field Officer for Forest Insect Investigations in the Entomological Branch of the Department of Agriculture, Ottawa. Mr. Chrystal, who is the son of Dr. Chrystal, Professor of Mathematics in the University of Edinburgh, graduated in forestry, including entomology, and afterwards studied forestry methods in Germany. During the last year he has been specializing on forest insects under Dr. R. Stewart MacDougall at Edinburgh University and Prof. Maxwell Lefroy of the Imperial College of Science, London. He will be detailed for work in British Columbia during the coming summer.

NEW GENERA AND SPECIES OF TENTHREDINIDÆ :
A FAMILY OF HYMENOPTERA.*

BY ALEX. D. MACGILLIVRAY, UNIVERSITY OF ILLINOIS, URBANA, ILL.

(Continued from page 108).

Astochus aldrichi, n. sp.—Female: Body black with the antennæ, a short, fine line on the inner orbits, the legs below the trochanters, and the abdomen beyond the basal plates, rufous; the following parts: the labrum, a spot on each side of the labrum. a narrow interrupted band on the edge of the pronotum, the tegulæ, an ovate spot on the mesopleura, a spot above the posterior coxæ, the front coxæ beneath, the hind coxæ beneath and at sides, the trochanters, and the stigma in great part, yellowish white; the ocellar basin elevated at sides and concave at middle; the frontal furrow deep and broad, extending to the supraclypeal area; head and thorax polished; postocellar area broader than long, with a deep median furrow, interrupting the posterior margin of the head; the wings slightly infuscated; the saw-guides convex above and below, convergent toward apex, obliquely truncated at apex. Length, 8 mm.

Habitat.—Julietta, Idaho.

This specimen was collected by Professor J. M. Aldrich, for whom the species is named.

Kincaidia, n. gen.—Front wings with the radial cross-vein, the radio-medial cross-vein, the free part of R_3 and R_4 present; the medio-cubital cross-vein joined to $R+M$ some distance before the origin of M ; Sc_1 wanting; the free part of R_3 and the transverse part of M_2 not interstitial; the free part of the second anal vein short, erect, transverse; the contraction of the third anal vein indicated; the hind wings with the free part of R_4 and the transverse part of M_2 present; the first anal cell almost as long as the one in front of it; antennæ with nine segments; compound eyes with the inner margins parallel and distant; the basal plates divided; the claws cleft. Type, *Tenthredopsis ruficornis* MacG.

This genus is related to *Astochus*. It is named for Professor Trevor Kincaid, from whom I have received many interesting species of sawflies from the Pacific Coast.

* Contributions from the Entomological Laboratories of the University of Illinois, No. 37.

Neopus MacG.—Front wings with the radial cross-vein, the radio-medial cross-vein, the free part of R_4 and R_5 all present; the medio-cubital cross-vein joined to $R+M$ a considerable distance before the origin of M ; Sc_1 obsolete on its costal half, located near the medio-cubital cross-vein; the free part of the second anal vein short, erect, and transverse; the contraction of the third anal vein indicated; hind wings with the free part of R_4 and the transverse part of M_2 wanting; antennæ with nine segments; the clypeus emarginate; compound eyes with their inner margins straight and parallel and distant; the basal plates divided; the claws cleft. Type, *Tenthredopsis 14-punctatus* Norton.

This genus is related to *Tenthredopsis*. This name was first used in Smith's Report of the Insects of New Jersey, 1910, p. 585, where it is properly accredited. Mr. S. A. Rohwer, in a paper on the genera of the Tenthredinoidea, has accredited this name and some others by the writer, used for the first time in this list, to Mr. H. L. Viereck. It is unfortunate that such references should have been used in a paper of this sort. Mr. Rohwer's conclusions in respect to the authority for these names is discussed by Mr. Viereck in the Proceedings of the Entomological Society of Washington, Vol. 13, 1911, p. 94.

Tenthredo neoslossoni, n. sp.—Female: Body black, with the following parts yellowish white: the clypeus, the labrum, mandibles at base, spot on the supra-clypeal area, the collar, the scutellum, a spot above the posterior coxæ, the sides of the basal plates, and the tarsi, yellow; the following parts rufous: the antennæ, a minute spot on each inner orbit, the tegulæ, the front femora beneath, the front and middle tibiæ, the basal three-fourths of the hind tibiæ, and abdominal segments two to four; antennæ with the third segment distinctly longer than the fourth; the clypeus deeply emarginate; the head and thorax roughened; the wings yellowish, the veins, including the costa and stigma brownish; the saw-guides bluntly rounded at apex. Length 10 mm.

Habitat.—Franconia, New Hampshire, Mrs. Annie Trumbull Slosson, Collector, for whom the species is named.

This species belongs to the mellina and redimacula group.

Macrophya melanopleura, n. sp.—Female: Body black, with the following parts yellowish white; the clypeus, the labrum, the basal segment of the antennæ, the collar broadly, the tegulæ, the scutellum, the postscutellum, the basal plates, the front and middle legs, the hind coxæ except the part beneath, the hind trochanters, the basal half of the hind femora, a broad ring on the hind tibiæ, and the hind tarsi; the third segment of the antennæ longer than the fourth; the head and thorax coarsely and densely punctured; the saw-guides with the upper and lower margins straight, subparallel, the apex obliquely truncated with the angles rounded. Length 9 mm.

Habitat.—Massachusetts. Received from the Hatch Experiment Station, Amherst, Massachusetts, through Professor H. T. Fernald.

A species related to *fascialis* Nort. and *varia* Nort. from which it is differentiated by having well-developed vertical furrows.

Macrophya confusa, n. sp.—Female: Body black, with the clypeus, the labrum, the mandibles, the collar, the tegulæ, a band on the pleuræ, a spot above the hind coxæ, the front and middle legs except a spot on the apex of their femora beneath and the apices of their tibiæ, the hind coxæ and trochanters, the basal half of the hind femora, a ring on the hind tibiæ, and the hind tarsi except the apices of the segments; the antennæ with the third segment longer than the fourth; the head finely punctured; the wings hyaline, the veins and stigma brownish; the saw-guides obliquely, bluntly rounded. Length 9 mm.

Habitat.—Pennsylvania. Received through Professor C. F. Baker.

This species is related to *pulchella* Klg., from which it differs in the amount and coarseness of the punctuation on the mesopleura.

Macrophya ornata, n. sp.—Female: Body black, with the following parts white: the clypeus, the labrum, the mandibles, the collar, the tegulæ, the scutellum, the front legs except a fuscous line on the tibiæ at apex above, the middle legs except a ring on the apex of the tibiæ, the apical half of the hind coxæ, the hind trochanters, the basal one-third of the hind femora, a ring on the hind

tibiae, and the hind tarsi beyond the middle of the first segment; the abdomen except the saw-guides rufous beyond the basal plates; the third segment of the antennæ distinctly longer than the fourth; the head finely punctured; the wings slightly infuscated, the veins, including the costa and stigma, brownish; the saw-guides bluntly rounded at apex. Length 8 mm.

Habitat.—Ithaca, New York.

This species is related to *nidonea* from which it differs in the colour of the abdomen.

NOTES ON THE WINTER AND EARLY SPRING
COLEOPTERA OF FLORIDA, WITH DE-
SCRIPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY, INDIANAPOLIS, IND.

(Continued from Page 92.)

6611. **Bassareus croceipennis** Lec.—Quite frequent at Sanford and Ormond on oak in blossom. March 28–April 13.

6621. **Cryptocephalus bivius** Newm.—Three examples of this large and handsome species were beaten singly from oak at Dunedin, Eustis and Sanford. March 21–April 7.

Cryptocephalus sanfordi Bl.—Three additional specimens were taken at Sanford and one at Dunedin. March 29–April 9.

6638. **Cryptocephalus incertus** Oliv.—Quite frequent at Dunedin and at various points along the Kissimmee River on flowers of the Ericad—*Andromeda nitada* Bart. January 21–March 21.

6644. **Cryptocephalus tinctus** Lec.—One example from the same Ericad. Istokpoga Creek, February 26.

6645. **Cryptocephalus lateritius** Newm.—Three specimens at Dunedin from the same shrub. January 15–March 19.

6668. **Pachybrachys limbatus** Newm.—Six specimens beaten from oak at Ormond. April 3–April 14.

6890. **Diabrotica vincta** Lec.—Two examples beaten from a tall ragweed (*Ambrosia sp.?*) near the mouth of Taylor's Creek on Lake Okeechobee, March 3.

6932c. **Ædionychus concinne** Fab.—A half dozen or more beneath boards and other cover along the margins of shallow fresh water lakes just east of Dunedin. February 7–March 24. One also at Ormond, April 6. I regard this as a distinct species, and not a variety of *vians* Ill., as listed. Aside from the differences in colour, it is much more finely and indistinctly punctate than *vians*.

Haltica schwarzi, sp. nov.—Oblong-oval, feebly convex. Above, uniform piceous, strongly bronzed or brassy; joints 4–10 of antennæ piceous, finely pubescent, the three basal joints dark reddish; under surface and legs piceous. Eyes large, coarsely granulate. Thorax one-third wider than long, sides feebly rounded, ante-basal impression entire; disc convex, feebly constricted near the apex, finely and very sparsely punctate. Elytra at base nearly one-half wider than thorax, sides parallel for three-fourths their length, then broadly rounded into apex; disc very finely alutaceous, distinctly but sparsely punctate, the punctures ending to form regular rows; a broad and shallow impression behind the scutellum; umbone not prominent. Under surface finely and closely punctate. Length 4.2–4.5 mm.; width 2.3 mm.

Frequent on semi-aquatic plants along the shores of Lake Okeechobee. March 3–March 7. Larger than *H. ignita* and uniform in colour as described. Umbone less prominent, its inner limiting depression obsolete. Elytra relatively longer, less convex, and more distinctly punctate. Of it Mr. E. A. Schwarz (to whom, for his many favours, I dedicate the species) says: "This is one of the various (at least four) good species which we lump in collections under the name *Haltica ignita*."

Longitarsus cotulus, sp. nov.

Oblong, narrowly oval, slender, apterous. Upper surface uniform pale yellowish testaceous, finely but distinctly alutaceous; under surface dusky. Antennæ slender, two-thirds as long as body, outer joints dusky, the second, third and fourth joints subequal in length. Thorax not wider than long, sides broadly rounded, disc

very finely and sparsely punctate. Elytra one-fourth wider at base than thorax, rather convex, umbone obsolete, sides parallel from just behind humeri two-thirds or more to apex, thence gradually converging to tips; disc finely and sparsely punctate, the punctures a little coarser than those of thorax. Wings absent. Length 1.7-2 mm.

Described from seven specimens swept from herbage at Kissimmee, Dunedin, Eustis and Sanford. February 16-April 7. According to Schwarz it is "very common in Florida on Mayweed or dog-fennel (*Anthemis cotula* L.), whence the specific name.

Allied to *testaceus* Melsh, but body distinctly smaller, more slender and more parallel; inner wings and umbones absent and elytra much more finely and indistinctly punctate.

7031. **Phyllotreta robusta** Lec.—Taken in large numbers at Sanford by sweeping herbage along borders of cypress swamps. Described from Garland, Colorado, and recorded elsewhere only from Lake County, Indiana.

10,467. **Psyllobora elegans** Horn.—Three specimens taken by sweeping—one at Sanford, two at Ormond. April 3-14.

7075. **Chalepus scapularis** Oliv.—Three examples of this species and about a dozen of the more handsome *C. bicolor* Oliv., were taken by sweeping low herbage along the border of a cypress swamp at Sanford. April 5-9.

7095. **Porphyraspis cyanea** Say.—Mention is made of this rather common species to record the taking of several black specimens along the Kissimmee River. It occurs only on the leaves of the Saw palmetto, *Serenoa serrulata* Hook, which is probably the most common shrub in Florida.

7400. **Merinus laevis** Oliv.—A single specimen of this large Tenebrionid was taken from beneath pine bark near Ormond on March 24. Horn, in his "Tenebrionidæ of America," records it from the "Eastern and Middle States and more rarely in Canada." It is uncommon in Indiana, and I can find no previous record of its occurrence in Florida.

7408. **Glyptotus cribratus** Lec.—Four specimens were beaten from large bunches of Spanish moss near Dunedin. March 18-27

7426. **Opatrinus aciculatus** Lec.—This appears to be far more common in Central and Southern Florida than *O. notus* Say. Numerous specimens were taken at Dunedin and on the Kissimmee River trip. It occurs beneath cover in moist sandy localities. January 20–March 24.

7487. **Eutochia crenata** Lec.—Sifted one specimen from a dead fungus near Dunedin. January 23.

Platydema subquadratum Mots. — One example, so named for me by Mr. Schwarz, was taken from an oak tree fungus near Dunedin, March 16. It is 7.5 mm. in length, shining black, with legs and basal joints of antennæ pale, and with elytral rows of punctures very small, close-set and unimpressed.

7535. **Hypophlœus thoracicus** Mels.—Three examples from beneath bark of dead pine in open woods. Sarasota, January 28.

7575. **Talanus (Dignamptus) langurinus** Lec.—Quite common on the custard apple (*Anona glabra* Dunal) and a wild cucumber (*Melothria pendula* L.) along the borders of Lake Okeechobee and the lower stretches of the Kissimmee River. March 1–7. All the specimens taken were a shining dark chestnut brown, not black as described. Length 3.5–7 mm.

I fully agree with Dr. John Hamilton (Can. Ent., XXVII, 321) that *T. stenochinus* and *langurinus* are only different sizes of the same species, the latter and smaller perhaps being the male. He states that Dr. Horn had come to the same conclusion and that the name *langurinus* should be given to both.

Talanus okeechobensis, sp. nov.

Elongate, subcylindrical, robust. Dark chestnut brown, shining; antennæ and legs slightly paler. Antennæ as long as head and thorax, the joints gradually stouter, the 8th, 9th and 10th wider than long. Head finely and rather densely punctate. Thorax slightly longer than wide, feebly narrowed at base; apex rounded, base truncate; hind angles small, rectangular, acute, disc convex, rather coarsely, closely and unevenly punctate. Elytra very distinctly wider than thorax, strongly convex, deeply striate, the striæ rather finely serrate punctate; intervals convex, minutely punctulate. Abdomen finely and very sparsely punctate. Front tibia with a strong tooth one-third from apex. Length 6–6.5 mm.

Two specimens beaten from custard apple at Lake Okeechobee. March 6. In *langurinus* the body is much more slender, thorax longer than wide, elytra much narrower, scarcely striate, intervals flat, front tibiæ not toothed.

7590. *Allecula atra* Say.—One, beaten from oak. Eustis, April 5.

Hymenorus granulatus Bl.—A female, 9 mm. in length, was taken at Ormond, April 14.

Isomira ignora, sp. nov.

Elongate, narrowly oval, convex. Uniform pale rufo-testaceous, shining; sparsely clothed with very short fine prostrate yellowish hairs. Head small, half the width of thorax, finely and densely rugosely punctate; eyes small, separated by twice their own diameters; antennæ slender, scarcely half the length of body, second joint half as long as third, the latter equal to fourth. Thorax at base two-thirds wider than long, sides nearly straight and parallel on basal half, thence converging and rounding into apex, disc punctate like the head. Elytra at base scarcely wider than thorax, sides parallel for three-fourths their length, thence gradually rounding into apex; disc very finely and rather sparsely punctate the punctures in places tending to form short transverse strigæ. Length 5 mm.; width 2.5 mm.

Nine specimens beaten from oak. Dunedin, March 15–24; Sanford, March 29; Ormond, April 3. Paler and much narrower than *I. quadristriata* without trace of sutural strigæ.

7610. *Isomira valida* Schwarz.—Two specimens beaten from oak near Eustis, April 6. A robust species, 7–8 mm. in length.

10,710. *Eustrophus repandus* Horn.—One from woody fungus near Dunedin, in company with *E. bicolor*, the latter common. March 16.

Chrysanthia repanda Horn.—Common on the flowers of the farkleberry at Sanford and Ormond. March 28–April 14. Taken on no other plant. The elytra of all were a very handsome purple in hue.

8060. *Macrobasis torsa* Lec.—Three from flowers of thistle. Sarasota, March 28.

(To be continued.)

SUNFLOWERS AS A LURE FOR THE PLUSIIDÆ

This season most of my sunflowers, being self-sown, were in bloom a good two weeks earlier than usual and were in greater profusion. They also lasted well into the fall.

I had noticed in previous years, when I had a good show of the flowers, that quite a number of species were attracted; consequently this year, with such a quantity out at once, and so early, I was particularly on the watch for things moving at dusk in that part of my garden.

Early "sugaring" having proved a failure, I had fallen back on collecting "at light" on suitable evenings when I could manage it, with a preliminary stroll around the flower beds with my net. Many good evenings were missed early in August, owing to other engagements or occupations, but during the latter part of the month, and the first two weeks of September, I was able to make a round nearly every evening, when the weather was favorable.

The list of species taken is as follows:

- 2475.—*Plusia aeroides* Grote. Aug. 3rd (1). Half a dozen specimens were also taken at light in July this year. I never took *aeroides* in Victoria, and but a single specimen during the previous seven years of my residence on Quamichan Lake.
- 2477.—*Plusia metallica* Grote. Aug. 30th to Sept. 13th (3). One of them my small daughter, Phyllis, netted off the flowers in the afternoon. I have always found the species rare.
- 2479.—*Euchalcia putnami* Grote. Aug. 21st to 24th (3). Also one at light on July 24th. I think this species may be double brooded with us, for I have taken it earlier in the year. I have always found it rare, however.
- 2481.—*Eosphoropteryx thyatiroides* Guenée. Aug. 10th (1). I have captured this rarely in previous years off a small species of sunflower, coming into bloom earlier. I took the species one season in Elm Park, Winnipeg (Aug. 18th) off a species of wild sunflower, when I was out sugaring.

- 2492.—*Autographa californica* Speyer. Aug. 21st to Sept. 16th. Not abundant like *celsa*, and, while in beautiful condition, most were allowed to go. The species is double brooded here.
- 2505.— “ *rectangula* Kirby. Aug. 4th to 29th. In all seven specimens.
- 2509.— “ *selecta* Walker. Aug. 23rd to Sept. 12th (3 or 4).
- 2514.— “ *celsa* Hy. Edw. Aug. 20th to Sept. 15th. This was by far the most plentiful species coming. Several nights I bottled as many as two dozen, all in good condition, and captured altogether, I dare say, considerably over 150 specimens. It shows quite a wide range of variation in the silver Y, or markings, and in size and colour, some individuals being almost black on the primaries. This species is a bit of a day-flier also.
- 2515.— “ *epigæa* Grote. Aug. 25th to Sept. 15th. About a dozen were taken.
- 2517.— “ *ampla* Walker. Aug. 22nd (2). This species is usually fairly abundant at light a little earlier in the season.
- 2524.— “ *corrusca* Strecker. Sept. 5th to 16th. About half a dozen. This species can generally be taken freely at light early in July, and from the above late catch (the specimens being fresh) it would appear to be double brooded here.

As several (3) 2482, *Autographa mappa*, G. and R., were taken at light early in July, the season would seem to have been a good one for this class of noctuids.

Off the sunflowers these moths were very easily “bagged.” I used a quart “economy” jar, charged with cyanide, the same as I use for “sugaring.” It was quite easy to bottle them off the flower heads, sometimes two at a time, and few were missed; no net was required at all; in fact, one was rather in the way.

Other species taken or attracted were *Noctua baja*, *Feltia herilis* (common) and *subgothica*, *Paragrotis vetusta* (1), *Mamestra stricta* and *pensilis* (1), *Dargida procinctus* (3), *Heliophila roseola* (1), a few

Geometridæ, and *Phlyctænia ferrugalis* and *profundalis*; these two kinds in abundance.

I can recommend this method of collecting to anyone interested in the *Plusiidæ*; the moths come freely, preferring sunflowers to any other kind of flower that I have grown for this purpose, they are easily taken, and with a minimum of rubbing. Moreover, the seed is cheap and the plants very easily grown anywhere.

A. W. HANHAM, Quamichan Lake, Duncan, B.C.

BOOK REVIEWS.

THE LIFE STORY OF INSECTS. By Prof. G. H. Carpenter (Cambridge Manuals of Science and Literature), 134 pp., 23 figs. Cambridge University Press. Price, one shilling.

Notwithstanding the existence of numerous entomological books of an elementary character, the treatment of the subject in the present little volume makes it peculiarly suitable to place in the hands of a person having no knowledge of insect life. It does not attempt to accomplish more than "an outline sketch of the facts and meaning of insect transformations," and, in the modest words of its author, the "humble volume will best serve its object if its reading should lead fresh observers to the brookside and woodland." We feel that its object will frequently be served, for it cannot fail to stimulate an interest in an enquiring mind in the study of insect life in its varied forms and it is sure to be the means of directing many a wayfarer's steps into the fascinating paths of entomological enquiry.

After describing the form and growth of insects, the life-histories of certain sucking insects, such as the aphids, are given. The author then passes on to a consideration of the adaptations and transformations of aquatic insects. This leads him to a discussion of the internal changes which accompany metamorphosis. A most readable account of the different larval forms and their adaptations constitutes the longest chapter in the book and the well-chosen illustrations contribute greatly to its clearness. A consideration of the varied pupal forms and their modifications naturally follows. A chapter on the life-story of insects in relation to the seasons succinctly portrays the varied life-cycles in relation to the seasons of the year and to seasonal conditions. The book concludes with an interesting chapter on the past history of insect life. In this the

author takes up the different views regarding the development of the insects of to-day and the manner in which the evolution of the highly developed insect with a complete metamorphosis may have taken place. A short bibliography will guide the student to further reading. We heartily congratulate Prof. Carpenter on the pleasing results of what has been by no means a light task, and we feel sure that it will serve to add many new recruits to our ever-increasing army.

C. GORDON HEWITT.

A SYNOPSIS OF ECONOMIC ENTOMOLOGY. By W. Lochhead, Professor of Biology, Macdonald College, Ste. Anne de Bellevue, P. Que. 113 pages.

This work, which has evidently been prepared by the author as a basis for his lectures on Entomology, will be found very useful by others with similar duties to fulfil and especially by science teachers in High Schools and Collegiate Institutes, who are unable to devote much time to the study of insects. Owing, however, to the entire absence of illustrations and the use of terms which are not explained, it will require to be supplemented by some such guide as Comstock's "Manual for the Study of Insects." For these reasons also it can hardly be recommended as a text-book for students.

The author might well have enlarged the title to a Synopsis of Systematic as well as Economic Entomology, as the book is nearly equally occupied by the consideration of both these aspects of the subject.

The work is divided into four parts. The first describes the external and internal anatomy of insects and their metamorphoses, the losses due to them, and an account of those that may be termed beneficial. Part 2 contains keys to insects injurious to farm, garden and orchard crops, including small fruits. These are arranged under the headings of attacks upon roots, trunks or branches, leaves and fruit. Part 3 occupies more than half the volume and is devoted to "a classification and description of common insects" given in the form of keys to orders and families, followed in each case by brief descriptions of the more important species from an economic standpoint. Part 4 describes the various methods, both cultural and artificial for the control of insects.—C. J. S. B.

The Canadian Entomologist.

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No. 5

AMERICAN TRICHOPTERA—NOTES AND DESCRIPTIONS.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

In the following pages are descriptions of various new caddiceflies, mostly from my own collection. I have given a new arrangement of the genera of the Hydropsychidæ based on a salient, but hitherto unused character, which makes the classification of this family easier than before.

PHRYGANEIDÆ.

Neuronia smithi, n. sp. (Pl. VIII, fig. 11).

In general similar to *N. concatenata*, but the irrorations on the wing a little further apart, and much less wavy; the vertex wholly pale yellowish, the thoracic notum also pale, but rather dark each side. Venation generally as in *N. concatenata*, but the first fork does not reach half way back on discal cell (in *concatenata* much more than half way). The lower appendages of the male have the apical spine longer and less curved than in *N. concatenata*.

Expanse 23 mm.

From Lakehurst, N. J., 4th July (Englehart). Named in memory of the late Dr. J. B. Smith.

LIMNEPHILIDÆ.

Limnephilus spinatus, n. sp. (Pl. VIII, figs. 8, 9).

Palpi yellow; face dark, with yellow hairs, vertex and thorax dark, with some yellow hair and black bristles; antennæ brownish, the basal joints darker; abdomen black above and on the sides, vertex pale; legs yellow, with black spines, those on tibia 1 are very short; wings, except costal and subcostal areas, are brown, marked with pale spots, these most numerous in front and along the veins, basal part of apical cells pale, beyond the brown is densely spotted with minute pale dots, the usual median oblique mark is distinct; hind wings hyaline, venation yellowish. In the fore wings

the discal cell is no longer than the pedicel, and in hind wings the discal hardly reaches before the fork of the median.

Expanse 26 mm.

From Vineyard, Utah, 27th August (Spalding).

***Limnephilus productus*, n. sp. (Pl. X, figs. 29, 36).**

Palpi yellowish brown, face brown, with much golden yellow hair, and some black bristles; vertex brown, with yellow hair and brown bristles; antennæ yellowish brown, basal joint darker; thorax with black bristles and yellow hair. Abdomen dull black, apex of segments paler; legs yellowish, spines black, those on tibia 1 very short. Wings mostly pale, but area behind median is dark brown, and more or less broken by pale spots, mostly along median vein, some dark spots along radius, longitudinal veins with dark streaks, a hyaline white mark on the thyridium and one on arculus; hind wings pale, with pale venation. In fore wings the discal cell barely reaches before the fork of median. In hind wings fork 5 is no longer than its pedicel, and in hind wings the discal cell begins a little before the posterior anastomosis.

Expanse 27 mm.

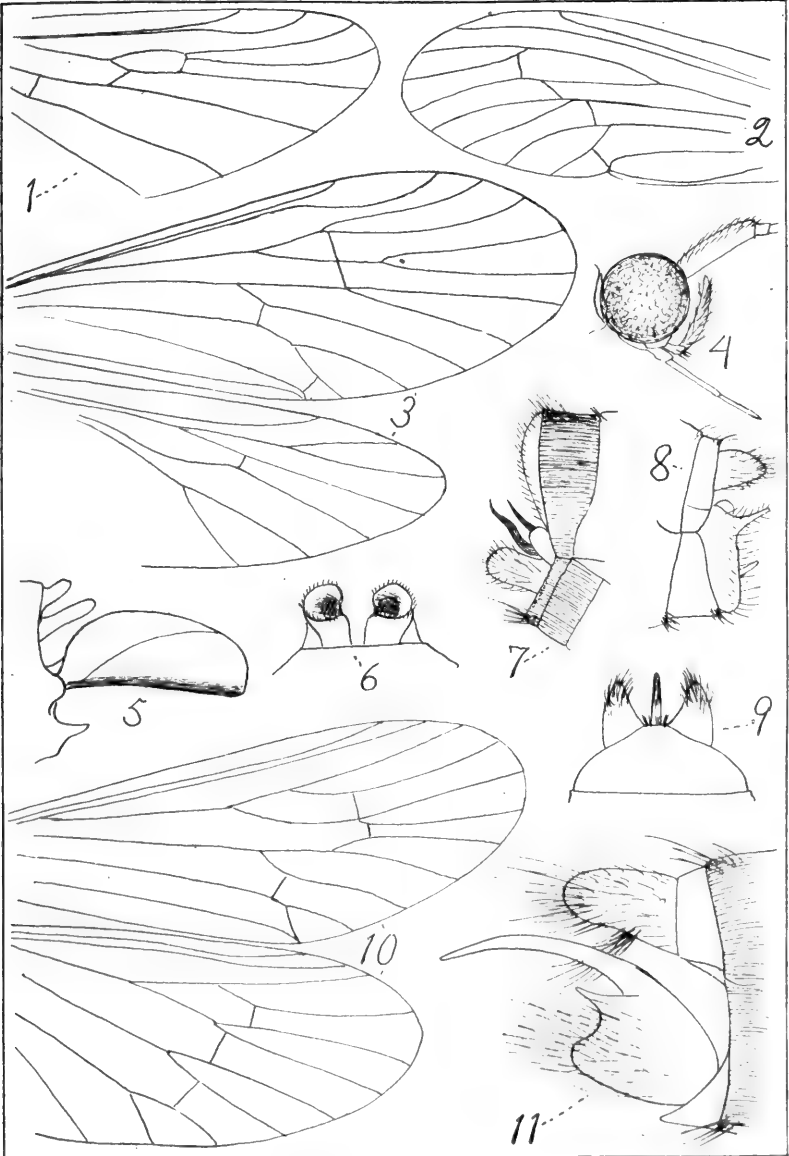
From Vineyard, Utah, 27th August, at sugar, (Spalding).

***Limnephilus æqualis*, n. sp. (Figs. 14, 31).**

Palpi pale, very slender, face with yellow hair; vertex darker in front, pale behind, with gray hair, and dark bristles, thorax pale above, with yellowish hair; abdomen pale yellowish, tips of male genitalia black; legs yellowish, with black spines, those on tibia 1 as long as width of the joint. Wings mostly brownish behind, pale in front, costal area unmarked, the brown much broken up, the usual oblique median mark, large pale space below stigma, over base of apical cells, and just before the anastomosis, and extending outward over tips of the first and second subapical cells; few marks in the radial or discal areas, and base of wings is mostly pale; hind wings pale, venation, yellowish. In fore wings the discal cell is longer than its pedicel; in hind wings the discal reaches very much before the fork of median.

Expanse 25 mm.

From Bon Accord, British Columbia, 7th June, (Russell).



NEW AMERICAN TRICHOPTERA

***Limnephilus secludens*, n. sp.** (Figs. 17, 27).

Palpi yellowish, very slender; face dark, with yellow hair; vertex and thorax dark, with yellowish hair and dark bristles; abdomen dull black above, venter pale; legs yellowish, spines black, tibia 1 with very short spines; wings mostly pale, but brownish behind and these faintly broken with pale, a blackish mark on thyridium; hind wings pale, venation yellowish. Fore wings with the discal cell longer than its pedicel; hind wings with discal cell hardly reaching before fork of median. The dark, median pieces of male genitalia are only visible from behind.

Expanse 20 mm.

From Penticton, British Columbia, 9th August (Wallis) and Saskatchewan, July.

***Limnephilus argenteus*, n. sp.** (Fig. 13).

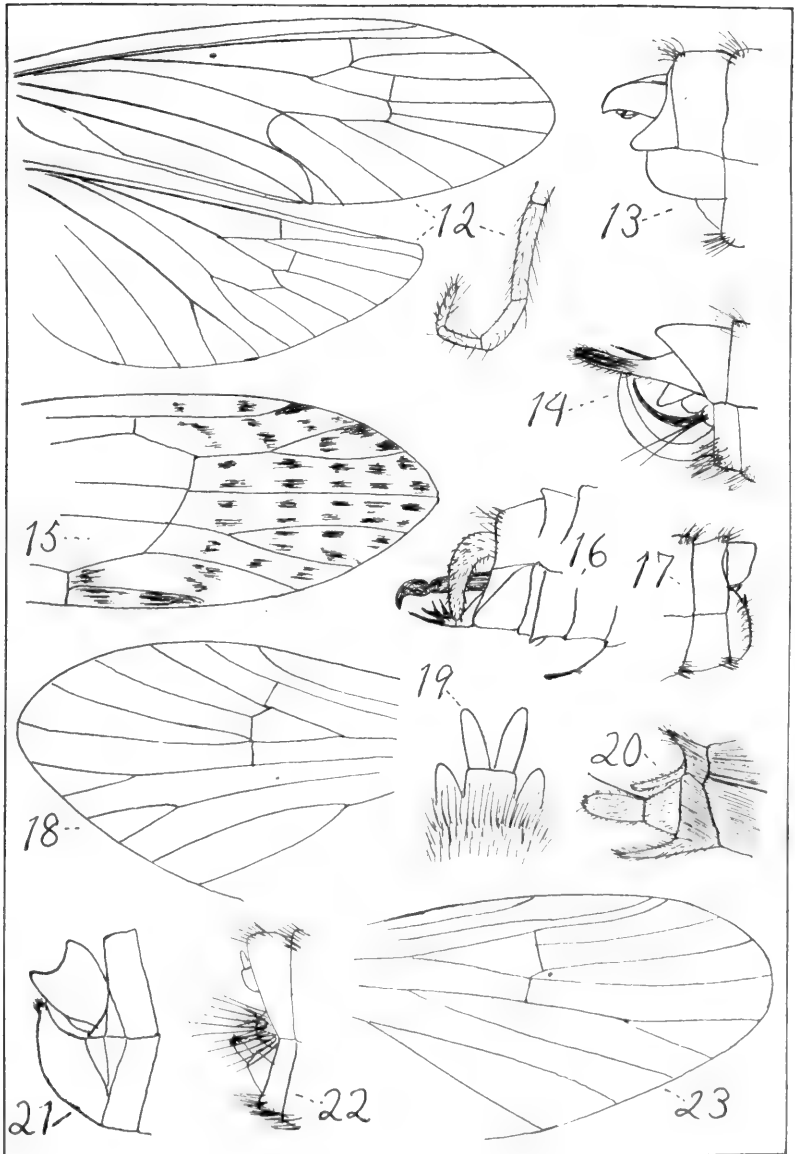
Palpi brownish, face brown with black bristles; vertex dark, pale behind; antennæ brownish, faintly annulate, thorax grayish brown, with black bristles and some white hairs near base of wings; abdomen black, tips of segments pale; legs pale yellowish, with black spines, no dark marks on tibiae. Wings brown, densely guttated with silvery marks, large oblique spot near the middle, several near the thyridium and in base of first subapical cell, and near base, but not extreme base, of apical cells with silvery spots, smaller silvery spots all over the wing, costal area with brown marks. Venation as in *L. gravidus*; in hind wings the fourth apical cell is plainly narrower than the second, but not acute, the cross-vein from base of fork 5 up to upper median is much more convex basally, and the lower median more fractured than in *L. gravidus*. The pronotum is longer and more flat above than in that species. The hind wings are excised as in that species, and in *Colpotaulius*, but the shape of fore wings and general appearance more like *Limnephilus*.

Expanse 35 mm.

From Nipigon, Ont., 18th June (Walker).

***Stenophylax hesperus*, n. sp.** (Figs. 6, 21).

Palpi yellowish; antennæ dark brown, black on basal joint, paler towards tip; face yellow, with black bristles; vertex yellow,



NEW AMERICAN TRICHOPTERA

with a large median black spot between ocelli and extending back, bristles black; pronotum pale, mesonotum brown, the mesothoracic strips pale, rest of thorax pale; abdomen pale brownish, yellowish below; legs yellowish, with black spines. Wings nearly uniform pale brownish, clothed with fine black hairs; venation pale, a hyaline white mark on thyridium, and also on arculus; hind wings pale grayish, rather darker on the costal tip; fore wings with the discal cell twice as long as the pedicel, fork 1 its width back on discal, fork 3 a little back of anastomosis, lower median not fractured at base of fork 5; the spot in the base of fork 2 is pale; in the hind wings fork 3 extends back farther than in the fore wings; the discal cell extends much before forking of median vein.

Expanse 47 mm.

From Departure Bay, Vancouver Island, British Columbia, 1st August (Walker).

***Stenophylax flavata*, n. sp.** (Figs. 32, 33).

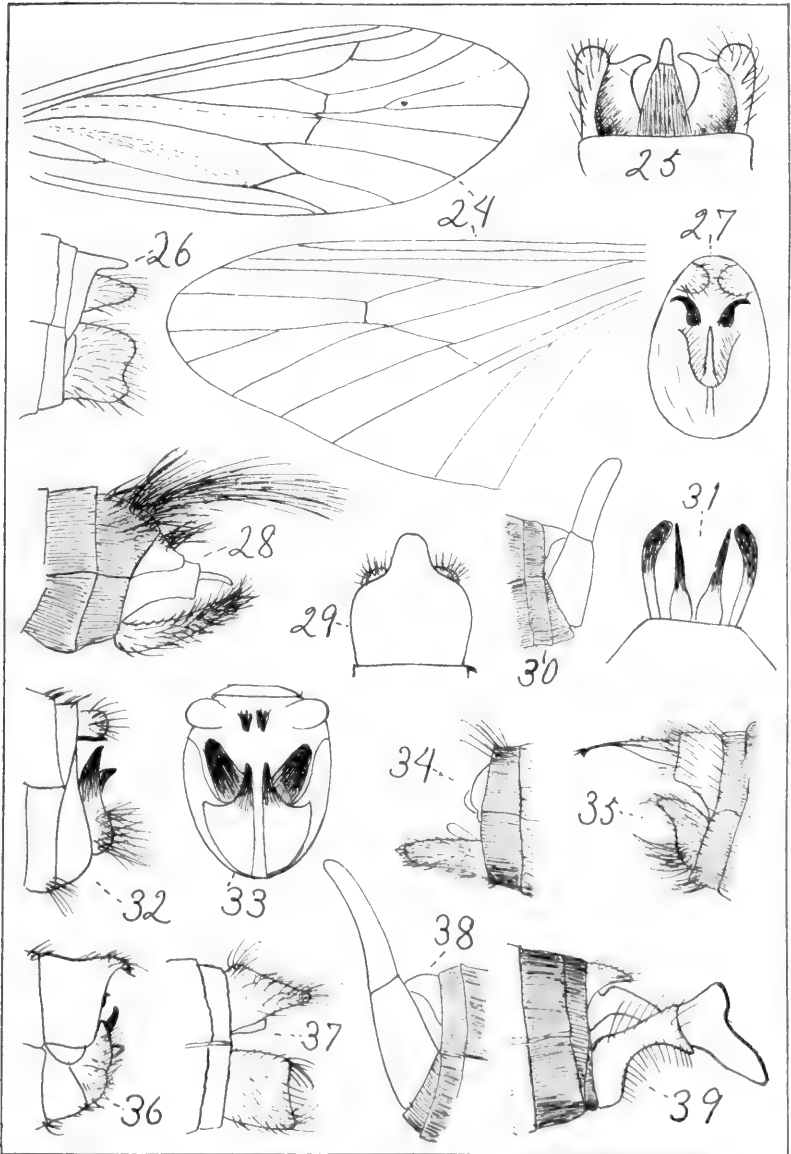
Yellowish with yellowish hair; palpi and antennæ yellowish; ocelli rather large, no ocellar macrochætæ; legs yellow, spines black, tibia 1 densely spined to base, two stout spines at tip of femur 1; hind tibia of male curved; abdomen brown, the segments pale on tips. Wings uniformly pale yellowish, with yellowish veins and hair, tip of thyridial cell, and back to and lower anastomosis dark brown. In fore wings the discal cell is plainly longer than the pedicel, fork 1 nearly its width back on discal cell, fork 3 broad at base, lower median not fractured at base of fork 5; radius barely sinuate before stigma. Hind wings have forks 1 and 3. both more acute at base than in fore wings.

Expanse 40 mm.

From Pisgah Forest, N. Car., August. Resembles *Anisogamus divergens* Walk., but the male has not the black dorsal plate so characteristic of that species.

***Anisogamus infernalis*, n. sp.** (Fig. 7).

Palpi brown, yellowish on base of the second joint; head yellowish, darker on vertex; antennæ yellowish; basal joint blackish beneath; posterior warts and pronotum with yellow hair, mesonotum with dark stripe each side, but tubercles in front of base of wings are pale, with golden hair; abdomen black, but pale on



NEW AMERICAN TRICHOPTERA

venter; legs pale yellowish, black on under side of first and second joints of tarsus I; spines black, and spurs yellowish. Leg I with very few spines, one at tip of femur, two or three on tibia, and small ones at tips of tarsal joints. Wings pale, the apical and posterior part brownish, with pale spots, larger pale spots beyond the anastomosis, anastomosis dark brown, membrane clothed with fine hairs. Costal area of fore wings rather broad, apical part hardly as long as in *A. disjunctus* and *A. costalis*, but venation about the same; the discal cell is hardly as long as the pedicel. Lower median only slightly fractured at base of fork 5; in the hind wings apical cells as in the fore wings.

Expanse 26 mm.

From Pinnacle Mt., Fulton Co., N. Y., 15th September (Alexander). It has shorter legs than *A. disjunctus* or *A. costalis*.

Anisogamus disjunctus, n. sp. (Fig. 22).

Yellowish; darker on head between ocelli and antennæ; mostly yellowish hair on head and prothorax, some black before base of wings; abdomen dark; wings nearly uniform pale yellowish, no markings, but a white hyaline spot on thyridium and also on arculus, membrane faintly roughened, clothed with sparse, fine, pale hair. Maxillary palpi with second and third joints in male subequal, each as long as space between eyes; in female palpi short, last joint not as long as basal joint of antennæ, fourth about one half of fifth, third about three-fourths of fifth joint, second hardly as long as third. Mesothoracic strips quite long, rather broader behind; posterior warts of vertex transversely elliptical and rather small. Legs with black spines and pale spurs, 1, 3, 4. Fore wings moderately long, rounded at tip; radius strongly bent at base of stigma, discal cell a little longer than pedicel, fork 1 its width back on discal cell, fork 3 a little back of anastomosis, its base not very broad, but not acute, lower median much disjointed at base of fork 5, in hind wings the apical cells are similar to those of fore wings, but fork 3 is more acute at base.

In both sexes the cheeks show a little blunt tubercle below.

Expanse 26 mm.

From Bon Accord, British Columbia, May and June (Russell).

(To be continued).

REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (*TIPULIDÆ*, *DIPTERA*).

(Continued from Vol. XLV., p. 322).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.

Subfamily: *TIPULINÆ*.Tribe: *DOLICHOPEZINI*.Genus: **Nesopeza**, gen. n.

Antennæ 13-segmented, segment 1 cylindrical with a few long hairs; segment 2 oval-cylindrical; segment 3 very long, cylindrical; the succeeding segments gradually shorter, the last very slender. Palpi with the apical segment slender, as long as all of the preceding segments combined. Legs excessively long and slender. Wing-venation as in *Dolichozepeza* Curtis (lack of cell 1st M₂, basal deflection of Cu₁ far before the fork of M, etc.), but the radial sector is very elongate, angulated at origin, almost as long as R₃ beyond the fork, R_s not short and simulating a cross-vein.

Type of the genus: *Dolichozepeza gracilis*, de Meij.**Nesopeza gracilis** de Meijere.1911.—*Dolichozepeza gracilis* de Meijere; Tijd. voor Ent., vol. 54, p. 60, 61; pl. 4, fig. 46.

One ♀ from Tokyo, Japan; August, 1912. (Vial D.)

This new genus represents one extreme of the *Dolichozepeza* group and *Scamboneura* Osten Sacken, the other. In this genus the radial sector is extremely elongated, in *Dolichozepeza* Curtis almost transverse and simulating a cross-vein, while in *Scamboneura* the origin of the sector is farther distad than the tip. See my key to the Dolichozepezi, Psyche, vol. 19, p. 64. (April, 1912.)

Genus: **Dictenidia** Brullé.Tribe: *CTENOPHORINI*.*Dictenidia fasciata* Coquillett.1898.—*Dictenidia fasciata* Coquillett; Proc. U. S. Nat. Mus., vol. 21, p. 304, 305.1902.—*Dictenidia fasciata* Kertész; Cat. Dipt., vol. 2, p. 266.

One ♂ from Tokyo, Japan, Aug. 1912 (Vial 39). It agrees very closely with Coquillett's description. The specimen offers the following measurements:

May, 1914 ♀

Length 12 mm.; wing 10.2 mm.; antennæ 5 mm.

Fore leg femur 6.7 mm.; tibia 7.4 mm.

Middle leg femur 7 mm.; tibia 6.4 mm.; tarsus 6.9 mm.

Hind leg femur 8.8 mm.; tibia 10.4 mm.; tarsus 6 mm.

I supply a figure of the wing of this beautiful crane-fly, it never having been figured. (See Plate XII, fig. 8).*

Tribe: TIPULINI.

Genus: **Pachyrhina** Macquart.

Key to the Japanese Pachyrhinæ.

1. Thoracic markings brown or black, distinct.....2.
Thoracic markings very pale, ill-defined.....*flavonota*, sp. n.
2. Mesonotal stripes pale brown; tip of wing narrowly and regularly bordered with dark brown; [scutellum and postnotum mostly yellowish; abdominal tergites trivittate].....*palloris* Coq.
Mesonotal stripes black; tip of wing hyaline or irregularly suffused with darker.....3.
3. Mesonotal stripes very broad, almost concealing the pale ground colour; tip of the wing clouded with darker....*pullata*, sp. n.
Mesonotal stripes narrower, so that the yellow ground colour is well defined; tip of the wing clear.....4.
4. Scutellum and postnotum unmarked with darker.....*repanda*, sp. n.
Scutellum black; postnotum with a dark median vitta.....*virgata* Coq.

Pachyrhina flavonota, sp. n.

Head yellow, shining, without a distinct darker spot; mesonotum orange-yellow with well defined darker stripes.

Male.—Length 12 mm.; wing 10.6 mm.; antennæ 3.8 mm.

Female.—Length 14.6 mm.; wing 14 mm.

Male.—Palpi light brown; frontal prolongation of the head yellow, nasus brown, with a tuft of brown hairs; antennæ, scapal segments yellow, first flagellar segment yellow, on its inner face at three-fourths its length with a wart-like knob, remaining flagellar segments brown, the enlarged bases darker brown, inner face of the

*Plate XII will appear in the next issue.

intermediate flagellar segments not very deeply incised; front, vertex and occiput shining yellow, no distinct mark on the vertex.

Pronotum yellowish; mesonotal præscutum orange-yellow with faint indications of darker stripes; a small brown mark in the notch of the transverse suture; scutum, scutellum and postnotum without distinct marks. Pleura light yellow. Halteres brownish yellow, the knobs yellow. Legs, coxæ and trochanters yellow, femora and tibiæ dull yellow, the tips darker, tarsi brown. Wings subhyaline, the tip broadly but indistinctly suffused with darker; stigma oval, brown; cells C and Sc. a little yellowish. Venation, see pl. XI. fig. 5.

Abdomen with the tergites yellowish, slightly darker medially and laterally; segments 8 and 9 brown; sternites yellowish. The male hypopygium with the 9th tergite from above (plate XI, fig. 6) with the caudal margin four-lobed, the central lobes on either side of the shallow median notch, these lobes provided with numerous black denticulæ; the 9th sternite from below with a broad and deep V-shaped median notch. Outer apical appendages narrow, tapering to a very long point; inner appendage with the usual cephalad prolongation, beneath which is a small, chitinized tooth. (See plate XI, fig. 15.)

Female.—Larger, the abdominal tergites with distinct brown blotches on each segment, these broadest behind, narrowed to a point in the front.

Holotype, ♂, Tokyo, Japan, August, 1912 (Vial K).

Allotype, ♀, Tokyo, Japan, August, 1912 (Vial 42).

***Pachyrhina palloris* Coquillett.**

1898.—*Pachyrhina palloris* Coquillett, Proc. U. S. Nat. Mus., vol. 21, p. 306.

1902.—*P. palloris* Kertész, Cat. Dipt., vol. 2, p. 321.

1910.—*P. palloris* Riedel, Deutsch. Ent. Zeitschr., p. 436.

Two females agreeing rather well with Coquillett's description, but showing the following differences: The median thoracic vitta is bisected from the front by a pale line, making this stripe double; sides of the scutellum brown; the antennæ, broken in the type, may be thus described: four basal segments yellow, remaining

segments with the enlarged basal third dark brownish black, the remainder of each segment dull yellow. The venation is shown in plate XI, figure 2. Vial K. Tokyo, Japan; August, 1912; 2 ♀.

***Pachyrhina pullata*, sp. n.**

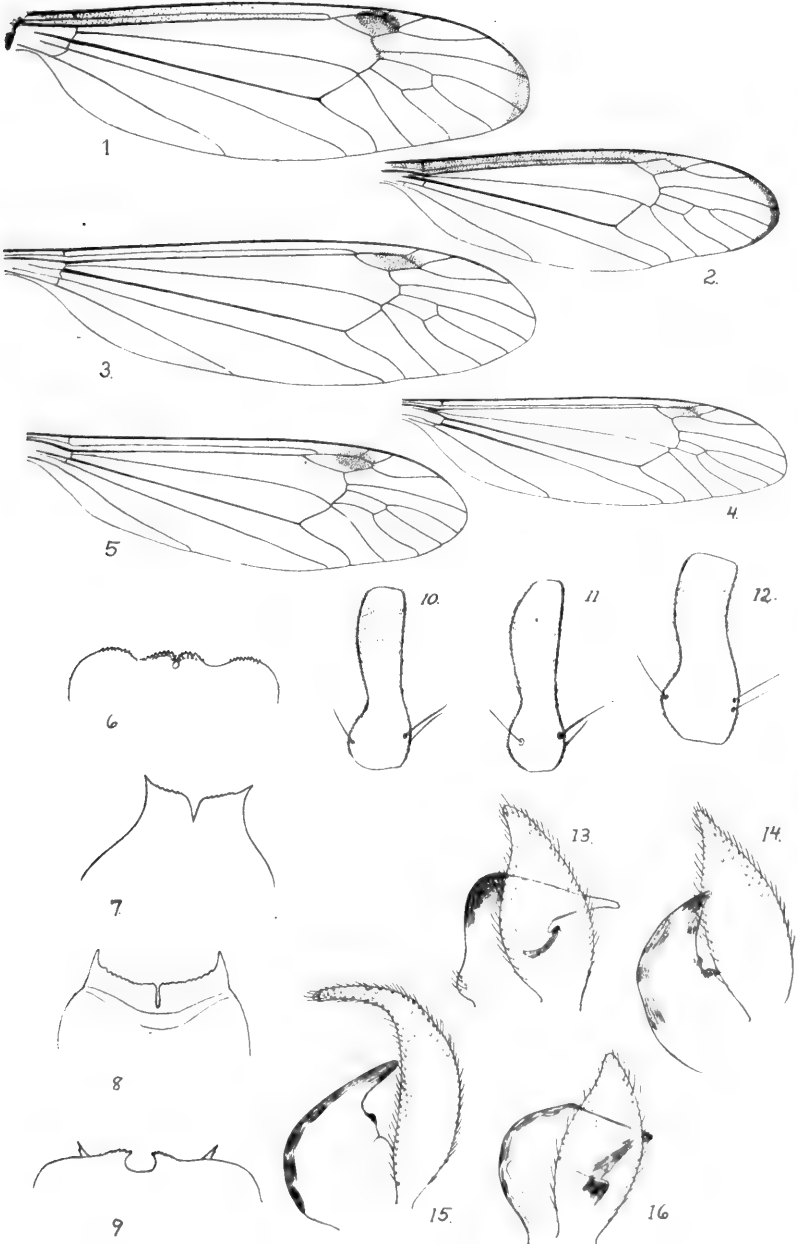
Thoracic dorsum mostly black; wings with the apex brownish.

Male.—Length 17.4 mm.; wing 12.9 mm.; antennæ 4.6 mm.†

Male.—Palpi brown, the third segment yellow; frontal prolongation of the head shiny black; antennæ with the first segment brown, paler apically, second segment yellow, third segment pale brown at the base, dark brown at tip, remaining segments dark brownish black. (See plate XI, fig. 12, for outline of the sixth antennal segment); vertex brownish yellow, darkening to the brown on the occiput and genæ.

Pronotum light yellow above; mesonotum dull yellow with three jet black stripes, the median stripe very broad and narrowed behind, the lateral stripes short, broad, straight, the space between these three stripes very narrow and greatly reduced; scutum with the median depression pale in front; behind and on the lobes black; scutellum and postnotum broadly black medially, paler on the lateral margin of the sclerites. Pleura yellow, with dark brownish black blotches as follows: An elongate, vertical mark on the propleura; mesopleura with a large blotch on the ventral portions of the episternum and the sternum; caudal edge of these two sclerites with an elongate vertical blotch extending from the wing-root to mesocoxa, the portion of the postnotum between the base of the wings and the halteres brown; metepimeron brown. Halteres pale, knobs whitish at the tips. Legs, fore coxæ brown, trochanter light yellow, femora yellow basally, browner at tip; other coxæ more yellowish, femora darkening to brown at tip, tibiæ brown, lighter basally; tarsi dark brownish-black. Wings hyaline or nearly so, cells C and Sc. yellowish; stigma brown, distinct; cord margined with brown; apex of wing brownish. Venation as in plate XI, fig. 1.

Abdomen with the first tergite brown, except on the side in front; segments 2 to 5 brown on the caudal half; segment 6 with the caudal half dark brown; segments 7 to 9 dark brown; sternites yellow; caudal half of the 7th to 9th segments dark brown.



JAPANESE CRANE-FLIES

Male.—Hypopygium, with the 9th tergite (pl. XI, fig. 7) from above, narrow with deep median notch on the caudal margin, and with the outer angles of the lobes produced into sharp points, which are directed caudad and laterad, the caudal margin of these lobes with fine denticulae, 9th sternite from beneath with the caudal margin gently concave, pleural suture very strongly arcuated; apical appendages, outer one rather broad and pointed, inner appendage with a long curved point below which are three chitinized teeth. (See plate XI, fig. 14).

Holotype, ♂. Tokyo, Japan; May 7, 1912. (Vial 30.)

***Pachyrhina repanda*, sp. n.**

Head yellow, with a small rounded brown spot on vertex; mesothorax with black stripes, scutellum and postnotum unmarked.

Male.—Length 12.9 mm.; wing 13.4 mm.; antennae 5.2 mm.

Male.—Palpi yellow; frontal prolongation of the head yellow except the nasus, which is brownish and provided with a tuft of long brown hairs; antennae with segments 1 to 3 yellowish, the third a little brown on the lower surface; remainder of antennae dark brownish black; the intermediate flagellar segments rather deeply incised on the lower face at the basal third (see plate XI, figure 11, showing the outline of the sixth antennal segment); front, vertex and occiput yellow, the vertex with a small rounded dark brown median spot behind.

Pronotum light yellow; mesonotal praescutum light yellow, with dark brownish black stripes as follows: A broad median stripe which is widest in front, slightly narrowed behind and running the length of the sclerite; a shorter lateral stripe on either side, this stripe curved laterad before the pseudosuture; scutum, lobes with a prominent oblique stripe running across them; a small triangular median blotch on the anterior half of the sclerite; scutellum and postnotum light yellow, unmarked. Pleura pale yellowish white. Halteres light coloured, the knob a little suffused with brown. Legs, coxae and trochanters light yellow, femora and tibiae yellowish brown, passing into brown at the tip of the latter; tarsi brown. Wings subhyaline, cells C and Sc. a little brighter, yellowish; stigma small, brown, tip of the wing a little suffused with darker; veins brown, vein Sc. yellow. Venation as in plate XI, figure 3.

Abdomen, tergites yellow with an indistinct light brown blotch in the middle of each sclerite; lateral sutures darker; sternites yellow; segments 7 to 9 dark brown. Male hypopygium with the 9th tergite (see plate XI, fig. 8) from above with the caudal margin concave, with a deep, parallel-sided, median notch, the lateral angles produced into points which are directed caudad the caudal margin with small, black denticulæ and points; 9th sternite from below with the caudal margin about straight with a rounded median protuberance. Apical appendages, the outer fleshy lobe rather broad, the point moderately long and rather obtuse; the inner appendage is strongly chitinized, rounded-oval, on the cephalic face produced into a long point which is directed forward; below this point, very strongly chitinized and deeply incised. (See plate XI, fig. 16.)

Holotype, ♂, Tokyo, Japan; August, 1912. (Vial 43.)

***Pachyrhina virgata* Coquillett.**

1898.—*Pachyrhina virgata* Coquillett, Proc. U. S. Nat. Mus., vol. 21, p. 306.

1902.—*P. virgata* Kertész, Cat. Dipt., vol. 2, p. 325.

1910.—*P. virgata* Riedel, Deutsch. Ent. Zeitschr., p. 436.

Several specimens of this interesting species were included in the collection.

Male.—Length 10.8—11.8 mm.; wing 10.2—12.4 mm.; antennæ 4.6—4.9 mm.

Female.—Length 14.4 mm.; wing 13 mm.

I give a figure of the sixth antennal segment in plate XI, figure 10, and of the wing-venation in plate XI, figure 4. The male hypopygium may be described as follows: The 9th tergite from above (plate XI, figure 9) with the caudal margin having a broad rounded median notch into which the tips of the apical pleural appendages fit, the inner edge of the adjacent lobe produced into chitinized lobules which are provided with denticulæ; each lobule with a sharp chitinized point on its caudal margin, these points directed caudad. In a small ♂ (Vial 46) the median notch is not so rounded, more oval, the sharp caudal points are longer. Apical appendages, the outer fleshy lobe rather broad and pointed, inner lobe with a

long, cephalad-directed point which is provided with a few hairs on its lower face, with a deep notch beneath its base and a strongly chitinized protuberance. (See plate XI, fig. 13).

Vial 22; Tokyo, Japan; April 26, 1912; 1 ♂, 1 ♀.

Vial 35; Tokyo, Japan; May 7, 1912; 1 ♀.

Vial 43; Tokyo, Japan; Aug. 1912; 2 ♂.

Vial 44; Tokyo, Japan; Aug. 1912; 1 ♀.

Vial 46; Tokyo, Japan; Aug. 1912; 2 ♂.

Vial K; Tokyo, Japan; Aug. 1912; 1 ♀.

(To be continued.)

THE PRESENCE OF RING-JOINTS IN AUSTRALIAN *SCELIONIDÆ*.

BY ALAN P. DODD, NELSON, N. Q., AUSTRALIA.

Quite recently while examining the antennæ of a Scelionid, *Gryonella reticulata* Dodd, I was somewhat surprised to find that two small ring-joints were present. As ring-joints have not been recorded in this family, I had never searched for them, and it was only accidentally that their presence in this species was noticed. This discovery caused me to examine the antennæ of numerous Scelionids in my collection. I found that in some cases there were obviously no ring-joints present; in others there appeared to be minute ring-joints, but I could not make sure of the fact, while in a few cases the ring-joints were distinct, though small. The following species possessed obvious ring-joints: Subfamily *Teleasinæ*, *Gryonella reticulata* Dodd; Subfamily *Balinæ*, *Acolomorpha minuta* Dodd; Subfamily *Scelioninæ*, *Hadronotus nigriceps* Dodd, *Opisthacantha giraulti* Dodd, *Sceliacanthella paroipennis* Dodd, *Leptoteleia aurea* Dodd, *Baryconus exsertus* Dodd, *B. longipennis* Dodd, and *B. trispinosus* Dodd.

The species, *Opisthacantha giraulti*, possessed apparently one ring-joint, but under high-power magnification there appeared to be three excessively thin ring-joints. *Gryonella reticulata* had two ring-joints, while the other species mentioned possessed but one each. This discovery is of considerable interest.

NEW AND LITTLE KNOWN SPECIES OF APHIDIDÆ.

BY JOHN J. DAVIS, BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

(Continued from Page 134.)

Rhopalosiphum howardii (Wilson).

This species has been collected by us from widely separated localities, and in all cases we have found it on the flower heads of the host plants. Mr. H. F. Wilson first described this species as *Amphorophora howardii* from the heads of *Panicularia nervata* at Batesburg. Mr. Geo. G. Ainslie found it on timothy heads, June 28, 1908, at Biltmore, N.C., Mr. R. A. Vickery collected it on *Elymus virginicus*, June 19, 1909, at Salisbury, N.C., Mr. C. N. Ainslie found it on heads of *Elymus*, August 11, 1911, at Salt Lake City, Utah; and the writer has collected it on the following plants and at the following localities: La Fayette, Ind., on heads of *Elymus canadensis*, orchard grass (*Dactylis glomerata*), and wheat, from July to October, inclusive; at Bedford, Ind., on *Elymus canadensis* and *E. striatus*, August 13, 1911; at Urbana, Ill., on *E. canadensis*, July 27, 1912; Lancaster, Wis., on *E. canadensis*, and cultivated barley, July 11, 1912; at Farley, Iowa, on *E. canadensis*, August 30, 1912; at Winner and Elk Point, S. Dak., on *E. canadensis*, September 2 and 5, respectively, 1912; and at Beaver Dam, Wis., on *E. canadensis*, September 11, 1912. During August, September, and October, the winged males were not uncommon, and these took flight within a few days after becoming winged. Although careful search was made, we were unable to find oviparous females. It appears from our present meagre data that the winged males and winged viviparous females migrate to an unknown host in the fall of the year, where the oviparous females are produced, as is also probably the case with *Myzus lycopersici* (Clarke).

Wingless viviparous females.

(Pl. VII, fig. 34.)

Entire body nearest to cadmium yellow as given in Smith's colour chart, but not so bright, the colour varying to brownish cadmium yellow; head and thorax paler, with a slight greenish tint. Antennæ blackish, excepting segments I, II, and entire base of III, which are dusky greenish (in recently matured individuals III, basal three-fourths of IV, and extreme base of V are brownish);

segments III and filament of VI subequal; total length very little more than half the body length and not reaching to base of cornicles; segment III as well as IV lacking sensoria, the usual distal ones being present on segments V and base of VI. Eyes blackish, ocelli absent. Legs with femora pale brown, the tibiae and tarsi black. Cornicles black and shaped as in the winged female. Style pale yellowish to brownish yellow, otherwise as in winged female.

Measurements from 8 specimens in balsam as follows: Length of body, not including cauda, 1.65 to 2.05 mm, average 1.80 mm.; length to tip of cauda 1.78 to 2.16 mm., average 1.93 mm.; width of body 0.97 to 1.08 mm., average 1.00 mm.; length of cornicle 0.43 to 0.49 mm., average 0.45 mm.; length of cauda 0.16 to 0.19 mm., average 0.18 mm. Antennal measurements as follows:

Locality, date, etc.	I. mm.	II. mm.	III. mm.	IV. mm.	V. mm.	VI. (base) mm.	VI. (fil.) mm.	Total mm.
La Fayette, Ind., Wheat, July 17, 1912.....	.....	.....	0.313	0.191	0.174	0.113	0.313	.....
Urbana, Ill., Elymus, July 27, 1912.....	.....	.....	.322	.157	.157	.104	.348	.....
Urbana, Ill., Elymus, July 27, 1912.....	.....	.....	.296	.157	.148	.104	.348	.....
La Fayette, Ind., Elymus, Aug. 14, 1911.....	0.087	0.061	.330	.209	.191	.113	.330	1.321
La Fayette, Ind., Elymus, Aug. 14, 1911.....	.087	.061	.322	.217	.191	.113	.330	1.321
La Fayette, Ind., Elymus, Sept. 4, 1911.....	.087	.061	.348	.226	.182	.104	.348	1.356
La Fayette, Ind., Elymus, Sept. 4, 1911.....	.087	.061	.356	.226	.182	.....	.....	.....
Elk Point, S. Dak., Elymus, Sept. 5, 1912.....	.087	.069	.417	.278	.243	.122	.400	1.616
Elk Point, S. Dak., Elymus, Sept. 5, 1912.....	.087	.069	.417	.296	.243	.122	.417	1.651
Winner, S. Dak., Elymus, Sept. 2, 1912.....	.....	.....	.313	.252	.209	.104	.348	.....
Winner, S. Dak., Elymus, Sept. 2, 1912.....	.087	.061	.348	.235	.226	.104	.383	1.444
Lancaster, Wis., Barley, July 11, 1912.....	.....	.....	.330	.209	.174	.122	.348	.....
Lancaster, Wis., Barley, July 11, 1912.....	.....	.....	.339	.191	.165	.104	.339	.....
Beaver Dam, Wis., Elymus, Sept. 11, 1912.....	.087	.069	.556		.217	.122	.408	1.459
Beaver Dam, Wis., Elymus, Sept. 11, 1912.....	.087	.069	.400	.287	.226	.113	.400	1.542

Winged viviparous female.

(Pl. VII, figs. 35-39).

Head dark brown. Antennæ black, excepting basal half of I and ring at extreme base of III, which parts are pale, and sometimes all of I and II are pale dusky; segment VII the longest; not reaching to tip of body; 2 to 10 circular sensoria in a row, usually near base, on segment III, and the usual distal ones on V and base of VI. Eyes reddish black, ocelli black. Beak barely reaching to coxæ of the second pair of legs. Thoracic plates shining dark brown. Wing veins blackish and conspicuous, the venation as illustrated. Legs with femora pale, excepting the hind pair, which are dusky to black; the tibiæ and tarsi black. Abdomen usually brownish yellow, but sometimes with a distinct pale green tint, and bearing three dusky spots on each side anterior to the cornicles; also the dorsum of each segment with a more or less distinct dusky transverse band. Cornicles black, a little longer than segment IV of the antennæ, and reaching about to tip of cauda, clavate in shape. Cauda pale greenish yellow, semi-ensiform and sparsely hairy.

Measurements, taken from 10 specimens mounted in balsam, as follows: Length of body, not including cauda, 1.35 to 1.74 mm., average 1.51 mm.; length of body to tip of cauda 1.47 to 1.90 mm., average 1.64 mm.; width of body 0.55 to 0.74 mm., average 0.65 mm.; length of wing 2.40 to 2.94 mm., average 2.67 mm.; width of wing 0.85 to 1.08 mm., average 0.93 mm.; cornicles 0.33 to 0.38 mm., average 0.35 mm.; cauda 0.156 to 0.191 mm., average 0.173 mm. Antennal measurements as follows:

Locality, date, etc.	I.	II.	III.	IV.	V.	VI. (base)	VI. (fil.)	Total	No. sens. on III.
Salisbury, N. C. Elymus, R. A. Vickery	0.080	0.060	0.383	0.278	0.226	0.139	0.556	1.722	4
Salisbury, N. C., Elymus, R. A. Vickery .....	.080	.060	.383	.261	.243	.130	.556	1.713	2
Salisbury, N. C., Elymus, R. A. Vickery .....	....	....	.417	.313	.304	.139	.609	....	5
Salisbury, N. C., Elymus, R. A. Vickery .....	....	....	.417	.330	.304	.156	.574	....	5
La Fayette, Ind., <i>Dactylis</i> , July 17, 1912 .....	.090	.070	.470	.348	.278	.130	.478	1.873	8
La Fayette, Ind., wheat, July 17, 1912 .....	....	....	.400	.296	.226	.139	.461	....	9

Locality, date, etc.	I.	II.	III.	IV.	V.	VI. (base)	VI. (fil.)	Total	No. sens. on III.
La Fayette, Ind., wheat, July 17, 1912.....	.090	.060	.408	.278	.226	.139	.470	1.671	10
Lancaster, Wis., barley, July 10, 1912.....	.....	.....	.435	.296	.243	.....	.....	.....	5
Lancaster, Wis., barley, July 10, 1912.....	.....	.....	.426	.313	.261	.139	.556	.....	.....
Urbana, Ill., Elymus, July 27, 1912.....	.080	.070	.435	.330	.261	.148	.478	1.802	7
Urbana, Ill., Elymus, July 27, 1912.....	.....	.....	.417	.348	.278	.139	.522	.....	7
Bedford, Ind., Elymus, Aug. 13, 1911.....	.080	.060	.365	.269	.235	.122	.487	1.618	4
La Fayette, Ind., Elymus, Sept. 6, 1911.....	.080	.060	.417	.296	.243	.122	.435	1.653	3
La Fayette, Ind., Elymus, Sept. 6, 1911.....	.080	.060	.391	.296	.252	.122	.452	1.653	3
Elk Point, S. Dak., Elymus, Sept. 5, 1912.....	.080	.060	.470	.313	.261	.139	.522	1.845	7
Elk Point, S. Dak., Elymus, Sept. 5, 1912.....	.090	.070	.487	.330	.252	.....	.....	.....	6
La Fayette, Ind., wheat, July 17, 1912.....	.....	.....	.435	.296	.243	.139	.522	.....	9
La Fayette, Ind., wheat, July 17, 1912.....	.080	.060	.435	.313	.252	.139	.539	1.818	8

Winged male.

(Pl. VII, fig. 40.)

Head blackish. Antennæ black; segment III longest, reaching a little beyond tip of body; segment III with 39 to 55 irregularly placed, moderately tuberculate, circular sensoria, segment IV with from 18 to 23, segment V with from 6 to 9, not including the usual distal one, and segment VI (base) with the usual distal sensoria. Thorax blackish. Wings as in the viviparous form. Legs blackish, excepting the base of femora. Abdomen dull green, with black transverse bands on the first three abdominal segments, and three rather large black spots on each side anterior to the cornicles; also a few scattered black markings on the abdomen, evidently traces of transverse bands. Cornicles black, clavate, reaching about to tip of cauda. Cauda concolorous with abdomen and conical in shape.

Average measurements from 3 specimens mounted in balsam, as follows: Length of body, not including cauda, 1.68 mm.; length to tip of cauda 1.79 mm., width 0.83 mm.; length of wing 3.12 mm.,

width 1.16 mm.; cornicles 0.77 mm.; cauda 0.31 mm. Antennal measurements as follows:

	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
La Fayette, Ind., Elymus, Oct. 10, 1911.....	0.087	0.070	0.504	0.400	0.313	0.130	0.678	2.182
La Fayette, Ind., Elymus, Oct. 10, 1911.....	.087	.070	.487	.383	.313	.130	.....	.....
La Fayette, Ind., Elymus, Oct. 10, 1911.....	.080	.070	.504	.400	.304	.139	.652	2.149
La Fayette, Ind., Elymus, Oct. 10, 1911.....	.087	.070	.504	.383	.322	.130	.661	2.157
Farley, Iowa, Elymus, Aug. 30, 1912.....	.087	.070	.539	.383	.304	.156	.539	2.078
Farley, Iowa, Elymus, Aug. 30, 1912.....	.....	.....	.539	.383	.330	.139	.591	.....

Eulachnus rileyi (Williams) *

This species is very closely related to *Eulachnus agilis* Kalt., both in form and in its habits, but differs from that species as described by G. Del Guercio by lacking sensoria on antennal segment III of the winged viviparous female. Del Guercio does not refer to the sensoria in his description, but in his figure on Plate XVII (fig. 227)* he shows the antennæ of the winged viviparous female of *E. agilis* to bear 8 sensoria on segment III, 3 sensoria segment IV, 2 sensoria on segment V, and the usual ones on segment VI.

Wingless viviparous female.

(Pl. VII, fig. 41.)

Head dusky brown; the prothorax likewise dusky, with a paler median dorsal line; remainder of body varying in colour from orange brown to nearly black or greenish black, usually the former; a longitudinal row of black dots on each side of the dorsal median and another row of similar dots lateral of this, each dot bearing a long spine-like hair; in life the body is usually covered with a pulverulence, giving the insect a hoary appearance and usually obscuring all markings. Antennæ, head, legs, and cauda, as well as the body, bearing numerous conspicuous, long, black, spine-like hairs. Antennæ dark brownish to blackish, excepting basal halves of IV and V, and extreme base of VI, which are paler; segment III longest; total length about one-half that of the body; segment IV

*This species has not been positively identified, since the type specimens are not available. The male of our species agrees well with the winged form as described by Williams for *L. rileyi* and the identification as here recorded is probably correct.

bearing a small distal sensorium, segment V a large distal sensorium, and segment VI one larger and two or three smaller ones near by. Eyes black. The hind pair of legs entirely blackish, except the basal ends of femora, which are paler; the two fore pairs of legs brownish, excepting tarsi, which are black. Cornicles represented by a black circle. Cauda broadly rounded and typical of the genus.

Average measurements for 6 specimens in balsam as follows: Length of body 2.13 mm., width 0.66 mm.; length of middle tibia 0.81 mm.; hind tibia 1.43 mm.; length of first tarsal segment of hind tibia 0.113 mm., of second tarsal segment 0.217 mm. Antennal lengths as follows:

Locality, date, etc.	I. mm.	II. mm.	III. mm.	IV. mm.	V. mm.	VI. mm.	Total mm.
St. Louis, Mo., July 25, 1911.....	0.078	0.087	0.400	0.209	0.243	0.191	1.208
St. Louis, Mo., July 25, 1911.....	.087	.087	.391	.209	.243	.191	1.208
Chicago, Ill., July 20, 1910.....	.087	.087	.400	.243	.252	.191	1.260
Chicago, Ill., July 20, 1910.....	.087	.087	.400	.226	.261	.191	1.252
Chicago, Ill., July 20, 1910.....	.087	.087	.374	.226	.269	.200	1.243
Chicago, Ill., July 20, 1910.....	.087	.087	.383	.209	.269	.191	1.226
Chicago, Ill., July 20, 1910.....	.087	.087	.356	.226	.243	.209	1.208
Chicago, Ill., July 20, 1910.....	.087	.087	.356	.217	.252	.200	1.199
Chicago, Ill., July 20, 1910.....	.078	.087	.356	.235	.269	.191	1.216
Chicago, Ill., July 20, 1910.....	.078	.087	.374	.243	.269	.182	1.233
St. Louis, Mo., Oct. 6, 1910, J. T. Monell.....	.087	.087	.452	.269	.278	.217	1.390

Winged viviparous female.

(Pl. VII, figs. 42-46.)

Entire body covered with a conspicuous white flocculence, beneath which the head and thorax are of a brownish colour and the abdomen a greenish brown to ochreous brown, more often the latter; abdomen with a row of inconspicuous setiferous dots, one on each side of the median line. Legs, antennæ and front of head bearing prominent spine-like hairs as in the wingless form; the cauda and tip of abdomen bearing many rather long hairs. Antennæ blackish, excepting basal half of III, which is pale brown; a little more than half the body length; segment III longest; sensoria as in the wingless forms. Eyes black. Hind legs blackish, excepting basal ends of femora; two fore pairs of legs similarly coloured

excepting tibiae, which are pale at extremities. Wings as in illustration, the media usually one-branched, although this character is variable, Mr. Monell has collected specimens of this species in St. Louis which had the media unbranched, and he also collected one individual with a bifurcate media. Regarding this variable venation Mr. Monell wrote Dr. H. Schouteden, who replied under date of April 23, 1905, as follows: "A Lachnus with cubital vein unforked is quite unknown to me, but there are some species with only one fork (*L. agilis*)."

Cornicles and cauda as in wingless form.

Average measurements from 3 specimens in balsam as follows: Length of body 2 mm., width 0.50 mm.; length of wing 2.2 mm., width 0.70 mm.; length of middle tibia 0.79 mm., of hind tibia 1.62 mm.; length of first tarsal segment 0.113 mm., of second tarsal segment 0.209 mm.

Antennal measurements as follows:

Locality and Date	I. mm.	II. mm.	III. mm.	IV. mm.	V. mm.	VI. mm.	Total mm.
St. Louis, Mo., July 25, 1911.	0.070	0.078	0.435	0.235	0.243	0.191	1.252
St. Louis, Mo., July 25, 1911. . . . .	.078	.078	.443	.243	.261	.191	1.294
St. Louis, Mo., July 25, 1911. . . . .	.078	.087	.426	.261	.287	.209	1.348
St. Louis, Mo., July 25, 1911. . . . .	.078	.087	.469	.269	.269	.209	1.381
Chicago, Ill., July, 20 1910. . . . .	.078	.087	.400	.243	.261	.191	1.260

Winged Male.

(Pl. VII, fig. 47).

Head and thorax black; abdomen pale brownish, with a dull orange tint, and the entire body covered with a white pulverulence. Antennæ black, reaching nearly to tip of body; segment III longest; segment III with 60 to 84 faintly tuberculate, circular sensoria, IV with 22 to 41, V with 10 to 29, not including the usual large distal sensorium, and segment VI with 3 to 5, not including the usual large sensorium. Eyes black. Wings as in the viviparous female. Legs black, excepting the pale extreme bases of femora and the brownish basal halves of tibiae. Cornicles and cauda as in other forms, the anal plate dusky.

Average measurements from six individuals in balsam as follows: Length of body 1.59 mm., width 0.47 mm.; length of wing 2.61 mm., width 0.83 mm. Antennal measurements as follows:

Locality and Date	Measurements						Total mm.	No. of sensoria			
	I mm.	II mm.	III mm.	IV mm.	V mm.	VI mm.		III	IV	V*	VI*
St. Louis, Mo., Oct. 1, 1910.....	0.078	0.087	0.617	0.382	0.417	0.243	1.824	75	25	17	3
St. Louis, Mo., Oct. 1, 1910.....	.078	.087	.635	.400	.417	.261	1.878	81	33	18	5
St. Louis, Mo., Oct. 1, 1910.....	.078	.087	.522	.304	.313	.217	1.521	72	24	19	3
St. Louis, Mo., Oct. 1, 1910.....	.078	.087	.548	.313	.313	....	....	65	22	20	.
Morgan Park, Ill., Sept. 22, 1908.....	.078	.087	.582	.365	.391	.261	1.764	83	28	20	4
Morgan Park, Ill., Sept. 22, 1908.....	.078	.087	.565	.400	.400	.252	1.782	..	..	..	..
St. Louis, Oct. 6, 1910 J. T. Monell.....	.078	.087	.591	.374	.382	.226	1.738	72	32	17	4
St. Louis, Mo., Oct. 6, 1910, J. T. Monell.....	.087	.087	.609	.365	.374	.235	1.757	83	31	16	5
St. Louis, Mo., Oct. 24, 1909.....	.078	.087	.556	.356	.348	.243	1.668	72	30	10	4
St. Louis, Mo., Oct. 24, 1909.....	.078	.087	.574	.348	.339	.235	1.661	60	27	13	..
La Fayette, Ind., Oct 23, 1912.....	.087	.087	.661	.382	.452	.261	1.930	83	34	29	4
La Fayette, Ind., Oct. 23, 1912.....	.087	.087	.661	.391	.435	.278	1.939	84	41	16	4

*Not including the large sensorium.

Wingless oviparous female.

(Pl. VII, fig. 48.)

Body ochreous brown and covered with many small blackish dots, each giving rise to a spinelike hair; head and thorax with dusky longitudinal bands on each side of the median line; the entire body covered with a fine pulverulence. Antennæ dusky to blackish, segment IV being slightly paler at base; relative length of segments about as in other forms; less than half the body length; sensoria as in wingless viviparous female. Eyes black. Legs blackish, excepting bases of femora, which are paler; hind tibiæ swollen and bearing about 65 circular sensoria. (An occasional oviparous female has been observed which bore no visible sensoria on hind tibiæ, although the latter are always swollen.) Anal plate dusky.

Average measurements from 5 specimens in balsam as follows: Length of body 2.55 mm., width 0.85 mm. Antennal measurements as follows:

Locality and Date	I. mm.	II. mm.	III. mm.	IV. mm.	V. mm.	VI. mm.	Total mm.
Morgan Park, Ill., Sept. 22, 1908. . .	.087	0.096	0.417	0.261	0.296	0.226	1.383
Morgan Park, Ill., Sept. 22, 1908. . .	.087	.087	.417	.261	.278	.209	1.339
Chicago, Ill., Oct. 15, 1909. . . . .	.087	.087	.408	.261	.287	.199	1.329
Chicago, Ill., Oct. 15, 1909. . . . .	.087	.087	.426	.252	.296	.217	1.365
St. Louis, Mo., Oct. 24, 1909. . . . .	.087	.096.	.417	.252	.269	.209	1.330
St. Louis, Mo., Oct. 24, 1909. . . . .	.087	.087	.400	.261	.261	.217	1.313
St. Louis, Mo., Oct. 24, 1909. . . . .	.087	.096	.426	.226	.261	.199	1.295
St. Louis, Mo., Oct. 24, 1909. . . . .	.087	.087	.400	.209	.261	.199	1.243
La Fayette, Ind., Oct. 23, 1912. . . . .	.087	.096	.435	.252	.252	.199	1.321
La Fayette, Ind., Oct. 23, 1912. . . . .	.087	.087	.452	.234	.243	.217	1.320

Egg.—(Fig. 18.)

When first laid, the egg is a pale yellowish brown, later changing to ochreous brown, and finally to jet black. It measures 0.65 by 0.30 mm. This insect lives upon the pine throughout the summer, and the winter eggs are deposited on the blackish leaf sheath at base of leaves of the same plant.

Outside of Nebraska, the type locality of *Eulachnus rileyi*, this species has been reported from Albany, N. Y., under the name *Lachnus agilis* Kalt., by Prof. C. P. Gillette.* The writer has collected it on the Austrian or black pine (*Pinus austriaca*) at Chicago, Morgan Park, and Urbana, Ill.; Independence, Iowa; La Fayette, Ind., and, in company with Mr. Monell, at St. Louis, Mo. Mr. Monell has specimens in his cabinet collected by Mr. Theo. Pergande in 1882 and 1885 at Washington, D. C., on the Jersey or scrub pine (*Pinus inops*), and he has himself collected it at various times

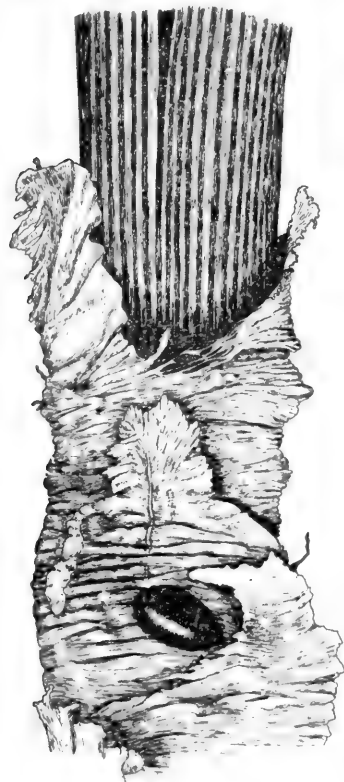


Fig. 18

since 1905 at St. Louis, Mo., on *Pinus austriaca*.

(To be continued.)

NOTES ON *RHABDOCNEMIS OBSCURUS* BOISD. IN AUSTRALIA.*

BY A. A. GIRAULT, NELSON, N.Q., AUSTRALIA.

During July, 1912, this species was reported to be injuring sugar cane at Innisfail (Darradgee, Goondi and Mundoo), North Queensland. Upon visiting the area during the last week of the month, the reports were found to be true and active measures were being taken by the farmers to combat the insect. Injured cane was first noticed on the trucks at the Goondi Mill, where about one or two per cent of the bottom ends of the cut cane were observed to bear borer channels. Later, after exploring rapidly the whole area, the insect was found to be most common at Darradgee, common at Goondi, but none were found at Mundoo nor East Innisfail. The farmers were using baits made of halved pieces of cane, the inner side of each half stick sometimes smeared with molasses and a half a dozen or so laid face down upon the ground in a row upon a small, clean area. The baits were placed only around one or two edges of a field; a large number of them were examined during the week, with the result that no beetles were found as a general rule with the exception of the worst fields, where on the average a dozen were taken from each trap (day: these fields had been trapped and collected for several weeks previously). Badila was the variety infested, since I saw but little injury to others (mostly Singapore); the former is softer, having less fibre. Exploration of cane fields—in the trash left after cutting, under logs, around the edges of cane fields, in nearby jungles, on banana trees and so forth—resulted in finding the beetle only in the living cane plants, where they were hiding (daytime) under the sheaths of the lowest *green* leaves upon which they feed by gouging out short, longitudinal channels from the inner surface. Sometimes they were hiding under the lower (dead) leaf-sheaths, and, as stated, under the traps. Rarely, a beetle was found on the ground or out of the fields entirely. None were seen at lights at night. They were sluggish at all times and none were observed flying (day); when disturbed they would generally assume a feigning attitude, remaining inert. The edges of the field, apparently, were most

* Contribution No. 8, Ent. Laboratory, Bureau of Sugar Experiment Stations, Bundaburg, Q.

May, 1914

infested, but sometimes the insect was distributed over an entire field.

There were no external indications of the presence of the borer in the fields, excepting that infested plants were weakened somewhat, and therefore very likely to be broken off by the wind; weakened and diseased plants were found to be infested more frequently than others. In canes which had been broken off by a cyclone, several months previously, when infested, there was sometimes a minute discoloured spot indicating the position of a large larva; these canes were infested near their tops and were only about three feet high and bare of leaves.

All stages of development were present. As a rule, only one or two of the beetles were found hiding in the same place; once four were found together and quite frequently pairs, but these were not mating, though in the mating position.

The farmers in the Goondi area had combined tolerably well and were using, as stated, the cane baits recommended by the Hawaiian entomologists; at the time, which was just before harvest, it seemed to me that one thorough search of the worst fields by hand, collecting the beetles and then, after harvest, burning the trash, would destroy the majority of those remaining, while the larvæ in the cane would be destroyed by the milling process. Mr. Robert Davis, of Darradgee, whom I quote later, brought to me some small pieces of infested cane taken from the remains of the trash on his field which had just been burnt in my presence. From these pieces were obtained three larvæ, two pupæ and three adults, and all proved to be dead except one pupa; later, the latter died; these specimen were taken from the interior of the pieces of infested cane, the pupæ and adults from cocoons. They appeared to have been steamed to death. From Mr. Davis I received the following interesting account:

"Notes in Connection with Cane Borer Pest.

"I first discovered Borer in or about April, 1912, in two shoots of cane while cutting cane for plants, after the field had been broken down by a recent cyclone. I made several enquiries about them from older farmers and was told that they were harmless, as they had been present on the (Johnstone) river for years past.

From April to the end of June I saw very few traces of them, owing to the heavy rainfall washing the ground. About the end of June they were found in many places, and because of enquiries I started to use baits composed of short pieces of cane split down the centre and laid flat on the headlands at about one quarter of a chain apart. In the meantime, I cleaned up all broken cane and cane tops from places where trees had fallen over on to the field, for in such places I found that the beetle bred more there; they were much worse in broken cane than in that standing. Cane broken and lying on the ground to rot is infested far worse than standing cane. The borer is also fond of hiding behind top leaves of standing cane and feeding on inside of leaf. During my clean-up I should say that we caught about two quarts of beetles and grubs; the second day caught some three quarts; the third day only a quart; the daily catch for the next week was about fifty borers a day. Since then the catch has been lessening, some days very few being caught. I also noticed that the damage was very much less on the headlands.

I have found old borers in last year's cane, left on the ground; also in cane that had been burnt last year. The borer works in the centre of the field as well as outside; it prefers *Badila* to any other. I find fresh, sweet cane quite as good for baits as sour cane; molasses darkens the bait and makes it difficult to see the captured beetles. I am quite sure that the borer will not be very plentiful, unless the cane is broken. The eggs laid in cane last April are now coming out in beetle form (last week of July). From June to last of July, I estimate that I have caught about 12,000 beetles and grubs, my outlay, not counting my own and boy's labor, being some £14."

During the time which I spent in the fields, a small quantity of the adults were collected and sent alive to the laboratory at Nelson (Cairns), N. Q., where they were kept temporarily under a wire cage containing pieces of cane. They fed upon the ends of these pieces, inserting their rostra into the soft pith. They were kept successfully in this cage until August 12, 1912, when they were taken out and counted; there were sixty-three males, fifty-four females—all collected at random in the Innisfail district from cane plants. From the ends of the pieces of cane upon which they

had been feeding for several weeks and which were now fermenting and dying, were recovered six eggs which died when exposed to the atmosphere.

Thirty-three random beetles were taken and confined singly in long glass vials plugged with cotton (vial 4 inches long by $\frac{3}{4}$ -inch diameter); they were not fed, and spent most of their energy in trying to escape; they died as follows: After one day, three males; two days, 6 males, 5 females; after three days, 8 males, 5 females; on the fourth day, 4 males, 2 females. They thus seemed to require a constant supply of food.

Ten random pairs were placed on a cane plant (leafless) under a high Tower breeding cage; all were dead after three weeks, as was also the cane plant.

On October 1, 1912, a single young larva was placed within a wound made in the top side of a strip of cane which had rooted in a box of earth; this larva hatched from eggs deposited between September 19-30, 1912. It developed; on November 27, or after nearly two months, the cane was cut off just below the spot where the young larva had entered, exposing a cylindrical channel which was five inches long, traversing four nodes. The grub was found at the end of this channel, nearly full grown. On December 20 the plant was examined again; the grub had gone four inches farther down and then returned, constructing a cocoon at about the place where it had been found in November. The cocoon contained a pupa which was accidentally injured. The plant was dead. The period of development in this case was about three months, probably longer than natural because of the unhealthy plant in which the grub developed. When placed into the plant, the young grub was about a week old or less.

Eleven glass jars were taken on August 12 and partly filled with about an inch of moist, sifted soil upon which was placed a node of matured cane; into each of these was introduced a male and female beetle of about equal size. The jars were then covered with cheese cloth. Four similar jars received single females taken at random and a fifth jar, five females. From time to time, the pieces of cane were removed from these jars, examined and a fresh piece added. The removal became necessary in most cases because of moulds developing on the cane. The beetles fed from the pith

at each end and eggs were laid into the ends quite frequently. The following short tables summarize:

TABLE I.—SUMMARY OF ELEVEN PAIRS KEPT IN CONFINEMENT FROM AUGUST 12, 1912.

No.	Dates of Finding	No. Eggs	No. Larvæ	Total Progeny	Death		Length of life — Days	
					Male	Female	Male	Fem'le
1	Aug. 19, 24; Sep. 19; Oct. 2, 10	11	4	15	.....	Oct. 20	...	69
2	Oct. 11; Nov. 15, 30; Dec. 7, 16	1	18	19	Nov. 23	Dec. 10	103	120
3	Sep. 20; Oct. 2, 11; Nov. 13, 28; Dec. 7, 16	11	28	39	Oct. 10	Dec. 25	59	135
4	Oct. 1, 10; Nov. 11	4	4	8	Nov. 23	Nov. 23	103	103
5	Sep. 20; Oct. 2, 11; Nov. 12, 28; Dec. 7, 16	15	20	35	Dec. 3	Dec. 24	113	134
6	Sep. 20; Oct. 1, 12; Nov. 15, 30	8	15	23	Dec. 4	Nov. 25	114	105
7	Sep. 19; Oct. 1, 9; Nov. 11, 27; Dec. 6, 16	12	21	33	Dec. 3	Dec. 20	113	130
8	Aug. 19, 24; Oct. 1, 9; Nov. 28	6	7	13	Nov. 1	Nov. 20	81	100
9	Aug. 24; Sep. 19; Oct. 1, 10, 31; Nov. 27	8	9	17	Nov. 20	Nov. 15	100	95
10	Aug. 19; Sep. 20; Oct. 2; Nov. 13, 27	3	13	16	Nov. 21	Nov. 22	101	102
11	Aug. 19, 24; Oct. 3, 12; Nov. 15, 30	8	17	20	Nov. 5	Nov. 25	85	105

TABLE II.—SUMMARY OF FEMALES KEPT IN CONFINEMENT FROM AUGUST 12, 1912.

Lot	Dates of Finding	No. of Eggs	No. Larvæ	Total Progeny	Death	Length life — Days
2	Aug. 24; Sep. 20; Oct. 3, 12	5	8	13	Oct. 20	69
3	Sep. 19; Oct. 1	0	2	2	Oct. 1	50
4	Sep. 20; Oct. 3, 12	12	3	15	Oct. 22	71
5*	Aug. 19, 24; Oct. 2, 10, 30; Nov. 27; Dec. 6, 16	27	13	40	Nov. 23*	103

*Five females. †Average time: one died after 51 days, one after 107 days, two after 110 days and one at the end of 136 days.

The total progeny of a female for several months is not very large from these data, but I am quite sure that all of the eggs were not found; the food was changed about every ten days. At any rate, it is quite evident that both sexes are able to live some weeks and that the rate of egg-laying is slow. Also that the young larvæ are quite unable to live in dried-up cane and that the beetles require a constant supply of food. The egg stage was not accurately obtained, but it was certainly not more than a week in duration. With better care, it is quite probable that the beetles would have lived considerably longer, still reproducing. Some of the females laid fertile eggs, when isolated from males, for about four months after. The rate of oviposition was not regular, sometimes several weeks elapsing between ovipositions.

From the practical standpoint, it may be that an important fact has been learned, namely, that the adults readily feed upon and lay eggs into fresh pieces of cane cut from the plant and it would seem desirable to try this method in place of the traps or else in conjunction with them. Not only would the beetles be thus caught, but also their progeny. These pieces could be strewn about and collected, say, every week and burned. It is quite possible, however, that the traps serve the whole purpose better because they offer a hiding place and to catch and kill the beetles is to put an end to all their progeny. Van Dine, in fact, states that this is what actually occurs in the case of the trapping. What I have seen of the latter would make me believe it to be an effective and practicable remedial operation and when used in conjunction with the operations already recommended by entomologists, there should be little or no difficulty in combatting this insect.

DOCTORS BARNES AND McDUNNOUGH ON FLORIDA LEPIDOPTERA.

BY HARRISON G. DYAR, WASHINGTON, D.C.

The article by Drs. Barnes and McDunnough on pages 27-31 of the January Canadian Entomologist has been noted. The article makes the appearance of a vindication, but is so vague that it can scarcely be answered. The gentlemen plead guilty. The plea may perhaps be considered to procure an ameliorization of sentence; at least, I shall be very glad to see any of their names rescued from the sorry pile of synonymy that they have created. Of positive statements in the gentlemen's paper there are but two:

1. *Acidaliodes eoides* B. & McD. is not a *Pseudocraspedia*, but a good species. I must, of course, accept their statement of fact, which I am very glad to do.

2. *Manatha nigrita* and *Prochalia pygmaea* are separable from *Platæceticus gloveri* by the presence of vein 6 in the hind wing in the former and the absence of a branch to vein 1b of fore wing in the second. These characters are of value, I believe, and are not valueless like the condition of the radial nervules, which I had in mind in speaking of *carbonaria*. It gives me pleasure, therefore, to retract the synonymy of these species and to recognize *Manatha nigrita* as

distinct from *gloveri* by venation and larval case. I regret that I overlooked the venation in making the examination for Mr. F. M. Jones, or he might have described this also with his new species *tracyi*. *Prochalia pygmæa* is evidently more nearly related to *Chalia rileyi* Heyl. than to *gloveri*, where I placed it, hastily as it now appears. Perhaps it is the same. Heylærts describes *rileyi* with 10 veins in fore wing, 7 in hind wing. My specimens have 11 veins in fore wing, 8 in hind wing; *Prochalia pygmæa* is said to have 12 veins in fore wing, 8 in hind wing. So few specimens of these forms are known in collections that the extent of variation cannot be stated, and I will, therefore, not make a positive reference of *pygmæa* now, though I think it probable that we have but one variable species in *C. rileyi*.

THE GALL PRODUCED BY *CYSTIPHORA CANADENSIS* FELT.

BY A. COSENS, TORONTO.

In Vol. XLV, No. 12, of this publication, Dr. E. P. Felt has described a new species of gall midge, *Cystiphora canadensis* Felt, reared by the writer from galls collected in this locality. The obtaining of a large number of specimens has made possible a fuller description of the gall.

It is produced on the radical leaves of *Prenanthes alba* L. or *altissima* L. As both these species grow in this locality, and only the radical leaves are infected by the midge, it is difficult to decide which species is serving as the host.

The gall is of the typical ocellate form, with a light yellow centre from 1—2 mm. in diameter, surrounded by a deep purple ring, averaging 2 mm. in width, which is bounded on the outside by a much narrower ring of the same shade as the centre of the gall. In immature galls the circle at the centre is green and in some exceptional cases entirely absent. When the galls are formed close together on the leaves, they are often connected by the widening of their outside yellow rings. The concentric rings of colour are much more apparent on the upper than the lower surface of the leaf.

The galls are frequently so numerous on the leaves as to almost cover them. In one instance forty specimens were found on a single leaf.

AN EGG-PARASITE OF THE TARNISHED PLANT BUG,
LYGUS PRATENSIS L.

BY C. R. CROSBY AND M. D. LEONARD, ITHACA, N. Y.

On October 3, 1913, while examining flower-heads of the daisy fleabane, *Erigeron ramosus*, we found one egg and two egg-shells of the tarnished plant bug, *Lygus pratensis*, with the tip slightly inserted in the receptacle. The flower-head was placed in a vial, and in a few days the egg took on an abnormal blackish colour. On October 7 a hymenopterous parasite emerged. From other flower-heads placed in a breeding-cage two other parasites of the same species were obtained on Oct. 21 and 27. This parasite is apparently undescribed.

***Anagrus ovientatus*, n. sp.**

Female.—Length .64 mm., abdomen .36 mm. General colour black; eyes dark red; antennæ blackish, except pedicle below and scape at tip, which are dull yellowish. The legs dull yellowish; coxæ dusky; femora broadly banded with dusky; middle and hind tibiæ dusky except tip and base; last tarsal segments dusky. Abdomen black, very slightly tinged with yellowish at the tip.



Fig. 19.—*Anagrus ovientatus*.

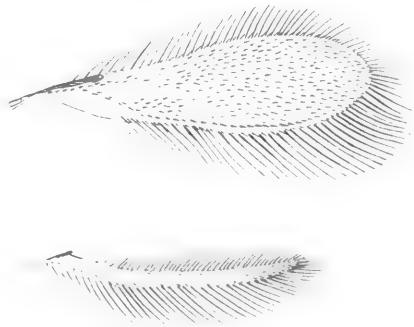


Fig. 20.—*A. ovientatus*, wing.

The relative length of the antennal segments is indicated by the following ratio: scape 4, pedicle 3, first funicle 1, second 2, third, fourth, fifth and sixth 3, club 5.

The ciliation of the wing is shown in figure 20.

Described from three females, Ithaca, N. Y., Oct. 7, 21, 27, 1913.
May, 1914

Type deposited in the Cornell University collection.

According to Girault's table of the North American species of *Anagrus* (Trans. Am. Ent. Soc., XXXVII, pp. 297-298, 1911), this species runs to *A. sagi* Girault. The two species may be separated by the following characters:

1. Species entirely dusky black; funicle segments of the antennæ all shorter and much smaller than the pedicle; scape and pedicle subequal; tips of tibiæ pallid. *saga* Girault.
2. Species black except for tip of abdomen, which is slightly tinged with yellowish; funicle segments of antennæ same size as scape, except first and second; scape and pedicle unequal; tips and base of tibiæ pallid. *ovijentatus*, n. sp.

BOOK REVIEWS.

THE CHINCH BUG. By T. J. Headlee and J. W. McColloch, Agr. Expt. Sta., Manhattan, Kansas. Bul. 191, p. 287-353, 1913.

This bulletin sums up the results of several years' careful study of the Chinch Bug and the various means of control. The much-debated question of the value of the artificial distribution of the fungus diseases, especially *Sporotrichum globuliferum*, which attack the bugs, has been given much attention, and in order that the conclusions reached might be based on sound grounds, a study of the life-history of the fungus itself in its relation to temperature, moisture and various hosts was carried out. From their study of the life economy of the Chinch Bug and Chinch-Bug Fungus and from the results of various experiments conducted by themselves and other entomologists in various parts of the country, the authors conclude that the facts unite in showing that artificial distribution of the chinch-bug fungus, either on diseased bugs or by artificial cultures, is not worth the time and trouble it takes. They state, moreover, that the farmers of Kansas have lost millions by the advocacy of this method of control because it tended to encourage them to neglect known really efficient measures.

The study of why bunch grass makes practically the only safe winter quarters for the bugs gave interesting results and seems largely to explain why the proper burning of such hiding quarters in early winter has given so good results. The two great artificial

methods of control, namely, this burning of the bunch grass to destroy the hibernating insects and the dust barriers to prevent migration or to destroy the nymphs when migrating from wheat to corn, are very clearly explained and the grounds on which they are advocated are set forth in a convincing manner. So far as one can judge, the Bulletin should be very valuable to the farmers of Kansas and to any who have to study and combat this very destructive pest.

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L. CAESAR.

THE HESSIAN FLY. By T. J. Headlee and J. B. Parker, Agr. Expt. Sta. Manhattan, Kansas, Bul. 188, pp. 83-138, 1913.

This is a technical bulletin giving a comprehensive account of the Hessian Fly in Kansas. The authors, however, have not limited themselves solely to Kansas conditions, but have made several very important references to the results obtained by other investigators in different parts of the United States, whenever by so doing they could make more clear the point at issue. The history, distribution, habits, life history, nature of injury, natural and artificial means of control have been discussed at considerable length. The most valuable parts of the bulletin deal with the effects of temperature and moisture on the insect; the part played by parasites; the uselessness or inadvisability of several advocated measures of control, and the effectiveness of other methods.

None of the measures advocated are new, but new data are given to prove more fully their value and considerable attention has been paid to answering the objections that have been made to them. The control measures advocated are (a) destruction of the insects on infested stubble preferably by ploughing under, (b) destruction of volunteer wheat, and (c) late sowing. In addition to these, the importance of a fertile, well-prepared seed-bed and good seed are emphasized. It is shown that climatic conditions and parasites play a very important part in control, but that they can never be relied upon to take the place of the measures just mentioned. Though the bulletin describes Kansas conditions, almost everything that it contains has a direct bearing upon this pest in Canada or elsewhere and is also very valuable by way of comparison with our local conditions.

L. CAESAR.

BOMBYCIA IMPROVISA AND *TEARLII* HY. EDWARDS.

I have in my collection one specimen of *Bombycia improvisa*, taken at Ladysmith, Vancouver Island, Oct. 10, 1907, which I compared with specimens so labelled in the cabinets of the late G. W. Taylor, of Wellington, B. C., but on further examination I found that the specimens did not agree with the figure of *improvisa* in Holland's Motto Book.

The specimen was submitted to the late Dr. J. B. Smith, who wrote me under date of April, 1908: "The determination is correct. I never noticed before that Holland makes *tearlii* a synonym of *improvisa*. It is not. He figures *tearlii*, and not *improvisa*."

In Dyar's Catalogue *tearlii* is noted as a synonym of *improvisa*.

This season I have been fortunate in securing two specimens of *tearlii*, identical with that figured by Holland and entirely distinct from the specimens of *improvisa* of Vancouver Island.

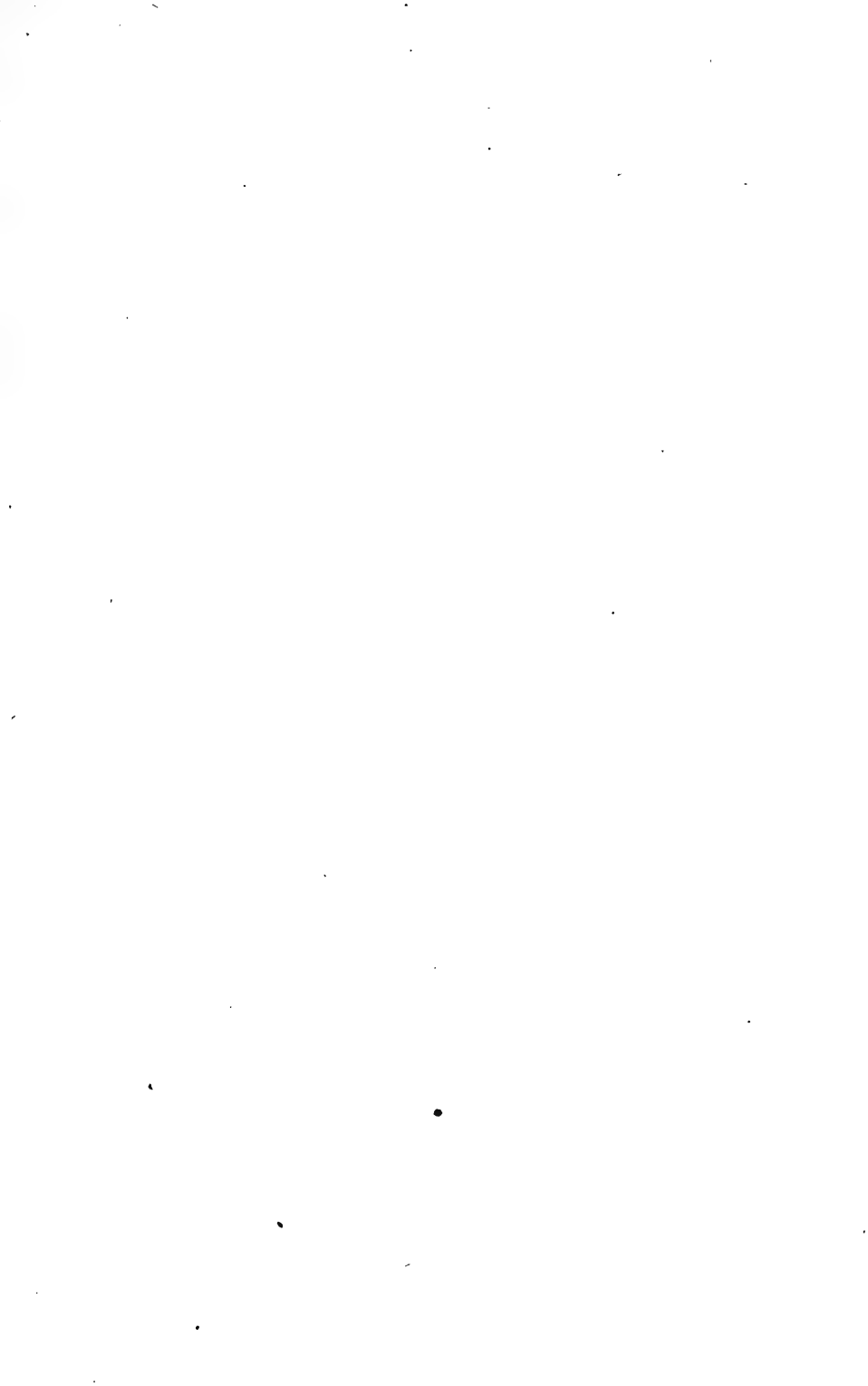
The correction must therefore be made in Holland's work, and the name *tearlii* be restored to its place in our nomenclature.

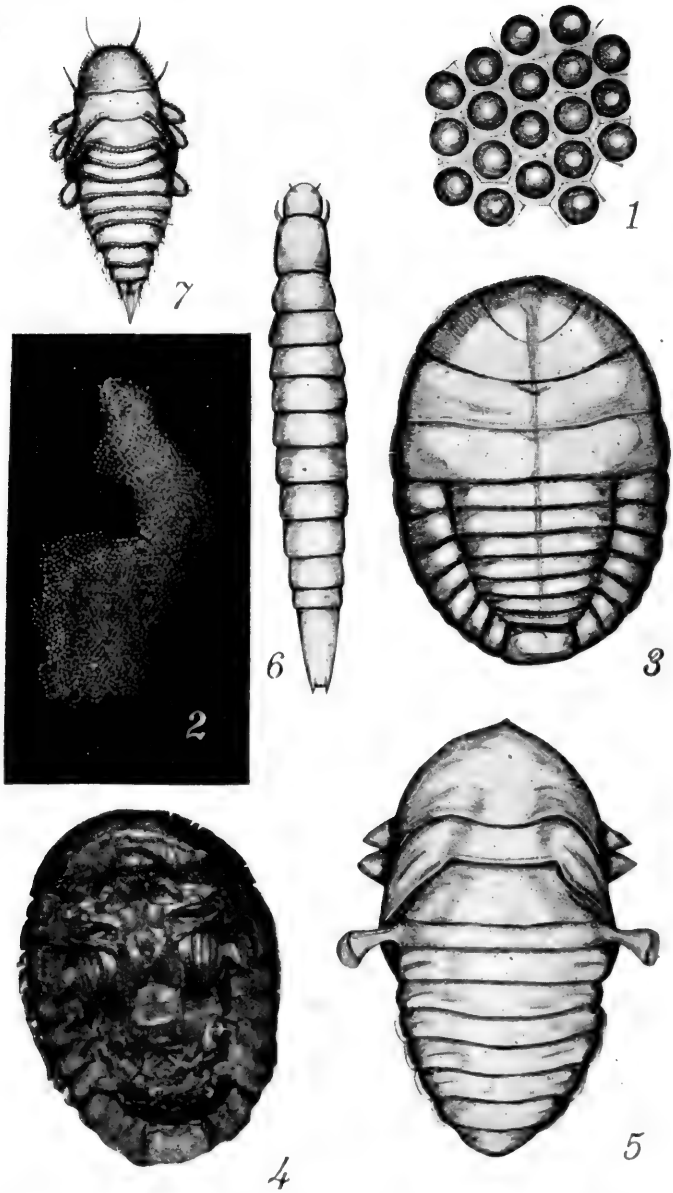
J. W. COCKLE, Kaslo, B. C.

THE LONDON BIOLOGICAL CLUB.

A society with the above title has recently been formed in London, Ontario, the organization consisting of a general club for conducting the business of the whole and of a number of sections devoted to special departments of biology. The objects of the club are stated to be: "(a) the development and advancement of the study of biology in general and of the subjects represented by the sections in particular; (b) the conservation of living things, including man and all useful to him; (c) the economic and scientific destruction of such living things as can be shown inimical to man."

The wide scope of the club is set forth in the bylaw relating to sections which, it states, may be organized to deal with the following subjects: Archæology, Bacteriology, Botany, Entomology, Ethnology, Ichthyology, Paleontology, Psychology, Ornithology, Sociology, Zoology, Bees, Poultry, Horses, Dogs, Cats, etc. It is provided further that any members, not less than three in number, may apply for the creation of a new section on any other subject relating to Biology. The club has begun with a fairly large membership, and with such an extensive field of operations should attract a great number of persons who take an intelligent interest in matters outside of their daily routine of work.





PSEPHENUS LECONTEI AND STENELMIS BICARINATUS.

The Canadian Entomologist.

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No. 6

LIFE-HISTORY NOTES ON TWO COLEOPTERA (PARNIDÆ).

BY ROBERT MATHESON, ITHACA, N. Y.*

***Psephenus lecontei* Lec.**

Although many notes, brief references, and figures of the larva (fig. 3), water penny, of this beetle have appeared from time to time in American literature, no consecutive account of its life-history has as yet been published. As this extremely interesting species is found very widely distributed in America and is of considerable interest on account of its peculiar larval form it seems to me that a short account, though gathered from desultory observations extending over the past two years, would not be out of place at this time.

Ordinarily the beetles are not usually observed by the collector though practically everyone who has any interest in entomology has seen the peculiar larvæ on the under side of stones, etc., in any of our rapid streams. In some streams they are very abundant and usually so in the swifter-flowing portions, particularly where the stones break the surface of the water into ripples. Here also the beetles are found, often in considerable numbers, but not in the water. H. G. Hubbard, in the *American Entomologist* for 1880 (p. 73), well described the habits of the adults. Both males and females may usually be found, particularly during the heat of the day, gathered upon stones in mid-stream which just break the surface of the water. They are very active, flying about, and chasing one another over the stones. I have never seen them plunge into the water nor suffer themselves to get wet. They are usually very easily frightened and one has to approach cautiously with a net in order to catch them; for they take sudden flight and one can scarcely follow their movements. However, if one will look around carefully they will usually be found only a few feet away actively playing on another stone.

*Contribution from the Entomological Laboratory of Cornell University.

I have observed the adults performing in this manner in Fall Creek and Coy Glen here at Ithaca and in the Salmon River at Truro, N. S. Guided by the activities of the adults I was not long in finding the eggs. They are laid in masses on the under side of stones, usually in the swiftest water. I have found these egg masses in shallow streams and also in rivers where the water was several feet deep, the current often so swift as to render footing difficult. The females when engaged in egg laying are very sluggish and never attempt to escape. One may easily observe the egg-laying process if he is careful to remove the stone on which the eggs are being deposited. Egg laying was common at Ithaca on June 25, 1911, at Truro, N. S. on July 14, 1913.

The eggs are deposited in a single, irregular layer. They are placed closely beside one another, often forming a layer of considerable extent (Fig. 2). At first the eggs are bright orange in colour, soon turning lemon yellow. They are firmly held together and to the stone by a tough, hyaline substance. In examining an egg mass removed from a stone, each egg is seen to be placed in the centre of a gelatinous envelope, hexagonal in outline. A layer of lemon-yellow eggs, each egg placed in the centre of its gelatinous envelope, presents a rather beautiful appearance, (fig. 1). The eggs are practically spherical in shape, measuring .18 mm. to .2 mm. in diameter. Some eggs may be a little larger, others smaller, but the above measurements represent the average size. The eggs are perfectly smooth without markings of any kind.

I was not able to rear the larvæ from the eggs nor study in detail their natural history. It would undoubtedly be of considerable interest for any one to study the form of the larva at hatching and what changes it undergoes during its larval existence. No one I believe has examined the stomach contents and nowhere have I found mention of its feeding habits. I did not determine the time between egg laying and the hatching of the larva. Judging from observations, the life-cycle lasts slightly less than a year,—egg-laying taking place during the latter part of June and July, the larvae reaching maturity the following season.

In the references to this species in literature I have found but one note on the pupa. Hubbard in the *American Entomologist* for 1880, p. 73, speaks of the larva leaving the water and

pupating under the larval skin beneath stones, boards, etc., in damp situations. He did not mention when they could be found. Last summer (Aug. 6, 1913) while collecting along the bank of Salmon River I was attracted by the large number of empty larval skins of this species. Though I had noticed such skins previously I had always discovered them empty. In searching over a large number I was fortunate to find two pupæ not yet transformed. Nearly a month previously the adults had been observed egg-laying, so evidently the time of pupation extends over a considerable period. How long the pupal period lasts I did not determine.

The pupæ are found on the under side of stones, boards, etc., in damp situations. I found the larval skins very abundant under loose rocks overhanging the Salmon River. These sedimentary rocks are soft and many cracks extend in all directions, retaining a considerable amount of moisture. The last larval skin is firmly attached to the rock. Under this skin the pupa is formed. The larval skin on the ventral side splits transversely just in front of the mouth parts and is forced back to the tip of the abdomen where it remains (fig 4). The pupa is pure white in colour and very tender. It is held in place under the larval skin by the unshed anterior ventral portion and the shed skin at the caudal end. In this way the pupa is prevented from coming directly in contact with the hard underlying rock, etc.

Although there are several extended descriptions of the larva and larval structures I have found scarcely a word regarding the pupa. The pupa is pure white in colour, measuring 4.5-5mm. long. The anterior end is firmly held in place by the remaining portion of the larval skin, while the end of the abdomen remains beneath the cast larval skin. However, if one carefully lifts the pupal head, then loosens the abdomen he will be surprised to find the pupa still firmly held in place. Carefully pushing the pupa it soon breaks away and discloses a process on each side extending from the latero-dorsal angles of the first abdominal segment. These processes are firmly attached to the lateral walls of the enveloping larval skin. A dorsal view of the pupa showing these peculiar processes is shown in fig 5. The pupa is perfectly smooth without any spines or setæ. There are eight abdominal segments on the

dorsal side. The seven pairs of spiracles are prominent, all except the third pair being black at the tip. The eyes are prominent and somewhat blackish. The legs and wing-pads are held in position as shown in fig 4 (ventral view of the pupa in position in the larval skin).

Stenelmis bicarinatus Lec.

This species is quite common in Salmon River and I was not surprised to find the larvæ and pupæ under stones along the banks. Unfortunately, however, it was rather difficult to determine the larva or pupa of this species as quite a number of other species of Coleoptera were not uncommon in similar situations. However, I found a considerable number of larvæ transforming and many pupæ, one of which I reared so that I was able to definitely connect all the different stages. The larvæ leave the water about the last of July or the first of August and construct small, smooth, pupal chambers in damp situations under stones. I found many pupæ and a number of larvæ in such situations about August 7, 1913. The beetle reared from one of these pupæ emerged on Aug. 10th. Further than this I know nothing of the life-cycle of this species, but this note may throw a little light on this small family of interesting forms.

The larva (fig. 6). The mature larva, ready to pupate, measures 6.25 mm. long, and 1 mm. wide at its broadest part. It is heavily chitinized, reddish brown in colour, the head and terminal segment of the abdomen being almost black.

The head is small and the mouth parts very inconspicuous. The antennæ are three-jointed, yellowish brown in colour, 1st segment measures .05mm., 2nd .09 mm.; the third, consisting of two very small segments lying side by side, .027 mm.

The larva consists of 12 segments exclusive of the head. The last abdominal segment is longer than the two preceding segments and ends in two sharp, short spines with two rounded lobes between (fig. 6). The entire cuticle is densely covered with small, dark elevations, each bearing a very minute spine. Otherwise, there are no distinctive markings. The legs are short, well developed and suited for clinging closely to stones or other objects in swiftly flowing streams.

The pupa (fig. 7). The pupa is soft, white in colour, the

thoracic segments, wing-pads and legs being slightly dark in colour. This darkness deepens with the age of the pupa. Length 3.4mm.; width at base of wing pads, 1.2 mm.

The head lies incurved under the prothorax, the developing mouth-parts showing very distinctly. The eyes are small and almost black. The antennæ lie in front of the eyes and extend under the pronotum, thus being concealed from the dorsal view. The wing-pads are prominent.

The pronotum is large and rather densely covered with fine colourless setæ. The outer angles of the anterior margin each bear a long, curving spine, measuring .32 mm. The posterior outer angles also, each bear a spine measuring .28 mm. These spines are yellowish brown in colour. They support the pupa in its chamber, preventing it from coming in contact with the coarse grains of sand.

The abdomen is composed of nine segments, the posterior margins on the dorsal side being strongly elevated into narrow ridges. These ridges are clothed with numerous short setæ. The ninth segment bears on its dorsal side two curving stout cerci, measuring .4 mm. in length. These cerci almost completely conceal the segment from which they arise. The pupa rests on its back in the pupal chamber. By the aid of the prothoracic spines and cerci together with the numerous short setæ arising from the raised ridges of the abdomen, injury from the roughened walls of the pupal chamber is avoided. The posterior margins of the wing pads and the legs are also provided with many short setæ.

THE KNOWN NYMPHS OF THE CANADIAN SPECIES OF *LESTES* (ODONATA).

BY E. M. WALKER, TORONTO.

The only attempt that has yet been made to separate the nymphs of the North American species of *Lestes* is that of Professor J. G. Needham in his report on "Aquatic Insects in New York State."* Professor Needham gives an excellent generic description of the nymph and a table for the partial separation of the five species that he reared, viz., *L. uncatius*, *unguiculatus*, *rectangularis*, *forcipatus*, and *eurinus*. Good figures are given of *L. rectangularis*.

*Bull. 68, N.Y. State Museum, 1903, pp. 228-236.
June, 1914

In 1908† the same author described the nymph of another species, *L. vigilax*.

To these six species I can add two others, *L. congener* and *L. disjunctus*, both of which I obtained on Vancouver Island during the summer of 1913.

These are all the species of *Lestes* known from Canada and the Northern United States, except *L. inaequalis*, although *L. eurinus* has not been certainly reported from the Dominion.

Of the nymphs of this genus reared by him, Professor Needham says: "I find them well-nigh indistinguishable specifically. Aside from slight and inconstant differences in size and a few very minor structural characters, they are all alike." Certainly they are a difficult group and can only be studied satisfactorily with an abundance of material. Nevertheless, I believe that most, if not all, of the species can be distinguished, provided both sexes are present, though I must admit that it is very doubtful whether single individuals, especially males, can be recognized with certainty in all cases.

In regard to *L. forcipatus* and *L. unguiculatus*, I can say very little, as I have seen no good specimens of either. These species have therefore been omitted from the key that I give below, though I have discussed them as far as the material before me permits in the notes that follow.

The key is based upon an examination of specimens kindly lent me by Professor Needham, as well as material collected by Mr. R. P. Wodehouse, of Toronto, and myself.

Key to the Known Nymphs of Canadian Species of Lestes.

- A. Lateral spines present on abdominal segments 4- or 5-9; labium, when closely applied to the ventral surface, reaching to or beyond bases of hind coxæ.
 - B. Mentum of labium relatively stout in its proximal half, its narrowest part being about one-third of the apical breadth; lateral setæ 4 or 5. *congener*.
 - BB. Mentum of labium very slender in its proximal half, its narrowest part being not more than one-fifth of the apical breadth; lateral setæ normally 3.

†Bull. 124, N.Y. State Museum, 1908, p. 197.

- C. Lateral spines on segments 4-9; mentum of labium 5.5-5.75 mm. long, barely reaching base of hind coxæ*; mental setæ 7 or 8, hind femora 6 mm.; outer wing-pad 6.5 mm. *eurinus*.
- CC. Lateral spines on segments 5-9 (4-9 in one specimen of *disjunctus*), mental setæ usually 5-6, but often 7; hind femora less than 6 mm. long; outer wing-pad 5.5 mm. long or less.
- D. Mentum of labium more than 4 mm. long, reaching generally to apex of hind coxæ or beyond; ovipositor extending beyond apical margin of segment 10.
- E. Mentum of labium 4.3-5.1 mm. long, reaching apex of hind coxæ or slightly beyond; ovipositor 3-3.5 mm., extending beyond basal joint gills *uncatus*.
- EE. Mentum of labium 4.75-5.5 mm., reaching beyond apex of hind coxæ, often to apex of trochanters, ovipositor 2 mm. long, extending very little beyond apical margin of segment 10. *disjunctus*.
- DD. Mentum of labium 3.7-4 mm. long, reaching generally to about the middle of the hind coxæ; ovipositor just reaching apical margin of segment 10. *rectangularis*.
- AA. Lateral spines present on abdominal segments 2- or 3-9; labium reaching barely to bases of hind coxæ or not so far. *vigilax*.

Lestes congener Hagen.

Both sexes of this species were reared¹ at the Dominion Biological Station at Departure Bay, near Nanaimo, Vancouver Island. The nymphs were obtained from Lonely Lake, a large pond a few miles from the Station in the depths of a rocky, coniferous forest. Two species of *Lestes* occurred near here, *L. disjunctus* and *L. con-*

*This character is doubtless somewhat variable as in other species.

gener, but the latter commenced to transform when the period of emergence of the former was almost over.

The nymphs were taken on July 31, 1913, and emerged on August 7th, 8th and 13th.

Nymph.—Labium, when closely applied to ventral surface, extending caudad to a little beyond the base, or to the middle, of the hind coxæ; mentum narrowest about the middle, the breadth here being about one-third of the apical breadth, widening very slightly proximad; lateral lobe with inner margin crenulate, the teeth being much less developed than in other species of the genus; the row of teeth between the two hooks of the outer part also less developed than in the other species; 4 or 5 lateral setæ, there being 3 or 4 on the movable hook and one before its base.

Lateral spines present on segments 5-9, those on 5 minute but distinct; spinules on lateral carinæ of seg. 9 varying from 9 to 14. Ovipositor extending very slightly beyond the hind margin of seg. 10, the styli just reaching the margin. Gills but little tapering distally, being little or no narrower at the distal than at the proximal third, apices convexo-acute. The three dark bands are usually distinct but not sharply defined. The femora have an obscure preapical dark ring.

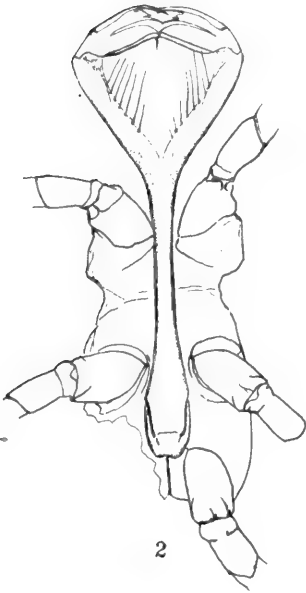
Length of body (without gills) 14.75 (contracted in alcohol) -20 mm.; labium (hinge to apex) 3.25-3.5 mm.; outer wing-pad 4.3-5 mm.; hind femur 4.7-5 mm.; gill 8.25-9.5 mm.

Described from four nymphs and three exuviae.

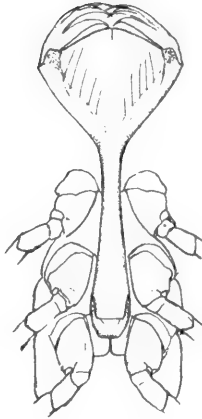
Lestes eurinus Say.

Of this species I have only one male exuvia, with the imago and a mounted labium from another specimen, both received from Professor Needham.

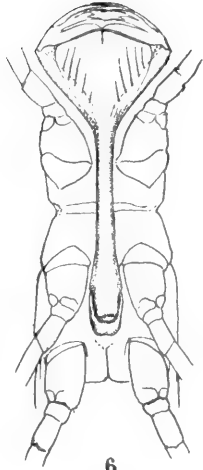
The labium is not very long for the size of the insect as it extends back only to the base of the hind coxæ. Mentum very slender in the middle, being only about one-seventh of the greatest breadth; broadening towards the hinge to about twice this breadth. The mental setæ of the mounted specimen are 7 on each side, in the other they are 7 on one side and 8 on the other. There is nothing characteristic about the lateral lobes except that the outer part is rather broad and the teeth between the two hooks are more irregular than in most species.



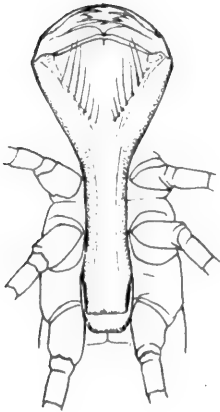
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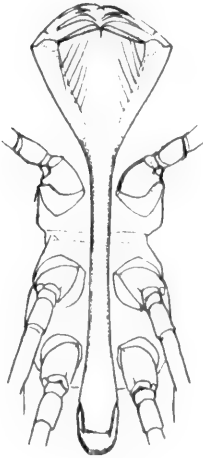
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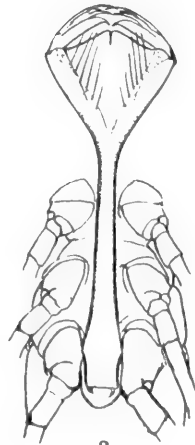
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1



4



3

NYMPHS OF LESTES.

Lateral spines on abdominal segments 4-9, small but distinct on 4, increasing to 7, smaller again on 9. Gills tapering but little distally, the width at the distal third little less than at the proximal third, apices broadly convexo-acute.

Length of body (without gills) 25 mm.; labium 5.5 mm.; outer wing-pad 6.5 mm.; hind femur 6.0 mm.; gill 11 mm.

Lestes unguiculatus Hagen.

All that I have to represent the nymph of this species is the slide received from Professor Needham, on which the mouth-parts are mounted. The labium is of about the minimum size for *L. uncutus*, measuring barely over 4 mm. in length from hinge to apical margin of mentum. The mentum is of the same form and bears 7 mental setae on the right side and 5 on the left, though there is a space on the left side that appears to have borne two others.

The lateral lobes have apparently no special characteristics but their exact form cannot be determined as they do not lie flatly on the slide.

Although nothing is known of the ovipositor of the nymph of this species, it is safe to infer that it is of about the same size as in *disjunctus* or *rectangularis*, as this relation obtains in the adults of these species.

Lestes uncutus Hagen.

On June 26, 1913, I found the adults of this species in enormous numbers about a prairie pond or "slough" at Prince Albert, Saskatchewan. The exuviae were also numerous here and one nymph was taken when about to transform. I also have a considerable number of full-grown nymphs taken by Mr. R. P. Wodehouse from a pond on Fitzwilliam Island, Georgian Bay, Ont., June 29th, 1912, where they were taken in company with nymphs of *L. rectangularis*. In addition to these I have a slide from Professor Needham, on which the mouth-parts are mounted.

It is a somewhat larger and slightly stouter nymph than that of *L. rectangularis* and the labium is noticeably larger. The females are easily recognized by the very large ovipositor, a character that is also present in the adults. This feature is probably shared by *L. forcipatus* (q.v.).

Nymph.—Labium long and slender, extending usually slightly beyond the apices of the hind coxæ but sometimes not quite reaching the apices, in other cases extending as far back as the middle of the hind trochanters. Slender proximal part of mentum about two-thirds of its entire length, the middle breadth being about one-seventh of the breadth at base of lateral lobes, widening proximad to more than twice this breadth at the hinge; mental setæ usually 6 or 7, rarely 5 or 8 on one side; inner part of lateral lobes with the marginal teeth prominent, the outer part broad with the row of teeth straight and more regular than usual; lateral setæ normally 3, rarely a fourth on the movable hook.

Lateral spines present on abdominal segments 5- or 6-9, those on 5, when present, very minute. Spinules on lateral carinæ of 9 varying from 10 to 14. Ovipositor much larger than in any other species examined, the tips of the styli reaching the level of the basal joint of the gills, the apices of the ovipositor slightly beyond the joint. The sides of the valves are perpendicular, and their ventral surfaces narrow; the longitudinal series of minute hairs along the ventro-lateral margins is very inconspicuous. Gills widest about the proximal third, tapering considerably in the distal half, the width at distal third about two-thirds that at the proximal third, apices acute.

In distinctly marked specimens (in alcohol), the dorsum of the abdomen is largely brown, the femora have a brown preapical annulus and the tibiæ and tarsi are apically infuscated. The dark bands of the gills are often sharply defined.

Length of body (without gills) 22-24 mm.; labium 4.3-5.1 mm. (av. 4.7); wing 4.9-5 mm.; hind femur 5-5.1 mm.; gill 8.9-10 mm.

Lestes disjunctus Selys.

I found the adults of this species in great abundance in two marshy coves on the edge of Lonely Lake, Vancouver Island (see under *L. congener*). There were also great numbers of exuviae which I felt safe in referring to this species as it was the only one present. I dredged up a number of nymphs which I also assumed to be *disjunctus*, but the few that were reared all proved to be *congener*. Only one specimen, not reared, was *disjunctus*. The

time for emergence of this species was practically over at the time the nymphs were collected (July 31, 1913).

Nymph.—Labium exceedingly long and slender, reaching back beyond the apex of the hind coxæ or even beyond the trochanters. The slender proximal part of the mentum includes about two-thirds of its length and its breadth, at the middle, is about one-seventh of the breadth at the base of lateral lobes. It expands proximad to more than twice its middle breadth. Mental setæ 6 or 7; lateral lobes similar to those of *uncatus*, the row of teeth on the outer part somewhat less regular; lateral setæ 3.

Lateral spines on segments 5-9 (4-9 on one specimen); 11-14 spinules on lateral carinæ of segment 9. Ovipositor extending slightly beyond the hind margin of segment 10, the styli reaching fully as far back as the apex. The longitudinal series of minute hairs on the ventral surface of the valves is slightly mediad of the lateral margin of the valves. Gills broadest at the proximal third, thence tapering gradually to the slender pointed apices, the breadth at the distal third being less than two-thirds of the breadth at the proximal third. The dark bands of the gills are somewhat diffuse in all the specimens, and in some very feebly indicated. The only other indications of a colour-pattern are the very feeble preapical femoral annuli and the darkened apices of the tibiæ and tarsi in some individuals.

Length of body (without gills) 18-19 mm.; labium 4.75-5.5; outer wing-pad 4.5-5mm.; hind femur 5.1 mm.; gill 8.8-10 mm.; ovipositor 2-2.3 mm.

Described from two nymphs and four exuviae.

Lestes forcipatus Rambur.

I have only a fragmentary male exuvia with the imago and four mounted labia, of this species, received from Professor Needham. The exuvia lacks both head and gills so that it is impossible to form a proper idea of the characters of the nymph. Moreover, one of the mounted labia is considerably larger than the others and appears to me to belong to a different species. Professor Calvert, however, has kindly furnished me with the following data taken from a male, reared by himself. The nymph was collected in Delaware Co., Pa., July 16, 1891, and transformed on July 22.

Mental setæ 6 on each side; lateral setæ 3+1 small one on the lateral edge of each lateral lobe, just proximal to the articulation of the movable hook. Lateral spines on abdominal segments 5-9, smallest on 5. Spinules on lateral carina of segment 9, 14 on right side, 12 on left. Length of body, without gills, 17 mm.; mentum of labium 3.8 mm.; outer wing-pads 5.5 mm.; hind femur 5 mm.; gills 9 mm.

In Professor Needham's material these characters are quite similar to the above, in so far as they are represented, except that one of the labia is larger than the others, measuring 5 mm. in length, whereas the others measure barely 4 mm. or a little less. One of the latter is labelled "bred." In all the specimens there are 3 lateral setæ and 5-6 mental setæ on each side. The rudimentary seta mentioned by Professor Calvert is present in all the specimens and in fact is rarely absent in any of the species of *Lestes* I have examined. In the exuvia from Professor Needham, there are lateral spines on abdominal segments 5-9, and the lateral carinæ of segment 9 bear 13-14 spinules.

In all these characters and also in the form of the labium and its lateral lobes, there is nothing to distinguish the nymph of this species from that of *L. rectangularis*, but the ovipositor will probably prove to be much larger, resembling that of *L. uncatu*s, since these relations obtain in the adult.

Lestes rectangularis Say.

I have bred this species at Toronto and have a large number of full-grown nymphs taken by Mr. Wodehouse from a pond on Fitzwilliam Island, Georgian Bay, in company with *L. uncatu*s. I also have exuviæ and adults reared by Professor Needham and a number of nymphs taken by him at Old Forge, N.Y.

Nymph.—Somewhat smaller than that of *L. uncatu*s, and of somewhat slenderer build. Labium of moderate length, generally reaching back to about the middle of the hind coxæ, but sometimes not quite reaching their bases while in two specimens, otherwise like this species, it extends a little beyond the apices of the coxæ. In none of the four exuviæ of bred specimens that I have does it extend beyond the base of the coxæ. The slender proximal part of the mentum is about 1.25 to 1.5 times as long as

the expanded distal part, and just before the latter, it is narrowed to about one one-sixth of the width at the base of the lateral lobes, widening towards the hinge to about twice this breadth. Mental setæ normally 5, occasionally 6 on one side. Lateral lobes similar to those of *disjunctus*, lateral setæ 3.

Lateral spines on segments 5-9, of small size, those on 5 usually a little longer than in *uncatus*. Spinules on lateral carinæ of 9, 10-14, usually 11-13. Ovipositor of moderate size, the apex and styli reaching the hind margin of segment 10. The longitudinal series of minute hairs is present on the ventro-lateral edges of the valves. Gills slender, gradually tapering from the proximal third, the breadth at the distal third being about three-fourths or three-fifths that at the proximal third, apices bluntly convexo-acute.

The coloration is quite similar to that of *uncatus*. Some specimens are very distinctly marked, the bands on the gills being very conspicuous and sharply defined.

Length of body 19-21 mm.; labium 3.6-4.0 mm.; outer wing-pad 4.5-5.5 mm.; hind femur 4.5-5.13 mm.; gill 8.5-9.0 mm.; ovipositor 1.9-2.0 mm.

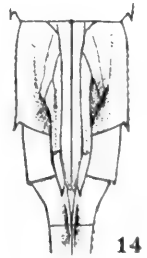
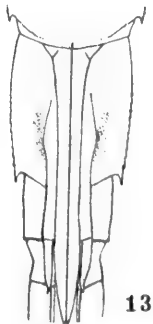
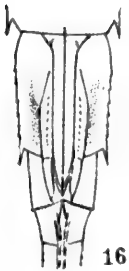
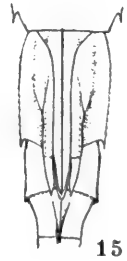
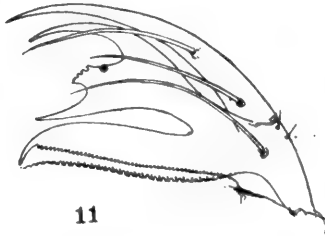
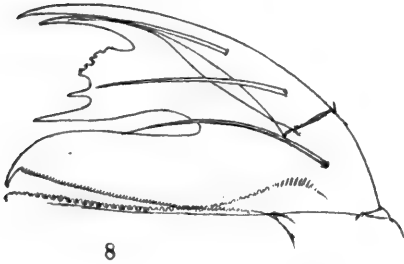
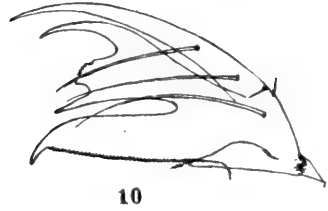
Lestes vigilax Hagen.

Although I have bred this species several times at Go Home Bay, where the nymphs are plentiful, I have at present only three exuviae from reared specimens and one immature nymph from that locality and four exuviae from Old Forge, N.Y., received from Professor Needham.

They are readily distinguished from other species by the characters given in the key.

Nymph.—A slender nymph, similar in form to that of *rectangularis*.

Labium relatively short, not extending behind the bases of the hind coxæ and in one exuvia only to the middle coxæ; somewhat abruptly expanded in its distal part, which is about one-third to two-fifths of its entire length, narrowed at the middle to about one-seventh to one-fifth of the apical breadth, and widening towards the hinge to about twice the middle breadth. Mental setæ 5 (rarely a small sixth on one side). Inner part of lateral



NYPHS OF LESTES.

lobes slenderer than in the other species, the marginal teeth prominent, the end-hook long and slender. Inner hook of outer part twice as long as the row of teeth, which is shorter than usual; lateral setæ 3.

Lateral spines on segments 2- or 3-9, larger than in the other species, those on segment 9, e.g., being about one-fourth the length of the lateral margin of segment 10. Spinules on lateral carinæ of segment 9 generally only 6-9, in extreme cases 5 or 11. Styli and apex of ovipositor not reaching the hind margin of segment 10, or the styli barely reaching the margin. The longitudinal series of minute hairs on the ventral margin of the valves is quite near the inner margin of the valves. Gills narrow, the margins being for the greater part of their length nearly straight and subparallel, apices rather broadly rounded, with or without slight indications of a point. Femora with a preapical annulus and the extreme apices dusky; a narrow sub-basal tibial annulus is sometimes present.

Length of body (without gills) 21-23.5 mm.; labium 3.33-3.8; outer wing-pad 5.2-5.4 mm.; hind femur 5.0-5.5 mm.; gill 10.0-10.5 mm.; ovipositor 2 mm.

EXPLANATION OF PLATES.

Plate XIII. Ventral views of labium and thorax, showing their relative positions when the former is closely applied to the ventral surface of the latter. The mental setæ are seen through the mentum, as they appear in the transparent exuviae.

- | | |
|----------------------------------|------------------------------------|
| Fig. 1. <i>Lestes congener</i> . | Fig. 4. <i>Lestes disjunctus</i> . |
| Fig. 2. " <i>eurinus</i> . | Fig. 5. " <i>rectangularis</i> . |
| Fig. 3. " <i>uncatus</i> . | Fig. 6. " <i>vigilax</i> . |

Plate XIV. Lateral lobe of labium (figs. 7-11) and ventral views of abdominal segment 10 of the female, showing ovipositor, etc. (figs. 12-16).

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|----------------------------------|-----------------------------------|
| Fig. 7. <i>Lestes congener</i> . | Fig. 12. <i>Lestes congener</i> . |
| Fig. 8. " <i>eurinus</i> . | Fig. 13. " <i>uncatus</i> . |
| Fig. 9. " <i>uncatus</i> . | Fig. 14. " <i>disjunctus</i> . |
| Fig. 10. " <i>disjunctus</i> . | Fig. 15. " <i>rectangularis</i> . |
| Fig. 11. " <i>vigilax</i> . | Fig. 16. " <i>vigilax</i> . |

AMERICAN TRICHOPTERA—NOTES AND DESCRIPTIONS.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

(Continued from p. 156.)

RYACOPHILIDÆ.

Rhyacophila bifila, n. sp. (Figs. 53, 56.)

Female: Related to *R. coloradensis*, the female appendages on the same plan, but both upper and lower pieces are more slender. Black, with black and gray or whitish hairs; palpi dark brown; antennæ brown, annulate with pale. Wings dark brown, densely irrorate with pale; the costal area mostly pale, stigma long and dark, outer margin with pale spots between the veins; in hind wings the stigma is also very long and dark; forks 1 and 2 equal in length, fork 3 reaching more than one-half way on fork 4.

Expanse 21 mm.

From Vernon, British Columbia, August (Bryant).

Rhyacophila acropedes, n. sp. (Fig. 39.)

Blackish, with black bristles and golden hair; palpi pale; posterior warts pale; antennæ yellowish brown; thorax with two strips of golden hair; legs pale, basal part of tibia I and II to middle spurs dark, basal parts of all tarsi dark; spurs blackish. Wings yellowish brown, darker near tip, mostly unmarked, but around apical margin are dark spots at ends of veins and pale spots between them; thyridial spot hyaline white; base of stigma dark; in hind wings, which are gray, the stigma is wholly dark. In fore wings fork 2 is a little longer than fork 1, fork 3 hardly one-half as long as fork 2, fork 4 with base nearly opposite fork 1; discal fork not before fork of median vein.

Expanse 20 mm.

From Deer Creek, Provo Canyon, Utah, 21 Aug. (Spalding).

Rhyacophila bipartita, n. sp. (Fig. 54.)

Palpi brown, paler on base; antennæ pale, annulate with brown; head and thorax with pale golden hair; legs pale, darker on tarsi. Wings pale brownish, with faint darker brown transverse marks, on stigma the marks are very distinct, also dark marks along cubitus, and at ends of veins; hind wings yellowish brown, the

stigma dark; fork 2 in fore wings plainly longer than fork 1; fork 3 about one-half way back on fork 4.

Expanse 20 mm.

From Banff, Canada, 30 Aug. (Sanson).

Glossosoma penitus, n. sp. (Figs. 16, 19.)

Black; basal part of antennæ pale; legs pale, spurs dark, vertex and thorax with yellowish gray hair; wings dark brown, with black hairs and dark brown fringe; a large corneous, black patch over basal anal area; hind wings with dense black costal fringe. In fore wings fork 3 reaches back as far as fork 2, not stalked, fork 4 about as long as its pedicel; in hind wings fork 3 is longer than its pedicel.

Expanse 12 mm.

From Peachland; British Columbia, 21 July (Wallis).

Agapetus malleatus, n. sp. (Fig. 57.)

Black; the tips of coxæ and bases of femora yellow, and basal part of tibia somewhat yellowish; head and thorax with yellowish hair; in fore wings fork 3 is very long, about twice as long as fork 4, fork 5 is long, widely divergent, reaching almost back to base of discal cell; in hind wings forks 2 and 3 are equal in size. Male has the lower appendage with broad tip, reaching beyond the upper piece, the latter very broad with acute process at lower tip; the process of sixth ventral segment short and blunt.

Expanse 11 mm.

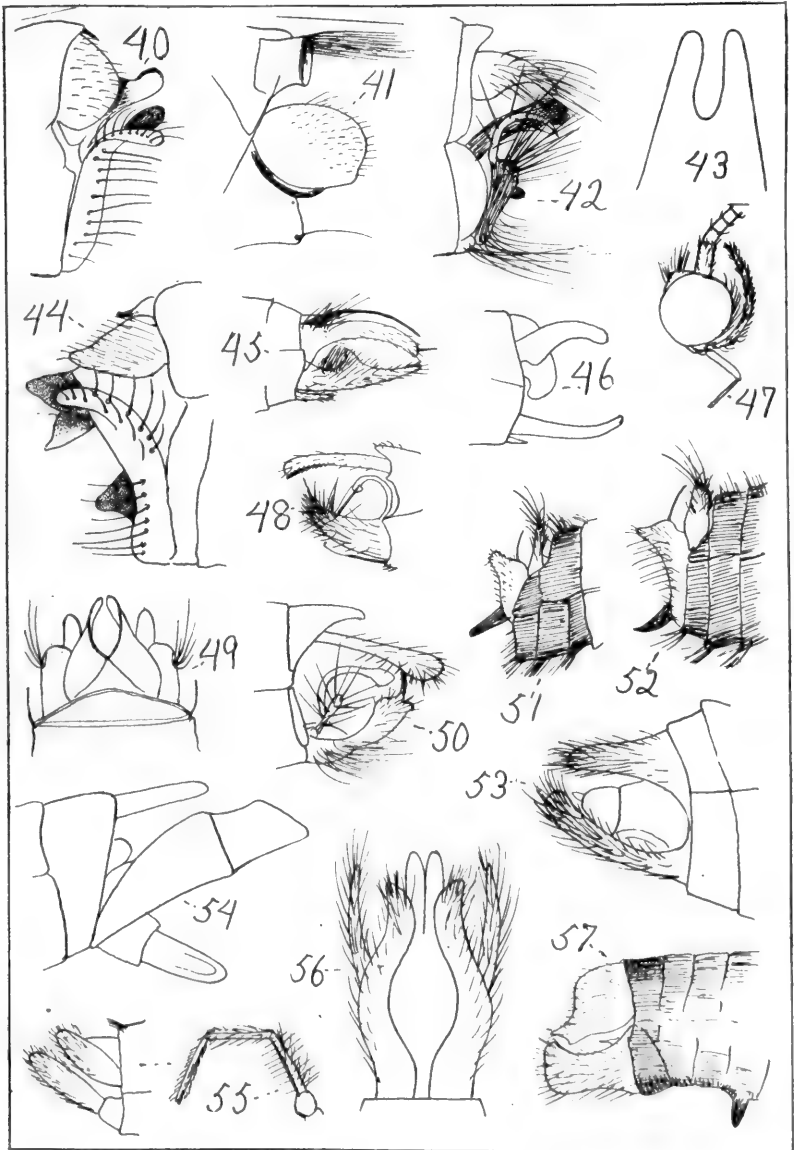
From Switzer's Camp, San Gabriel Mts., Calif., 3,000 ft., 17 June (Grinnell).

Paragapetus, new gen.

Similar to *Agapetus*; venation of front wings about the same, but fork 3 (in type species) is not longer than fork 4, and so does not reach as far forward. In hind wings the venation is similar to that of fore wings, but no fork 4; fork 1 is present and reaches back to discal cell; fork 2 also back to cell.

Paragapetus moestus, n. sp. (Figs. 18, 20, 23.)

Palpi black; antennæ dark, annulate with pale, head brown, white hair on the anterior part of vertex, brown hair on warts; abdomen dull black, genitalia yellowish, legs yellowish, tips of



NEW AMERICAN TRICHOPTERA.

tibiæ darker above and tarsi also darker. Wings black, with some scattered yellow hair, the principal marks being three costal spots of yellow, and three on hind margin, one at arculus, one beyond, and one before it; in disc various faint markings, transverse; anastomosis hyaline white, hyaline forked, mark on fork of median vein; hind wings gray, with gray fringe.

Expanse 8 mm.

From Black Mt., North Fork Swannanoa River, N. Car., May.

HYDROPSYCHIDÆ.

In the classification of this family great importance has been placed on the presence of ocelli, and of three spurs on the anterior tibia. Since both of these characters are common in the Rhyacophilidæ, the ancestors of the Hydropsychidæ, I think they are not of such great importance, and as ancestral characters are liable to break out in various places in the Hydropsychidæ. To use the two little appendages at the tip of the female abdomen would also produce false alliances. I have therefore below used a new character as of prime importance; one that is easy of application:

1. Fork 5 of fore wings subequal in length to fork 4; palpal joint 2 about as long as 3 or 4; inferior male appendages two-jointed, usually slender; penis often long and prominent. 2
 Fork 5 of fore wings much longer than fork 4 (or 4 absent);
 palpal joint 3 or 4 usually much longer than 2. 3
2. Hind wings broad, with a closed discal cell; fork 1 in fore wings; no warts in pits of mesonotum; tip of female abdomen not with two little appendages. *Hydropsychini*.
 Hind wings narrow, no closed discal cell; fork 1 lacking in both wings; fifth palpal joint not nearly as long as others united; in female mid-tibiæ and tarsi dilated. *Psychomyini*.
3. No warts in pits of mesonotum; ocelli present; spurs 2, 4, 4, mid-tibiæ and tarsi of female not dilated. . . . *Philopotamini*.
 A small wart in a pit each side on mesonotum; spurs 3, 4, 4; no ocelli; mid-tibiæ and tarsi of female dilated (at least a little. *Polycentropini*.

The *Hydropsychini* will include *Hydropsyche*, *Hydropsychodes*, *Arctopsyche*, *Dipletrona*, *Rhyacophylax*, *Smicridea*, *Potamyia*,

Hydromanicus, *Antarctopsyche*, *Symphitopsyche* and *Stenopsyche*. This latter genus has been placed in the Philopotamidæ since it has ocelli, but is more allied to *Hydropsyche* by all other characters.

The *Psychomyiini* will include, besides the usual genera, *Ecnomus*; it was also placed here by MacLachlan. *Tinodes* is removed to the next tribe.

The *Polycentropini*, besides the usual genera, includes *Tinodes*; this move is also warranted by the structure of the male genitalia.

The *Philopotamini* has the usual genera, as placed by Dr. Ulmer, but without *Stenopsyche*.

(To be continued.)

REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (*TIPULIDÆ*, *DIPTERA*).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.

(Continued from p. 164.)

Genus: **Tipula** Linnaeus.

Key to the Japanese Tipulæ.

1. Large species (over 30 mm. in length) 2
 Smaller species (less than 25 mm. in length) 4
2. Wings ochre-brown, the cross-veins darker, the stigma bright yellow [abdomen ochraceous-brown, the sternum paler] *præpotens* Wied (1)
 Wings not ochre-brown with a yellow stigma 3
3. Abdominal tergites with the apices brown; hypopygium pale dull fulvous brown, thoracic dorsum blackish with two rusty lines *mikado* Westw. (2)
 Abdomen with three dorsal longitudinal stripes, the median one indistinct on the basal segments *coquilletti* End.
4. Wings hyaline or subhyaline, with the costal region darker . . 5
 Wings either subhyaline without a dark costal border, or else variegated hyaline, gray and brown 6
5. Thoracic notum yellowish; abdomen without a distinct stripe on either side *yamata*, sp. n.

1 *Præpotens* Wiedemann; Aussercur. Zweifl. Ins., vol. 1, pp. 40, 41 (1828).
 2 *Mikado* Westwood; Trans. Ent. Soc. Lond., for 1876, p. 504.

- Thoracic præscutum and scutum dark; abdomen yellow, with a broad brown stripe on either side of the yellow median vitta..... *aino*, sp. n.
6. Abdomen with the segments having a dark caudal margin... 7
 Abdomen lined with dark stripes..... 8
7. Caudal margin of the abdominal segments very narrow; wings light yellow without darker markings, except the prominent stigma..... *insulicola*, sp. n.
 Caudal margin of the abdominal segments broad, comprising at least two-thirds of the length of the sclerite; wings light gray with hyaline blotches..... *nipponensis*, sp. n.
8. Head yellowish..... 9
 Head black or dark brown..... 10
9. Abdomen with a median stripe; flagellum of antennæ black..... *japonica* Loew⁽¹⁾
 Abdomen with three stripes, one median and two lateral: two basal flagellar segments yellow, remainder brown at base, yellow at tip..... *serricauda*, sp. n.
10. Large species (length, ♂, 15 mm.; wing, 19 mm.)..... *yusou*, sp. n.
 Small species (length, ♂, 10 mm.; wing, 13-5 mm.)..... *parva* Loew⁽²⁾

Tipula coquilletti Enderlein.

1898 *Tipula nubifera* Coquillett; Proc. U.S. Nat. Mus., vol. 21, p. 305.

1902 *Tipula nubifera* Kertess; Cat. Dipt., vol. 2, p. 299.

1912 *Tipula coquilletti* Enderlein; Zoöl. Jahrb., vol. 32, pl. 1, p. 7.

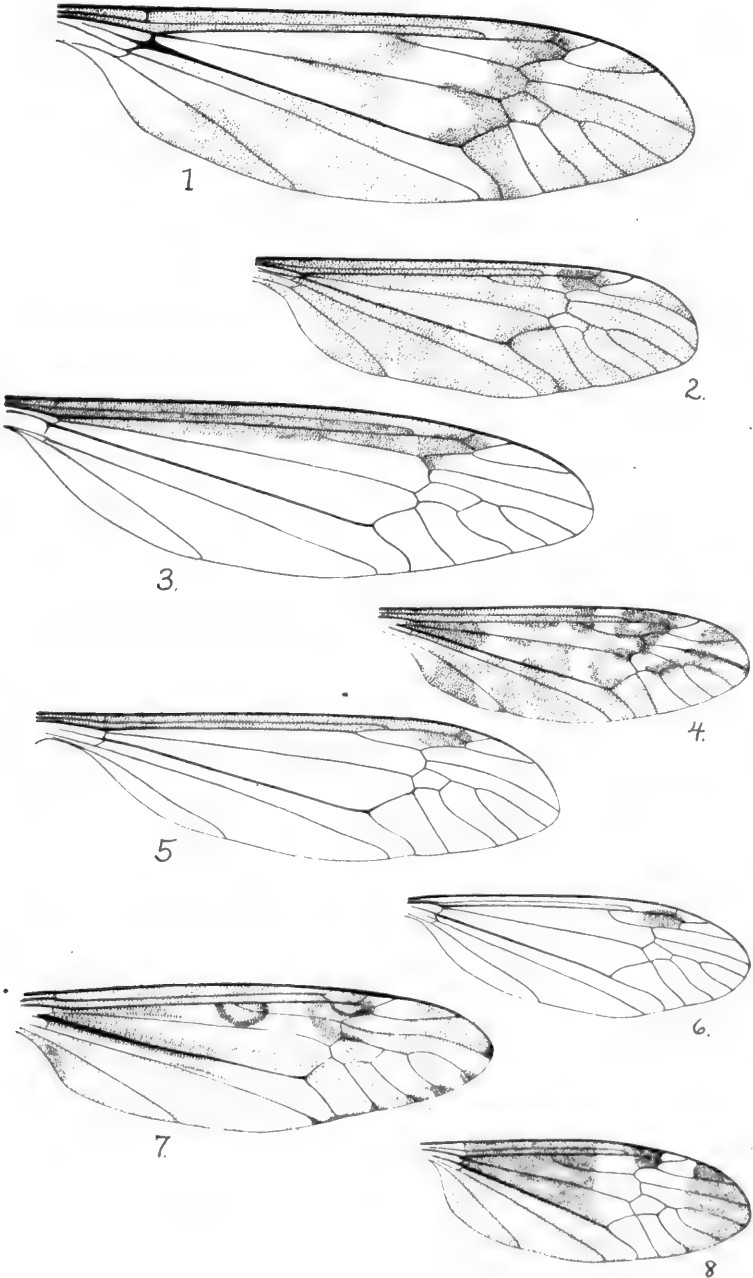
A male and female; the following a *Idenda* to Coquillett's description may be of value:

The legs in my specimens have the femora and tibiæ almost uniformly dark brown; abdomen very long for a *Tipula*. The wing is shown in plate 16, figure 7. Male hypopygium: 8th tergite rather broad, its caudal margin almost straight; 8th sternite (see plate ⁽³⁾ figure 17), much produced caudad into a scoop-like lobe which is very deeply notched medially, the tips of the lobes directed

1 *Japonica* Loew; Wiener Ent. Monatschr., Vol. 2, p. 101, 102 (1858).

2 *Parva* Loew; Wiener Ent. Monatschr., vol. 2, p. 102 (1858).

3 Plate 17 will appear in the next issue.



JAPANESE CRANE-FLIES.

inward; 9th tergite rather small (see plate 17, figure 8), viewed from above, the caudal margin is narrowed and evenly concave, the whole caudal end being covered densely with small black spicules; suture between the sternum and tergum not clear; 9th sternite (plate 16, figure 7), broad, its caudal margin concave. Pleural appendage, a large flattened lobe (see plate 17, figure 10), on the inside (plate 17, figure 9), with the dorsal outer angle densely provided with short black spicules, with numerous other spicules down the inner face.

Female (allotypic): tergal valves of the ovipositor long and slender, heavily chitinized, not so deep as the high sternal valves.

Vial 13; Tokyo, Japan; April 25, 1912; 1♂, 1♀.

***Tipula yamata*, sp. n.**

Head blackish; thoracic notum yellowish; anterior half of the pleura dark brown; abdomen without distinct longitudinal stripes; wings with a pale brown suffusion, the costal region a little darker.

Male, length 12 mm.; wing 16.6 mm.

Female, length 19.2 mm.; wing 16.8 mm.

Male.—Palpi dull yellow; frontal prolongation of the head rather short, dull yellow; antennæ light yellow, the flagellar segments passing into brown; front, vertex and occiput dark brown passing into yellow on the genæ.

Pronotum brown. Mesonotum light coloured, yellowish, with indistinct, narrow, darker stripes on the præscutum. Pleura, propleura and anterior half of the mesopleura and the metapleura, pale, whitish. Halteres long, slender, pale. Legs: fore and middle coxæ dark brown; trochanters and femora yellow, light brown at tip; tibiæ yellowish, brown darker at the tip; tarsi brown. Wings with a pale brown suffusion; costal border darker brown, this colour including cells C and Sc.; stigma greyish brown. Venation, see plate 16, figure 5.

Abdominal tergites 1-4 yellowish, 5-9 darkened, brownish; sternites 1-6 yellow, 7 yellow with a brown median line, 8 brown basally, yellow at the tip. Male hypopygium: 9th tergite from above with a prominent median chitinized protuberance, its caudal margin gently concave and with short bristles and chitinized points. Pleural suture incomplete; pleural appendages as follows: outermost (see plate 17, figure 3), a broad, flattened lobe quite

densely covered with long hairs, these hairs rather stout except along the caudal margin where they are delicate, fringe-like; just inside this appendage is a cylindrical, chitinized arm directed toward the end of the 9th tergite, the apex evenly rounded; the largest of the pleural appendages is a flattened arm whose apex is notched and crenulated and fits into the notch of the 9th tergite; the penis is very long and slender, the central vesicle large and rounded.

Female.—About as in the ♂, the flagellar segments subannulate, the apical three-fifths of each segment being much paler than the basal portion; abdominal tergites 5-7 with a dark brown basal mark, segments 8 to the end brown; valves of the ovipositor short and sharply pointed. In one ♀, the entire tergum beyond segments 1-3 is almost entirely dark brown but this may be caused by the gravid condition of the abdomen which is greatly distended with eggs.

Holotype, ♂, Tokyo, Japan; August, 1912 (Vial 42).

Allotype, ♀, Tokyo, Japan; August, 1912 (Vial K).

Paratypes, 2 ♀, Tokyo, Japan; May 7, 1912 (Vial 34).

The specific name is that of an aboriginal Japanese race inhabiting the southern and central portions of the southern half of Nippon, facing the Pacific Ocean.

Tipula aino, sp. n.

Head blackish; præscutum and scutum dark coloured; abdomen yellow with two dorsal brown lines, one on either side of the broad ground stripe; wings with a slight gray tinge, costal region brown.

Male.—Length 16 mm.; wing 16.5-18.4 mm.

Female.—Length 19.4 mm.; wing 20.5 mm.

Male.—Palpi and the frontal prolongation of the head brown; antennæ with the three basal segments orange, segments 4 and 5 orange at the extreme base, entire remainder of the antennæ black; front, vertex and occiput dark coloured, blackish.

Mesonotum with the præscutum and most of the scutum uniformly dark brown with narrow darker stripes, one median and one on either side; scutum pale medially, lobes very dark; scutellum and postnotum dull yellow, the latter a little brown on the sides and in some specimens entirely dark. Pleura dull yellow

with a brown tinge on the propleura and anterior portions of the mesopleura. Halteres rather long, pale. Legs: coxæ and trochanters light yellow; femora orange-yellow the tip brown; tibiæ yellowish on the basal half, thence passing into brown; tarsi brown. Wings with a dark brown costal border, this including cells C, Sc., and the cephalic halves of cells R and 1st R₁; stigma even darker; most of cells R and M and the bases of cells R₂, R₃ and R₅ hyaline; remainder of the wings with a brownish-gray tinge. Venation as in plate 16, figure 3.

Abdominal tergites yellow with a broad brown stripe on each side, these stripes becoming confluent on segments 7 and 8; caudal margin of segments 3-6 narrowly brown; sternites dull yellow, the caudal margins of the segments a little darker. Male hypopygium: 9th tergite from above (see plate 16, figure 4), with the latero-caudal angles produced into strong spines between which is a small rounded lobe covered with hairs; suture between the tergum and sternum not clear; appendages of the pleural region viewed from the side (see plate 17, figure 5), two in number, the more ectad of which is a large, oval lobe, somewhat chitinized on its edges, its ventro-cephalic margin on the inside with a small oval knob provided with hairs; inner lobe very large, its caudal edge thickened and here provided at its tip with a comb of bristles directed caudad and an apical bunch directed dorsad; inner face of this appendage near its tip with a group of about 14 sharp points.

Female.—Ovipositor with the sternal valves very high, blade-like, the tips subacute; tergal valves very slender apically, the tip scarcely enlarged.

Holotype, ♂, Tokyo, Japan; April 13, 1912 (Vial 12).

Allotype, ♀, Tokyo, Japan; April 13, 1912 (Vial 12).

Paratypes, 5 ♂, 5 ♀; as follows:

Vial J; 1 ♀, Tokyo, Japan; August, 1912 (Cornell).

Vial 12; 2 ♂, 2 ♀, Tokyo, Japan; April 13, 1912 (Cornell).

Vial 40; 3 ♂, 2 ♀, Tokyo, Japan, August, 1912 (U. S. Nat. Mus.).

The specific name is that of an aboriginal Japanese race formerly occupying the northern half of Nippon, now confined to Yesso and the islands to the northward.

***Tipula insulicola*, sp. n.**

Antennæ annulated black and yellow; thorax without indistinct brown stripes; wings light yellow with a prominent oval brown stigma; abdominal segments with a dark caudal margin.

Female.—Length 11.2 mm.; wing 11.3 mm.

Female.—Palpi and frontal prolongation of the head brown, the latter short and stout; antennæ with the three basal segments yellow, remaining segments with the basal two-fifths dark brown, the apices light yellow, these colours abruptly contrasted; front, vertex and occiput brown.

Præscutum dull yellow with three indistinct brown stripes of which the median one is broad, the lateral ones shorter and narrower; scutum with the lobes reddish; scutellum and postnotum dull yellow. Pleura dull yellow. Halteres dull yellow. Legs: coxæ, trochanters and femora light yellow; tibiæ brownish yellow, a little darkened at the tip; tarsi brown. Wings light yellow, cells C and Sc. a little brighter; stigma prominent, oval; an indistinct hyaline stripe across the wing beginning before the stigma and including cell 1st M₂. Venation, see plate 16, figure 6.

Abdominal tergites dull yellow, each segment narrowly but distinctly margined with dark brown all around, sternites very pale, almost white, each segment with the caudal margin narrowly brown; genital segment reddish yellow. Ovipositor with the tergal valves having a stout, enlarged base, the valves produced caudad into exceedingly slender points which are slightly expanded at their tips; tergal valves much shorter than the elongate, bladelike sternal valves which are directed caudad.

Holotype, ♀, Tokyo, Japan; August, 1912 (Vial K).

(To be continued.)

**TWO NEW CALIFORNIA THAMNOTETTIX
(HOMOPTERA).**

BY E. D. BALL, LOGAN, UT.

While collecting in California, several years ago, a single specimen of a beautiful *Thamnotettix* was captured, but escaped from the net; not, however before its characters were pretty defi-

nately fixed in mind. While collecting in another locality last year the same species was found and instantly recognized, and, like the former one, lost. This now became the chief object of search, and later it was captured in several different places. Its remarkable agility in escaping from a net probably being a reason it has not been captured before.

Thamnotettix pasadena, n. sp.

Size and form of *ursina* nearly, colour pattern resembling *collaris*, but still more highly ornamented. Rich brown, with head, saddle and antepical band yellow. Length ♀ 6.5mm; ♂ 6mm.; width 1.5mm.

Vertex definitely obtusely angled, almost two-thirds as long as its basal width, slightly shorter than the pronotum, one-half longer at apex than against the eye, disc flat, the margins rounding to the front except at the conical apex, front broadly wedge-shaped, the lateral margins nearly straight, clypeus broad, slightly constricted. Elytra moderately long, strongly flaring behind. Venation weak, often obscure, with irregular reticulations in the antepical cells, often especially emphasized along the claval and costal margins.

Colour—Vertex and face light yellow to yellowish ivory, eyes reddish or reddish brown, pronotum rich brown, the anterior submargin rich brown, with a row of irregular coalescing black spots, on either side a transverse median ivory mark; scutellum rich brown, sometimes with a medium light shield ornamented with two round dots. Elytra with the anterior two-thirds of claval areas rich yellowish ivory, the remainder brown, corium yellowish subhyaline, a brown cloud along the claval suture abruptly terminating just before the apex of clavus, where it expands and, uniting with the claval markings, forms a transverse brown band which narrows toward the costa and becomes slightly oblique, the reflexed apices of the elytra, including most of the apical areas smoky brown.

Genitalia—Female ultimate segment three or four times as long as the preceding, deeply angularly excavated from the lateral angles two-thirds of its depth, the bottom of the notch broadly

evenly rounding, whole segment curved around the pygofers until it appears to be only broadly and shallowly excavated on the median third. Pygofers long, but considerably exceeded by the elytra. Male, valve stout, obtusely angular with a strong median ridge either side of which the lateral margins are semicircularly depressed, giving the appearance of a waved margin and a notched apex, plates together bluntly spoon-shaped, their apices slightly parted and heavily clothed with coarse hairs; just visible above these are two long curved hooks.

Described from eight examples from California collected by the author in July and August, 1912. This is the most strikingly marked species in the genus, and, while the genitalia are slightly variable, its size and colour pattern will at once distinguish it.

Thamnotettix januata, n. sp.

Resembling *flavocapitata*, but smaller, darker and with a shorter vertex. Pale brown with the vertex light yellow. Length 4.75 mm.

Vertex twice wider than long, obtusely angled, one-fourth longer on middle than against the eye; disc convex in both diameters, the apex bluntly subconical; face convex, front long, narrow, wedge-shaped, clypeus long, the apex expanded. Pronotum broad and fully a third longer than the vertex. Elytra long, narrow and posteriorly appressed.

Colour—Vertex lemon yellow, sometimes with a faint brownish line just back of the anterior margin and parallel with the basal margin. Face and below pale straw. Pronotum olive brown, with the anterior margin narrowly lighter, scutellum washed with orange. Elytra olive brown with costal margin shading out to a subhyaline. Whole insect slightly coppery iridescent.

Genitalia—Female segment nearly twice wider than long, the whole posterior margin obtusely, angularly excavated with a narrow median strap-shaped tooth which extends beyond the lateral angles. Male, valve oval convex, plates together, slightly longer than wide with the apices slightly filamentous.

Described from four examples from San Francisco, Cal., collected by the author. A small and obscurely marked but quite distinct species.

THE CANADIAN ENTOMOLOGICAL SERVICE.

Thirty years ago, in 1884, the Canadian Government appointed a Dominion Entomologist to advise agriculturists and others regarding the control of insect pests. Two years later, on the establishment of the Experimental Farms' system, Dr. James Fletcher, who occupied the position, was attached to the new Branch of the Department of Agriculture in the joint capacity of Entomologist and Botanist, which position he occupied with conspicuous success until his death in 1908. The growth in importance of the two subjects necessitated their separation, and accordingly Divisions of Entomology and Botany were created. Dr. C. Gordon Hewitt was appointed Dominion Entomologist in 1909 and entrusted with the work of organizing the new Division of Entomology of the Experimental Farms' Branch of the Department of Agriculture with offices and laboratory at the Central Experimental Farm, Ottawa.

The urgent need of legislation in order to permit action to be taken to prevent the introduction into Canada and spread within the country of serious insect pests and plant diseases, was responsible for the passage of the Destructive Insect and Pest Act in 1910. The still greater need of investigations on the insect pests affecting agriculture, forestry, and other branches of human activity, has led to the establishment of field or regional laboratories in different parts of Canada with trained Entomologists in charge to study the local problems.

Owing to the consequent expansion of the Entomological work along investigatory and administrative lines and the fact that such work did not constitute a necessary part of the work of the Experimental Farms' system, and executive was virtually distinct, the Entomological Service has now been separated from the Experimental Farms' Branch and has been constituted an independent Branch of the Department of Agriculture under the direction of the Dominion Entomologist. It is proposed to erect a building to provide offices and laboratories for the new Entomological Branch. Will correspondents kindly note that all official communications and publications should be addressed to "The Dominion Entomologist, Department of Agriculture, Ottawa."

This reorganization, which will also include the establishment of a national collection of the insects of Canada in the Canadian National Museum (the Victoria Memorial Museum) at Ottawa, under the care of the Dominion Entomologist, marks an important step in Canadian Entomology. It will result in a still greater development in the study of Canadian insects along scientific and practical lines.

The present organization of the Entomological Branch of the Canadian Department of Agriculture is as follows:

Dominion Entomologist and Chief.....C. Gordon Hewitt, D. Sc.,
F.R.S.C.

Chief Assistant Entomologist.....Arthur Gibson.

Assistant Entomologist in Charge of
Forest Insect Investigations.....J. M. Swaine, M.Sc., B.S.A.

Assistant Entomologist in Charge of
Fruit Insect Investigations.....

FIELD OFFICERS IN CHARGE OF BRANCH LABORATORIES:

G. E. Sanders, B.S.A., Entomological Laboratory, Bridgetown, N.S.

J. D. Tothill, B.S.A., and L. S. McLaine, M.Sc., Entomological
Laboratory, Fredericton, N.B.

C. E. Petch, B.S.A., Entomological Laboratory, Covey Hill, Que.

Wm. A. Ross, B.S.A., Entomological Laboratory, Vineland Station,
Ont.

H. F. Hudson, B.S.A., Entomological Laboratory, Strathroy, Ont.

Norman Criddle, Entomological Laboratory, Treesbank, Man.

E. H. Strickland, Entomological Laboratory, Lethbridge, Alta.

R. C. Treherne, B.S.A., Entomological Laboratory, Agassiz, B.C.

Field Officer for Forest Insect Investigations—R. N. Chrystal, B.Sc.

INSPECTORS AND ASSISTANTS:

A. B. Baird, Fredericton, N.B.; J. Perrin, Halifax, N.S.;

J. I. Beaulne, Ottawa.

Artist Assistant.....A. E. Kellett..

SUPERINTENDENTS OF FUMIGATIONS AND INSPECTORS:

H. E. Goold, St. John, N.B.	L. Paradis, St. Johns, Que.
G. Manley, Niagara Falls, Ont.	C. Wright, Windsor, Ont.
A. K. Leith, Winnipeg, Man.	T. R. Waddington, North Portal, Sask.
Inspector of Indian Orchards.....	T. Wilson.

SECRETARIES:

J. A. Letourneau; Miss J. McInnes; J. M. Moloughney; Miss E. Read.	
Laboratory Assistant.....	H. S. Fleming.. C. G. H.

BOOK REVIEW.

"MACROLEPIDOPTERA OF THE WORLD." By Prof. Dr. A. Seitz.

The issue of Volume II. of "Macrolepidoptera of the World," by Prof. Seitz, concludes the palearctic part of this great work, inasmuch as "Moths" (Tineidæ) and "Spinners" (Bombycidæ) are concerned. This edition is quite voluminous, containing fully 440 pages of text alone, irrespective of the index.

It represents, like volume I of "Butterflies," the most complete work of its kind known to-day. Above all, it contains figures of almost all the species of the Amur region of Turkestan, of the Caucasus, of Persia, of Syria, etc., many of these illustrations having appeared for the first time.

The text of this volume was compiled by nine authors, generally known as reliable authorities on Entomology. In this respect it certainly is astonishing that, notwithstanding the "many cooks," a pleasing uniformity has been obtained in regard to the text as well as to the plates, which uniformity does not appear in so marked a degree throughout Volume I.

The following figures will serve to give a good idea of the thoroughness of the volume in question:

In the Catalogue of Staudinger-Rebel, which appeared 13 years ago, 238 forms of Zygænidæ were enumerated, while "Seitz" lists 418 Zygænidæ of the palearctic region alone; of Saturnidæ "Seitz" has 122, against "Staudinger-Rebel's" 31. Furthermore, "Seitz" describes 329 Sphingidæ against 100 mentioned in the

"Staudinger-Rebel"-Catalogue; of Cymatophoridae 86 are given in the "Seitz," while in "Staudinger's" work only 23 are shown; of Limacodidae 46 are found in the "Seitz," whereas 15 are accounted for in the catalogue mentioned above.

All in all, this volume describes about 3000 species of Spinners (or varieties thereof), besides about 300 Sphingidae. The number of coloured figures on 55 plates amounts to nearly 2400. When it is considered that the Moths and Spinners in the Staudinger do not quite number a thousand (in which, of course, some varieties are to be counted), one must readily admit that our knowledge of the palearctic region, with reference to Entomology, has been vastly increased by means of this gigantic work.

The reliability of the text, it must be said, can only be judged by those versed in this subject, or by specialists of the palearctic Fauna. The names of the authors, who contributed to this work, are so well known in the scientific world that one may readily place confidence in their statements and their scientific work.

By reading a chapter of the "Seitz," it will doubtless be ascertained that the numerous serviceable hints on collecting and rearing moths and caterpillars, are based upon personal experience; and that, furthermore, the author himself has personally bred the principal representatives of almost all the species, no matter whether they live in the Amur region, or in Syria, or in Mauretania, etc. He has, at any rate, observed them alive. The vast amount of information on food-plants, on methods of collecting, etc., are, no doubt, of the utmost importance to any collector; for is there any other book which mentions, e.g., at what hour the caterpillars of *Emydia striata* must be collected, in order to obtain them in greatest abundance? or is there one that cautions against delay in taking in the *Ognogyna* caterpillars, and admonishes us to collect them before the grass has grown so high that they are completely hidden from sight?

As in the first volume the plates are the most important features of the work. If anyone should presume the assertion to be too bold that it was left to the "Seitz" to show the world what really good figures are, he certainly ought to make a critical comparison with other works of this kind. The average collectors are, of course, satisfied with the illustrations in the new "Berge," and

everybody admits that the butterflies illustrated therein, in that complex mixed company, in which caterpillars, plants and butterflies are placed together upon a tinted background, present an attractive picture. But how do these "pictures" compare with those of the "Seitz" from a scientific viewpoint. If, for instance, a *Batis* in the "Seitz" be compared with the corresponding figure of a *Batis* in the "Berge" (Plate 28, figure 49e), a vast difference manifests itself. This also applies to the illustrations of the Vienna Emperor Moth. Looking at Plate 29 of "Berge," without comparing with nature, one is well pleased with the figure of "pyri," fig. 1b; but a comparison with the figure in the "Seitz," table 31b, discloses the mistakes of the former at once. The borders and the ground colour of the wings in the "Berge" are yellowish red, whereas, in reality they are grey, as correctly depicted in the "Seitz." Of course, the representation of *pyri* in the "Seitz" does not make a brilliant showing, as only one-half of the insect is illustrated, and is furthermore not as finely elaborated, in order to be in accordance with real nature, and because it does not show any head. But by comparing it with a specimen in one's collection, it is at once evident that, viewed from above, *pyri* seems to be headless, as do also *spini* and *pavonia*. The figure in the "Berge," which shows a big head, is a mere phantasm, while the half figure in the "Seitz" is genuine nature. It is, therefore, to anybody who earnestly intends to work in Entomology far more valuable, than the "trimmed-up" and "pleasingly grouped" illustrations of amateur-works.

This apparently trivial point has been mentioned quite intentionally, as there is a species closely resembling *pyri*, namely, *atlantica*, in which, viewed from above, the forehead is clearly to be seen.

To convey an idea of the number of plates contained in the different volumes of "Seitz," so far printed, it may be mentioned that up to last year they already exceeded 500.

As it is, the author has unquestionably earned well-deserved praise with the eminently satisfactory issue of the "Second Volume of Macrolepidoptera." In the meantime Volume III has also been finished, and Volume IV is nearly completed. It goes

without saying, that these new publications are just as excellent in every particular as the two former ones.

"MACROLEPIDOPTERA OF THE WORLD" is also published in a separate English Edition by the "Verlag des Seitz'schen Werkes," Stuttgart, Germany. WILHELM LEHR, Baltimore, Md.

THE officers of the London Biological Club, whose names were omitted from our notice in the May number (p. 184), are as follows: President, Dr. H. W. Hill; Vice-President, Dr. S. Wolverson; Curator, Mr. J. F. Calvert; Secretary-Treasurer, Mr. J. W. Noble.

THE OCCURRENCE OF THE HOUSE CENTIPEDE, *SCUTIGERA FORCEPS* RAF., IN CANADA.

When retiring for the night on April 15th I was most interested to capture in my bathroom at the hotel in which I was staying in Toronto, an adult female specimen of this remarkable myriapod, whose occurrence in Canada has not been previously recorded, so far as I am aware.

It is a southern species, its normal habitat being the Southern States. As early as 1849 it was observed in Pennsylvania, and it has gradually spread northward. Mr. R. V. Chamberlin informs me that the most northerly locality which he has recorded from it is Boston, Mass., and that it also occurs at Ithaca, N. Y.

The captured specimen, after enabling me to study its method of capturing flies, died a few days after my return to Ottawa. *Scutigera* feeds on house-flies, roaches and other household insects, springing on them and imprisoning them in its unusually long legs. An account of its habits is given by Marlatt in Howard & Marlatt's "Household Insects" (Bull. No. 4, N. S. Div. Ent., U. S. Dept. of Agric., pp. 47-50, 1896. C. GORDON HEWITT.

PROFESSOR WALTER C. O'KANE, Entomologist to the New Hampshire Experiment Station, and Professor of Economic Entomology in New Hampshire College, has been elected Professor of Zoology and Entomology at the Ohio State University, from which he graduated in 1897. He is widely known as the author of an excellent work on injurious insects, published in 1912.

A NEW WASP FROM THE PHILIPPINE ISLANDS.

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

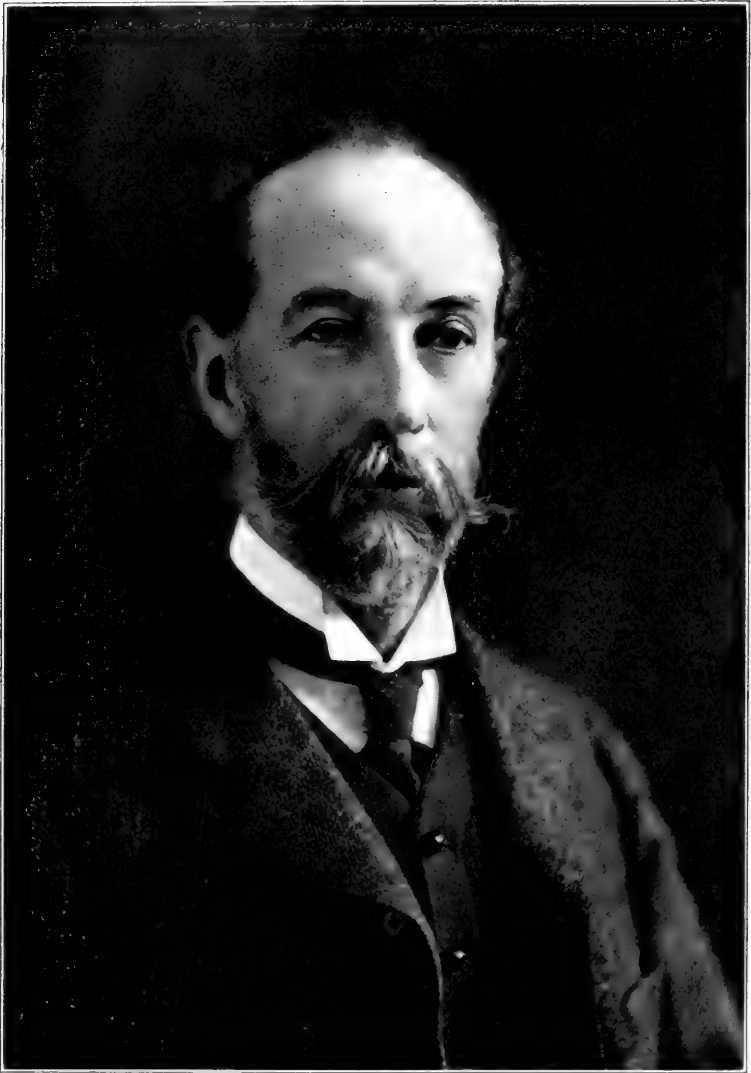
***Cerceris angularis*, n. sp.**

♀.—Length about 16 mm., anterior wing a little over 14; black, with the abdomen largely red; no yellow markings, except that a high keel between the antennæ is pale yellow, and the mandibles have a broad, dull straw-coloured longitudinal band on the basal half; head very large; eyes converging above; vertex and cheeks very broad, with strong punctures on a shining ground; ocelli close together; face covered with appressed silvery hair; antennæ black, apical joint partly red; clypeus not keeled, but transversely obtusely elevated in middle, the part above the elevation dull and feebly punctured, that below it smooth and shining, the lower margin indistinctly bidentate, with a little round tubercle in the submarginal region above each tooth; mandibles with an enormous triangular shining tooth on inner side about the middle; molar space wanting; thorax dull, with large but not very deep punctures, those on the mesothorax in grooves, the margins of the grooves forming longitudinal ridges, especially in the anterior middle region; area of metathorax with weak basal plicæ, and beyond with oblique plicæ, which arch over and join in the middle line, where they become transverse; under side of thorax with fine silvery tomentum; mesopleuræ grooved, extended into a great angular projection or tooth, the sharp edge of which is vertical; legs black; tegulæ black; wings dark fuliginous, venation normal; abdomen with the joints beyond the second not constricted; punctures distinct but sparse; first segment black with an apical red band; second and third segments bright ferruginous; remaining segments black, except that fourth is red at extreme sides; venter with very minute punctures, and scattered larger ones; fifth ventral segment depressed in middle, sixth deeply incised; pygidial plate finely rugose, narrow, truncate.

Hab.—Mt. Makiling, Luzon (Baker). Structurally somewhat allied to *C. elizabethæ* Bingham, but that is a much smaller species, with different colours. In many ways *C. vafra* Bingham is apparently allied, but it is larger, with a different clypeus, etc.

FORMER students of Professor John Henry Comstock have raised a fund, to be known as the Comstock Memorial Library Fund, which is to be presented to Cornell University for a permanent memorial of Professor Comstock's forty years of distinguished service as instructor and professor of entomology. He is to retire from active teaching as a member of the faculty next June, at the age of sixty-five. The ceremony of presentation will take place on June 13.—[*Science*.

Mailed June 10th, 1914.



HENRY HERBERT LYMAN, M.A.

The Canadian Entomologist.

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No. 7

HENRY HERBERT LYMAN, M.A.

The appalling calamity that befell the steamship "Empress of Ireland" in the River St. Lawrence near Father Point shortly after midnight on Friday, May 29th, was acutely brought home to the older members of the Entomological Society of Ontario by the sad tidings that Mr. H. H. Lyman and his wife were among the thousand and more who were lost. For some few days we hoped against hope, but no trace of them has been found and there is not a vestige to show in what manner death came upon them; it seems most probable that they were drowned in their stateroom before they had time to escape. Mr. Lyman was to have sailed a fortnight earlier, but owing to the pressure of business matters he postponed his departure with so sad a result.

Mr. Lyman was born in Montreal on the 21st of December, 1854 and received his early education at the High School and West End Academy. At McGill University he took the Arts Course and proceeded to the degree of B.A. in 1876, winning the Logan medal in Geology and Natural Science, and received his M.A. degree in 1880. On completing his college career he entered his father's firm, Lymans, Clare & Co., wholesale chemists and druggists in Montreal; in 1885 he became a partner in the business, whose name had been changed to Lyman, Sons & Co. On the death of his father he became senior partner and president of Lymans, Limited, which includes the branch house in Toronto. His position in these important concerns manifests his remarkable business capacity and the attention he must have paid to their affairs. The houses are widely known throughout Canada and bear the highest reputation for upright dealing, energy and enterprise.

Though much engrossed with the management of a very large business establishment, which demanded a close attention to innumerable details, Mr. Lyman found time for an active interest in many other things. In 1877 he joined the 5th Battalion of the

Canadian volunteer force (now the Royal Scots of Canada), and rose from Ensign to Major in 1885, retiring with that rank in 1891. He was a life governor of the Montreal General Hospital; Treasurer and Vice-President of the Graduates' Society of McGill University; Fellow of the Royal Geographical Society and of the Royal Colonial Institute; one of the organizers of the Imperial Federation League in Canada and a member of the deputation which waited upon Lord Salisbury's administration in 1886, asking that an Imperial Conference representing the whole British Empire should be summoned. The Conference was held during the following year. He was also a Director of the British and Colonial Press Service. Though little interested in local politics he was an ardent Imperialist and considered that the perpetual unity of the Empire far surpassed in importance all other political questions; he advocated Imperial preferential trade and believed that Canada should bear its share of the burden of Imperial defence.

To turn to a different aspect of his life, the one in which our readers are more interested—we learn that when only eight years of age he began to observe insects and their ways, and when a boy of twelve commenced to form a collection of Lepidoptera, which has now become one of the finest and most extensive in Canada. On Jan. 5th, 1875, Mr. Lyman became a member of the Entomological Society of Ontario by joining the Montreal Branch. At the following meeting he exhibited a case of butterflies from Illinois, following a custom which has always been characteristic of the Montreal meetings. These exhibits usually led to discussions in which Mr. Lyman took an active part and spared no pains in arriving at correct conclusions, studying the original descriptions and at times taking the specimens to the United States or the British Museum for final determination. He would never jump at conclusions but, sparing no time or trouble, would not rest satisfied till certainty was assured.

His first paper was presented at the meeting on Oct. 5th, 1875, being a description of the larva and pupa of *Grapta interrogationis*; this was followed a few months later by a list of Diurnal Lepidoptera taken at Portland, Maine (published in the Can. Ent., XII, pp. 7-9). For nearly ten years he spent his annual summer holiday on the Atlantic Coast, where he added largely to his col-

lections and developed his love for the butterflies which he took great delight in rearing through all their stages. The first article from Mr. Lyman's pen which appeared in the Canadian Entomologist (Volume VI, page 38), is in the form of a letter asking questions about several butterflies found at Portland, Maine. In the same volume (page 158), he described the curiously marked egg of *Gastropacha americana*. From the 19th to the 44th volume, none have been without at least one article from his pen, and he lately expressed his regret that he failed to contribute last year to Vol. XLV. In addition to his articles in this magazine, he wrote several of a more popular character for the Annual Reports of our Society, and contributed a few also to "Entomological News." A list of his more important papers is given below.

The third annual meeting of the Montreal Branch was held at Mr. Lyman's residence on May 7, 1876, at which the minute book records that "he exhibited his fine collection of local and exotic insects." This was the beginning of a long series of gatherings under his hospitable roof; during thirty-seven years a large proportion of the monthly meetings were held there, and were thoroughly enjoyed by the members and occasional visitors from a distance. They were made especially interesting at times by his delightful accounts of visits to scientific gatherings in the United States and Europe as well as in Canada; he would recount the proceedings, often with a good deal of humour, and tell of the eminent men whom he met. In the course of years he gathered together a large collection of books on the Lepidoptera of North America chiefly, and these he was always most kind in lending to his fellow members when they required to consult them.

While interested in everything connected with the Lepidoptera of this continent, he paid little attention to the "Micros," but was always keen to acquire specimens for study and comparison of such genera as *Colias*, *Argynnis*, *Grapta*, *Chionobas*, *Haploa*, *Hyphantria*, *Papaipema*, *Xylina* and *Hepialus*. His papers on these subjects will always be found of value and interest.

On June 5th, 1877, he was elected Vice-President of the Montreal Branch and four years later he became President holding the higher office for two years; in 1888 he again became President and retained the position till 1899.

In 1895 he was elected Vice-President of the parent Society and in 1897 became President, holding this highest place in the Society for the usual term of two years, to the great satisfaction of the members. He rarely missed one of our annual meetings, and as a permanent Director of the Society took an active part in the management of its affairs. His interests, however, were not confined to his native land. Many years ago he joined the American Association for the Advancement of Science and was recently much gratified at being elected a Fellow; he used to say that an amateur who did good work was really more deserving of honour and recognition than a professional Entomologist who received pay for his work. He was also a Fellow of the Entomological Society of America and of the Entomological Society of London, England; an honorary member of the New York Entomological Society and the Cambridge Entomological Club; for some time he was Vice-President of the Natural History Society of Montreal. His last official act was the reading of his report as delegate from our Society to the Royal Society at the meeting in Montreal on Wednesday, May 27, the day before he started on his fatal voyage.

For a long time past Mr. Lyman's friends have been much distressed by his increasing deafness, which of late had almost become total. Conversation with him could only be carried on with the aid of an ear-trumpet or by writing. In spite of this severe disability, he was always bright and cheerful, full of innocent fun and enjoying a harmless joke. He travelled about a great deal, attending scientific meetings and other gatherings, among others the International Congresses of Entomology at Brussels and Oxford, which he seemed to enjoy, though latterly he could not hear a word of the papers and discussions.

The writer and many friends were greatly pleased as well as surprised when he informed us that he was about to be married. Since the death of his mother to whom he paid devoted attention during a long period of weakness and infirmity, he had been living a somewhat lonely life. Two years ago, in March 1912, he was married to a daughter of the Rev. William Kirkby, of New York, formerly rector of Collingwood, Ontario. She attended with her husband the Jubilee meeting of our Society at Guelph last August

and charmed all who had the pleasure of spending any time in her company. It seems inexpressibly sad that our two friends should have had so short a period of happy married life, and have ended their days together in a tragedy so sudden and so awful.

C. J. S. B.

MR. LYMAN'S PUBLISHED PAPERS.

To the Canadian Entomologist he contributed sixty articles, among which the following may be mentioned:—

- Notes on *Colias christina*, Vol. XVI, 5.
- The North American *Callimorphas*, Vols. XIX, 181, with plate, and XXI, 231.
- Can Insects survive freezing? Vols. XXIV, 1, and XXX, 287.
- Pamphila manitoba* and its varieties, XXIV, 57.
- Preparatory stages of *Nemeophila scudderi*, XXV, 248.
- Occurrence of *Hepialus thule* at Montreal, XXV, 297 and XXXIX, 397.
- The larger species of *Argynnis* and the mystery of their life history, XXVIII, 143.
- Preparatory stages of *Erebia epipsodea*. XXVIII, 274.
- Life history of *Colias interior*, XXIX, 249.
- Life history of *Xylina Bethunei*, XXXIII, 1.
- What is a Genus? XXXIV, 187.
- New *Gortynas*, XXXVII, 305 (with plate).
- A North American Entomologists' Union, XXXVIII, 1.
- Type and Typical, XL, 141.
- Recent work among the Borers, XL, 249.
- Notes on N. A. *Graptas* in the British Museum, XLIII, 418.
- The second International Congress of Entomology, XLIV, 370.
- In the Annual Reports:—
- No. 23, p. 32. A Trip to Mt. Washington.
- No. 32, p. 57. Fall Web Worms, with plate of 33 figures.
- No. 32, p. 61. Notes on *Danais archippus*.
- No. 37, p. 39. A hunt for a borer.
- No. 39, p. 145. Life history of *Euchetias oregonensis*.
- No. 40, p. 46. Origin and diffusion of Entomological Errors.

In 29th report, p. 17. President's Annual Address delivered on the occasion of the 25th Anniversary of the Montreal Branch.

In Entomological News, Vol. XVIII, p. 420, is an able article on *Thecla calanus* and *T. edwardsii* (with the footnote that it was read before the Ent. Soc. of Ontario at Guelph, July 4, 1907).

In Vol. VII, 172. On occurrence of *Chionobas tarpeia* in North America.

Several short items also appear, including one regarding *Erebia discoidalis* in the first volume, p. 146.

NEW OR LITTLE KNOWN SPECIES OF APHIDIDÆ.

BY JOHN J. DAVIS, BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

(Continued from p. 173.)

***Symdobius albasiphus*, n. sp.**

This very interesting plant-louse was first taken by the writer on white oak (*Quercus alba*), at Elgin, Illinois, August 30, 1910. The past year (Sept. 10, 1913), the wingless females were found quite common on white oak at Lafayette, Indiana, and October 8, 1913, at the same place, the wingless oviparous females and winged males were observed. In all cases the plant-louse was found on the leaves near the leaf petiole, usually on the under surface of the leaf, and invariably attended by the ant, *Cremastogaster lineolata* Say.* We have found only the apterous forms of the viviparous generation, but Mr. J. T. Monell collected three winged individuals of this species on oak petioles at Mine la Motte, Missouri, June 28, 1890, and our description of this form is taken from these specimens and the notes accompanying them, through the kindness of Mr. Monell. I have recently received an oviparous female of this species from Mr. A. C. Baker, accompanied by the following note: "On white oak, Vienna, Va., Oct. 4, 1912. Ants had built a mud nest over the aphids to protect them. This nest was on the upper side of the leaf, covering nearly half of it." The first, and so far as we are aware, the only published reference to this species is by Dr. Thomas in the Eighth Report of the State Entomologist of Illinois (1879, p. 118), where the apterous females are described as *Lachnus quercifoliæ* Fitch, from specimens collected on white oak

*Kindly determined by Dr. W. M. Wheeler.
July, 1914

at Carbondale, Illinois, in August. As will be readily noticed, this is not the species designated *quercifoliæ* by Fitch.

Although apparently not a typical member of the genus *Symdobius*, the species under consideration seems to best belong there.

Wingless viviparous female:

General colour dark brown. Head and prothorax brownish yellow to light reddish brown; mesothorax usually concolorous or but slightly darker; metathorax with a dark brown longitudinal area on each side, the remaining areas greenish brown; abdomen dark brown with irregular paler greenish brown areas, apparently due to the pale greenish young within the body; sometimes the metathorax and entire abdomen shining dark brown, almost black. Body sparsely clothed with *Chaitophorus*-like hairs, more prominent at posterior end.

Eyes maroon colour. Antennæ scarcely more than one half the body length; almost naked; segment III longest, and the filament of VI shorter than the basal portion of that segment; only the usual distal sensoria on V and base VI; segment I and II dusky, III and IV pale, with a barely noticeable duskiness at tip, V pale and dusky at tip. VI, base, with the basal half pale, the distal half and all of filament VI blackish (Pl. XVIII, fig. 49). Beak pale yellow, the extreme tip dusky; reaching to the coxæ of the second pair of legs. Two fore pairs of legs whitish, the joints often dusky and the distal half of tarsus blackish; hind pair blackish, excepting the distal half of tibia, which is paler. In life the cornicles are rather conspicuous because of their pure white colour, as though covered with a heavy white pulverulence; quite small, the opening narrow; slightly cone-shaped, and inconspicuous in mounted specimens (Pl. XVIII, fig. 50). Cauda a rather inconspicuous rounded protuberance, pale yellowish and hairy; anal plate bilobed, moderately deeply emarginate and the lobes robust and hairy (Pl. XVIII, fig. 51).

Measurements from six individuals in balsam: Length of body 1.4 to 1.9 mm., average 1.6 mm.; width 0.8 to 1.0, average 0.9 mm.; antenna I, 0.069; II, 0.052; III, 0.191 to 0.278, average 0.234; IV, 0.139 to 0.182, average 0.157; V, 0.157 to 0.191,

average 0.174; VI, base, 0.113 to 0.139, average 0.125; VI, filament, 0.070 to 0.087, average 0.080; total average length 0.891 mm.

Winged viviparous female:

Head (Pl. XVIII, fig. 52) and thorax dark brown to blackish. Abdomen brown with a central longitudinal whitish yellow stripe. Body very sparsely hairy, the tip of abdomen, including cauda and anal plate, more noticeably hairy. Antennæ shorter than body; relative antennal lengths as in the apterous; segment III bearing 7 to 8 rather large circular sensoria in a row, the usual distal ones on V and base VI (Pl. XVIII, fig. 53). Wings hyaline, veins narrow, an almost imperceptible duskiness at tips of veins; terminal branch of media variable, sometimes branching near apex of wing and sometimes nearer to the point where this vein first branches. Cornicles whitish, slightly narrower at tip than at base, about as long as broad and quite inconspicuous in mounted specimens. Cauda broadly rounded and anal plate bilobed as in the apterous form (Pl. XVIII, fig. 54).

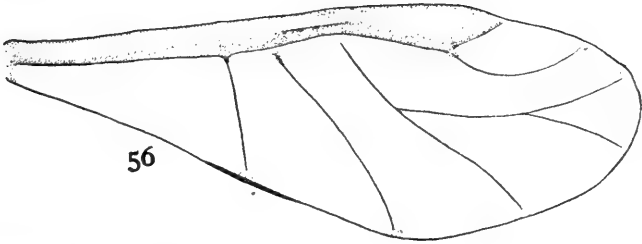
Measurements from three specimens in balsam, the bodies somewhat shrivelled. Average length of body 1.16 mm.; average width 0.57 mm.; length of wings approximately three times their width; antenna I, 0.06; II, 0.05; III, 0.261 to 0.295, average 0.278; IV, 0.156 to 0.174, average 0.165; V, 0.182 to 0.200, average 0.191; VI, base, average 0.122; VI, filament 0.078 to 0.096, average 0.087; average total length 0.953 mm.

Immature:

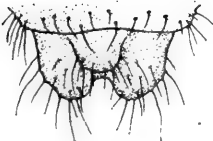
The young is whitish green with pale olive green markings, as follows: A U-shaped marking the bottom of which extends to and usually includes the first abdominal segment and the top of which reaches the prothoracic segment. A longitudinal area on each side of the abdomen and about in line with the cornicles, but not quite reaching to them. Another marking just posterior to the cornicles. Cornicles white as in the adult.

Winged male:

Head and thorax dark brown to blackish. Abdomen pale pea-green with a dorsal median longitudinal marking and an area



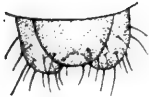
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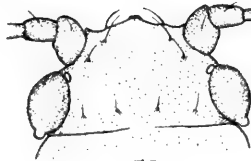
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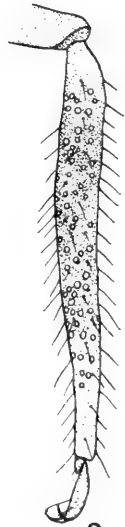
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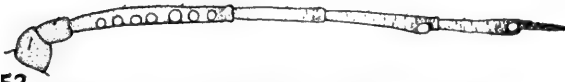
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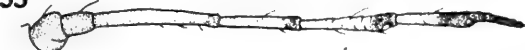
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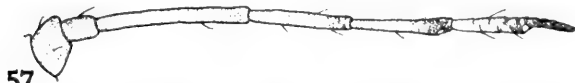
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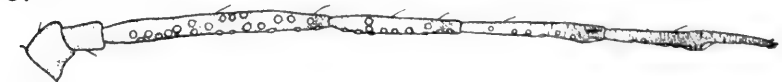
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SYMDOBIUS ALBASIPHUS, n. sp.

around each cornicle of a paler green. Body with only a few sparsely-placed hairs.

Eyes dark red. Antennæ a little more than half the body length; relative lengths of segments as in other forms: I and II pale dusky, III, IV, V and base of VI pale with blackish tips, and all of VI filament black; segment III bearing 23 to 30 irregularly-placed circular sensoria, IV with 8 to 13, V with 5 to 9, not including the usual distal one, and VI base with 2 to 4, usually in a row, exclusive of the usual distal ones; sparsely hairy (Pl. XVIII, fig. 55). Fore pair of legs pale, with the tip of tarsus blackish; middle pair similarly coloured, but with the femur dusky towards the tip; hind pair with femur blackish except at base, tibia blackish except towards tip, and apex of tarsus black. Wings as in the winged viviparous female (Pl. XVIII, fig. 56). Cornicles as described for the other forms. Cauda pale green, covered with a rather heavy pulverulence, hairy, and similar in shape to those of the other forms. Anal plate rounded (not bilobed as in the viviparous forms) and hairy.

Measurements from six individuals mounted in balsam, as follows: Length of body 1.32 to 1.82, average 1.51 mm.; width 0.46 to 0.58, average 0.54; length of wing, average 2.28 mm.; width, average 0.82 mm.; antenna I, 0.061; II, 0.054; III, 0.296 to 0.322, average 0.315; IV, 0.174 to 0.217, average 0.197; V, 0.200 to 0.235, average 0.217; VI, base, 0.122 to 0.148, average 0.138; VI, filament 0.087 to 0.104, average 0.092; total average length 1.074.

Wingless oviparous female:

Body mottled with green and black, but to the naked eye it appears to be largely blackish. Head and first two thoracic segments of a light reddish to pinkish tint; remainder of body blackish, with a more or less distinct median dorsal line of pale yellowish green or whitish green, sometimes even with a faint pinkish tint. Laterad of the median paler area are dots of the same colour intermixed with the black; also a pale area around the cornicles. Body moderately sparsely clothed with medium-length hairs as in the wingless viviparous female.

Eyes maroon red. Antennæ approximately one-half the length of the body; relative lengths of segments as in the other

forms; very sparsely hairy; segment I concolorous with head, II pale with a slight duskiness, III, IV, V and base VI pale with blackish tips, VI filament black; sensoria as in the wingless viviparous female (Pl. XVIII, fig. 57). Beak reaching to coxæ of second pair of legs. Fore pair of legs entirely pale, excepting distal end of tarsus; middle pair with femur dusky to blackish except at base; hind pair as the middle pair, but the tibia dusky except at tip; hind tibiæ noticeably swollen and bearing many irregularly placed circular sensoria (Pl. XVIII, fig. 58). Cornicles white as in other forms. Cauda pale with greenish tint, anal plate rounded as in the male.

Measurements from six individuals, as follows: Length of body 1.63 to 2.01, average 1.81 mm.; width 0.96 to 1.12, average 1.04 mm.; antenna I, 0.069; II, 0.060; III, 0.269 to 0.313, average 0.290; IV, 0.148 to 0.200, average 0.179; V, 0.174 to 0.209, average 0.186; VI, base, 0.113 to 0.139, average 0.130; VI, filament 0.070 to 0.090, average 0.078; total average length 0.992 mm.

Egg:

The egg is very pale greenish when first laid, later changing to black.

***Aphis pseudobrassicæ*, n. sp.**

This species was first received by us from Mr. W. J. Schoene, who found occasional specimens on cabbage at Geneva, New York, July 15, 1912. Later in the year (Nov. 20, 1912), a correspondent sent us specimens collected at Evansville, Indiana, with the note that they were abundant on kale and mustard, and that "these same insects have been bothering our turnips and turnip greens, destroying large portions of the patches. It does not bother on spring greens, only on fall crops." In the lot received from Evansville were *Myzus persicæ* and *Aphis pseudobrassicæ* in about equal numbers.

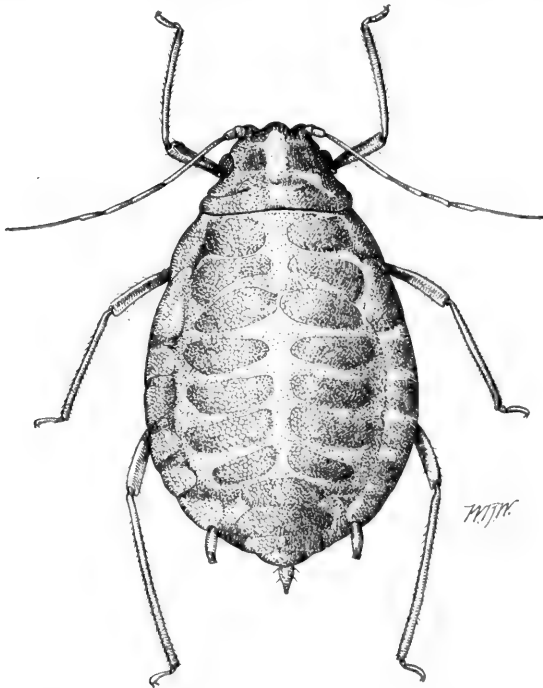
The past fall (September and October, 1913) we have found it at Lafayette, Indiana, abundant on radish and turnip and in the insectary it bred rather freely on rape, although the two former seem to be the preferred host plants. Mr. F. B. Paddock has also found it abundant on turnip at College Station, Texas, and has kindly forwarded specimens to us. No doubt further collections

will show this species to be generally distributed over the country and since it closely resembles *Aphis brassicæ* it has likely been mistaken for this species in some instances.

The fact that the winged viviparous female bears sensoria on segment IV. of the antenna, alone separates it from *brassicæ*. The sexes have not been found and our present knowledge leads us to believe that the more usual means of passing the winter is as viviparous females.

Wingless viviparous female. (Fig. 21).

Entire body pale whitish green, head slightly dusky. Abdomen with a longitudinal row of impressed dots along each side in



line with the cornicles; also on each side of the median dorsal line is a row of transverse shining areas with a reticulated surface, those on the last four or five segments usually united; and a similar row of smaller areas on each side. These shining reticulated areas contrast with the rest of the body which is dull and very slightly pulverulent. Thoracic segments with similar transverse areas. In specimens

Fig. 21.—*Aphis pseudobrassicæ*, wingless viviparous female.

just molted the entire body appears shining and reticulated. Eyes black. Antennæ blackish excepting segments I, II and basal half of III which are pale; reaching a little beyond the

middle of the body; segment III longest, it being a half to three fourths longer than VI filament; segments V and VI base with the usual distal sensoria. Beak reaching to coxæ of second pair of legs. Legs pale with dusky joints, the tips of the tibiæ and all of the tarsi black. Cornicles pale with the tip dusky, slightly swollen towards the tip and constricted just before the apex, and noticeably longer than the cornicles of *A. brassicæ*. Cauda conical, and dusky to blackish.

Measurements, as follows (averages from six individuals): Length of body 1.66 mm.; width 1.00 mm.; cornicle 0.226 mm.; cauda 0.140 mm.; antenna I, 0.080; II, 0.061; III, 0.399; IV, 0.202; V, 0.160; VI, base 0.122; VI, filament 0.287; total average length 1.311 mm.

Pupa.

Head dusky, remainder of body cream colour or with a faint greenish tint, and covered with a slight whitish pulverulence, excepting the shining areas which are covered with a noticeable reticulation, and which are placed as follows—a row of oval or transverse areas on each side of the median dorsal line and a row of smaller and more circular ones laterad of these on each side, about in line with the cornicles.

Eyes black. Antennæ pale dusky, the distal ends of segments being more so, relative lengths of segments as in the winged female. Wing pads blackish. Legs pale dusky with the joints, distal end of tibiæ and tarsus blackish. Cornicles dusky, paler at middle, blackish at tips, and similar in shape to those of the wingless female.

Winged viviparous female. (Fig. 22).

Head and thorax black. Abdomen pale apple green with a tint of Nile green and a row of three black spots on each side anterior to the cornicles; a row of small impressed dots on each side dorsad of the larger spots; and in addition a few scattered inconspicuous dusky markings on the dorsum, and the last three segments with black transverse, dorsal median markings.

Eyes black. Antennæ black; almost reaching to base of cornicles; segments III and VI filament subequal; segment III with 19 to 26 moderately tuberculate circular sensoria irregularly placed,

IV with 6 to 10, often more or less in a row, V and VI base with the usual distal sensoria and not infrequently segment V bears one or two near the base (Fig. 22a). Wings with black and rather conspicuous veins, and the terminal branch of the media nearer the

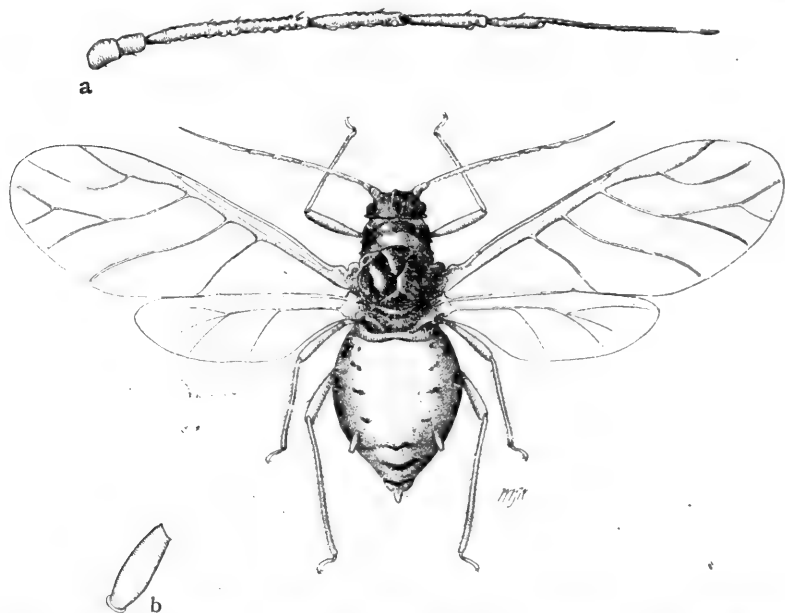


Fig. 22.—*Aphis pseudobrassicæ*. winged viviparous female; a, antenna of same, enlarged; b, cornicle of same, enlarged.

apex of wing than where it first branches. Legs with femur pale brownish to blackish, tibia pale brownish with tip black and tarsus black. Cornicles dusky, paler at tips, and shaped as in the wingless form (Fig. 22b). Cauda concolorous with the abdomen or paler. Measurements as follows (averages from six individuals): Length of body 1.4 mm.; width of body 0.66 mm.; length of wing 2.4 mm.; width of wing 0.9 mm.; antenna I, 0.069; II, 0.061; III, 0.363; IV, 0.191; V, 0.165; VI, base 0.126; VI, filament 0.358; total average length 1.333 mm.; length of cornicles 0.172 mm.; of cauda 0.134 mm.

Descriptions made from specimens collected on radish, turnip, and rape, at Lafayette, Indiana.

DIRECTIONS FOR SENDING LIVING APHIDS.

It is desirable, in sending aphids for determination, that living individuals be submitted when possible. We have found the following method to be the most satisfactory of several tried:

Place a portion of the plant bearing the aphids in a glass vial and with it a strip of filter paper, the size depending on the size of vial and quantity of foliage placed within it. The vial is then tightly stoppered with a cork and placed in a mailing tube or substantial box for mailing. Always have the stem of the plant and the end of the filter paper sufficiently long so that they will be held by the cork; otherwise the loose foliage and twigs will shake about and may crush the aphids. By this method we have shipped living specimens 1,700 miles and had them reach their destination in excellent shape. Tin salve boxes also make excellent shipping boxes for living aphids. Shipments of this nature should always be accompanied by full data, such as name of food plant, locality, date, part of plant affected, and collector.

All of the illustrations in this paper are by Dr. Henry Fox, excepting figures 10, 21, and 22, which are by Mr. W. R. Walton and figures 43 and 45 to 48 inclusive of plate VII and all of plate XVIII, which are the author's.

EXPLANATION OF PLATES.

Plate II. *Macrosiphum creelii* n. sp.—Figure 1 antenna, and 2 cornicle of wingless viviparous female; 3 head and 4 antenna of winged viviparous female.

Macrosiphum coryli n. sp.—5 head, 6 antenna and 7 cauda of wingless viviparous female; 8 antenna, 9 wing, and 10 cornicle of winged viviparous female.

Plate IV. *Macrosiphum venafusca* n. sp.—11 head, 12 antenna and 13 cauda of wingless viviparous female, 14 head, 15 antenna, 16 wing, and 17 cornicle of winged viviparous female; 18 antenna of winged male; 19 antenna and 20 hind tibia of wingless oviparous female.

Plate V. *Macrosiphum tiliæ* Monell.—21 head, 22 antenna and 23 cornicle of wingless viviparous female; 24 antenna of winged male; 25 hind tibia of wingless oviparous female.

Myzus lycopersici Clarke.—26 antenna of wingless viviparous female; 27 antenna, 28 head, 29 cornicle and 30 cauda of winged viviparous female; 31 antenna of winged male; 32 antenna of oviparous female.

Plate VII. *Myzus lycopersici* Clarke.—33 hind tibia of wingless oviparous female.

Rhopalosiphum howardii Wilson.—34 antenna of wingless viviparous female; 35 head, 36 wing, 37 cornicle, 38 cauda and 39 antenna of winged viviparous female; 40 antenna of winged male.

Eulachnus rileyi Williams.—41 antenna of wingless viviparous female; 42 head, 43 antenna, 44 beak, 45 wing and 46 hind tarsus of winged viviparous female; 47 antenna of winged male, 48 hind tibia of wingless oviparous female.

Plate XVIII. *Symdobius albasiphus* n. sp.—49 antenna, 50 cornicle and 51 cauda and anal plate of wingless viviparous female; 52 head, 53 antenna and 54 cauda and anal plate of winged viviparous female; 55 antenna and 56 wing of winged male; 57 antenna and 58 hind tibia of wingless oviparous female.

REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (*TIPULIDÆ*, *DIPTERA*).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.

(Continued from p. 211.)

Tipula nipponensis, sp. n.

Head yellowish; thorax yellow with brown stripes; abdomen with the caudal margin of the segments broadly brown; wings variegated gray, brown and hyaline.

Male: Length 12.8 mm.; wing 13.6 mm.; antennæ about 4 mm.

Female: Length 13–14.1 mm.; wing 14.2–15.2 mm.

Male: Palpi brown, the terminal segment very long and pale; frontal prolongation of the head very short and stout, yellowish; antennæ, segments 1 and 2 yellow, flagellar segments with the somewhat enlarged base dark brown, the remainder of each segment dull yellow; front, vertex and occiput dull yellow, the sides of the vertex and the genæ dark brown.

Pronotum pale; mesonotum dull yellow with dark brown stripes, the median one bisected by a pale line, lateral stripes short,

very close to the median stripe; scutum with the lobes brown; scutellum and postnotum yellowish medially, the sides dark brown, a narrow indistinct median line. Pleura yellowish with brown blotches as follows: On sides of the propleura; a large blotch on the mesoepisternum and mesosternum; a very dark spot on the dorsocephalic angle of the mesepimerum, a dark blotch at the base of the halteres. Halteres paler. Legs, coxæ dull yellow with the base on the outer side tinged with brown; trochanters yellow; femora yellow, the tip brown; tibiæ light brown, tarsi dark brown. Wings with a light gray suffusion, cells C and Sc a little lighter, yellowish; stigma brown; hyaline spots as follows: In front of and beyond the stigma, cell 1st M₂, a large blotch in the end of cell M and a spot in cell 1st A near the end of vein 2nd A; veins Cu and 2nd A narrowly seamed with brownish. Venation (see plate XVI, figure 2).

Abdominal tergites with the basal third yellowish, apical two-thirds brown; pleural line conspicuously dark brown; sternites light yellow, each segment with a narrow, transverse subbasal brown band. Male hypopygium: 9th tergite from above narrow, not nearly as wide as the 8th tergite, its lateral angles rounded, its caudal margin deeply and broadly notched. Pleural appendages from the side (see plate XIX, fig. 2). A more dorsal and ectal fleshy lobe which is directed backward, this lobe cylindrical, tapering, provided with sparse long hairs; entad and ventrad of this lobe is a large bifid appendage whose caudal arm is feebly chitinized, pale, with abundant hairs, the inner or cephalic arm is chitinized, and with strong teeth which approach the caudal margin of the 9th tergite. Penis with the central vesicle large, its convex side directed dorsad, the penis proper, long and slender.

Female.—Almost as in the ♂, the antennæ shorter; ovipositor with the tergal valves much more slender than the high sternal valves.

Holotype, ♂, Tokyo, Japan; April 26, 1912 (Vial 25).

Allotype, ♀, Tokyo, Japan; April 26, 1912 (Vial 25).

Paratype, ♀; Tokyo, Japan; April 26, 1912 (Vial 25).

***Tipula serricauda*, sp. n.**

Head with a brown median stripe; thorax with three brown stripes; abdomen trivittate with brown; female ovipositor with the

sternal valves exceedingly short, tergal valves long, serrated on the outer margin; wings clouded brown, gray and hyaline.

Female.—Length about 23 mm.; wing 18-18.8 mm.

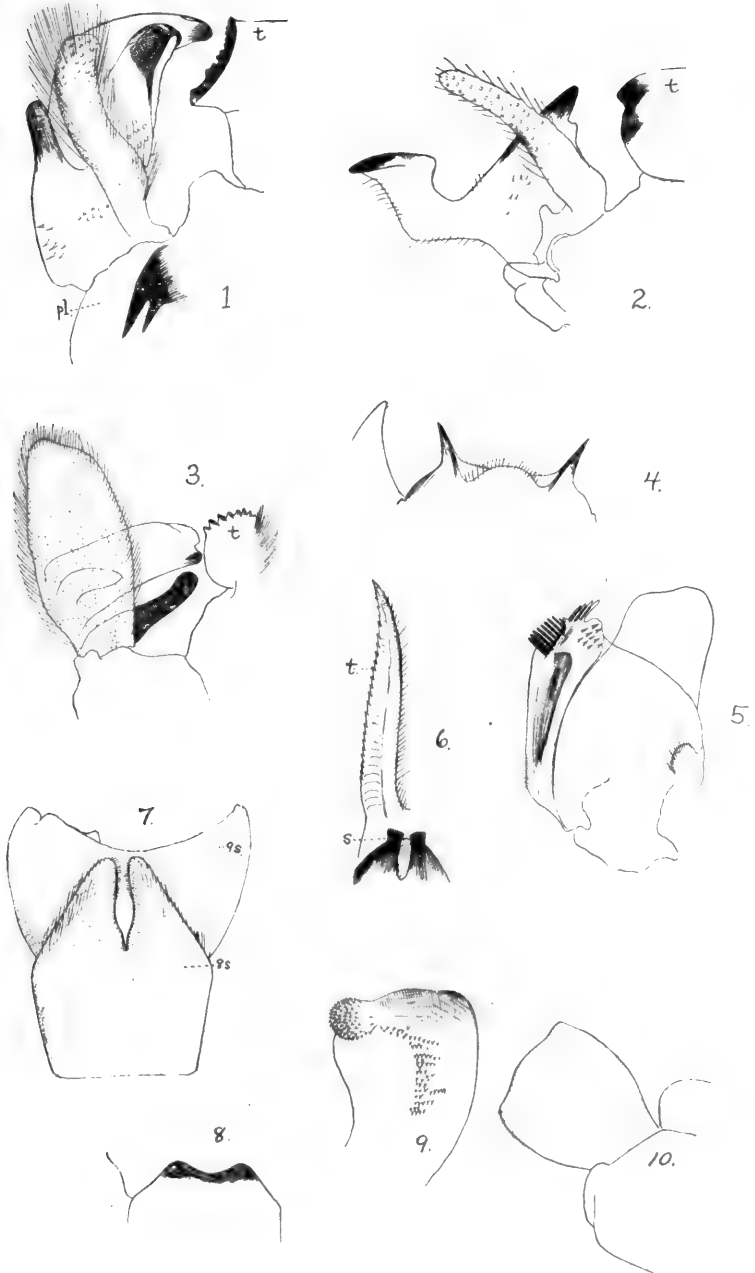
Female.—Palpi with the base dark, the apical segments pale; frontal prolongation of the head rather short, dark above, pale beneath; antennæ, four basal segments light yellow, the remaining segments a little brown at the base, yellow apically; front, vertex and occiput dull yellow, the head with an elongate brown median stripe.

Mesonotal præscutum light brown, with three broad dark brown stripes of which the median one is very broad and is bisected by a pale line, lateral stripes close to the median one; scutum dull brownish yellow, the lobes mostly dark brown; scutellum brownish yellow; postnotum light brown, with three dark brown longitudinal stripes. Pleura brown, much darker on the mesosterna. Halteres rather short, dull yellow, the knob a little brown. Legs, coxæ with the externo-cephalic face brown; trochanters dull yellow, femora and tibiæ yellow, the tips brown; tarsal segment 1 brownish yellow, brown at the tip; segments 2-5 brown. Wings gray, cells C and Sc yellowish brown; dark brown blotches as follows; At base of vein M, in middle of cell M₁ adjoining vein Cu, at origin of Rs, stigmal region including the cephalic portion of the cord. Hyaline blotches scattered over the wing, the largest beyond the stigma, extending obliquely across the wing to cell 1st M₂; a large blotch in cells R and M near the basal third, another in cell M near the tip; others before the stigma and in the anal cells. Venation (see plate XVI, fig. 4).

Abdominal tergites brownish yellow, with three indistinct dark brown longitudinal stripes which extend the length of the abdomen. Ovipositor of a remarkable structure; viewed from beneath (see plate XIX, fig. 6), the sternal valves are remarkably short, not even attaining the base of the upper valves; upper valves parallel on a horizontal plane, slightly curved, the inner margin smooth, the outer margin with numerous saw-like teeth. Sternites dull yellow, a broad brown longitudinal median stripe rather indistinct on segments 1-3 but becoming darker and better defined on the apical segments.

Holotype, ♀, Tokyo, Japan; August, 1912; vial 41.

Paratype, ♀, Tokyo, Japan; August, 1912; vial 41.



JAPANESE CRANE-FLIES.

Tipula yusou, sp. n.

Head and thorax blackish; postnotum blackish; abdomen yellow with three dorsal brown longitudinal lines and one median stripe; wings pale greyish brown variegated with hyaline.

Male: length 15 mm.; wing 19.2 mm.; antennæ 4-5 mm.

Female: length 23 mm.; wing 21 mm.

Male: Palpi and frontal prolongation of the head dark brown, the latter very long; antennæ, segment 1 very long; scapal segments yellow, segment 3 yellow basally darkening into brown at the tip, remaining segments dark brown, the enlarged base even darker, front, vertex and occiput dark brown.

Pronotum dull yellowish brown. Mesonotal præscutum light brown with three darker brown stripes of which the median one is elongate cuneiform, its narrowed point ending just before the suture; scutal lobes dark brown; scutellum dull yellow with an indistinct, narrow darker line; postnotum dark brown. Pleura dark brown. Halteres pale, the stem browner before the knob. Legs, coxæ brown on the outer face, the tips yellow; trochanters yellow; femora yellow, becoming brown at the tip; tibiæ and tarsi brown. Wings, basal half pale yellowish, apical half more brown, cells C and Sc yellowish; stigmal blotch darker brown, irregular; hyaline blotches as follows: a large blotch across the wing before the cord; a narrower one beyond the cord; a large blotch in the caudal portions of cells 1st A and 2nd A; cell M pale in the middle. Venation, see plate XVI, figure 1.

Abdominal tergites 1-7 dull yellow with a narrow dark brown median stripe; segments 3-7 with a shorter and narrower stripe near the lateral margin of each sclerite; segments 8-9 dark brown; sternites dull yellow, also with a distinct, narrow median vitta. Male hypopygium (Lateral aspect, see plate XIX, figure 1): 9th tergite from above, with the caudal margin deeply and broadly rounded, the edge with abundant chitinized teeth, the lateral angles notched; 8th sternite, viewed from the side triangular, the caudal end with a dense bunch of orange coloured hairs; 9th sternite rather large, oval, bearing on its pleural region a group of appendages as follows: the more dorsal a large, fleshy, sigmoid lobe, very densely clothed with long delicate hairs, ventrad and entad of this a large bifid appendage whose caudal branch ends in

a cylindrical chitinized arm, and whose cephalic branch is produced dorsad into a spoon-shaped appendage whose concavity is directed toward the chitinized portion of the 9th tergite; entad of these appendages is a large lobe whose point is chitinized and directed cephalad, the sides with deep parallel grooves. The penis is rather short and very stout; just underneath its tip inside the pleura are a pair of apophyses (shown in the figure), these strongly chitinized and ending in two sharp spines of which the caudal one is the larger.

Female.—Like the ♂, but the dorsal abdominal stripe is much broader, lateral stripes also much broader; on the caudal half of the 7th tergite and on the 8th tergite, all three of the dorsal vittæ unite and cover the segment; the sternal vitta is very broad, but is interrupted at the end of the 6th segment; segments 7 and 8 with a small brown median spot near the caudal margin, and the anterior and posterior edges of the sclerite a little darker; genital segment dull yellow.

Holotype, ♂, Tokyo, Japan; May 7, 1912; vial 36.

Allotype, ♀, Tokyo, Japan; April 26, 1912; vial 21.

Paratypes, 2 ♀, Tokyo, Japan; April 23, 1912; vial 3.

The specific name is that of an aboriginal Japanese race formerly occupying the north-west shores of the southern half of Nippon facing the Sea of Japan.

EXPLANATION OF PLATES.

PLATE XI.

- Fig. 1. Wing of *Pachyrhina pullata*, sp. n.
 Fig. 2. " *P. palloris* Coquillett.
 Fig. 3. " *P. repanda*, sp. n.
 Fig. 4. " *P. virgata* Coquillett
 Fig. 5. " *P. flavonota*, sp. n.
 Fig. 6. Dorsal aspect, 9th tergite, of *P. flavonota*, sp. n.; ♂.
 Fig. 7. " " " *P. pullata*, sp. n.; ♂.
 Fig. 8. " " " *P. repanda*, sp. n.; ♂
 Fig. 9. " " " *P. virgata* Coquillett; ♂.
 Fig. 10. Sixth antennal segment, *P. virgata* Coquillett; ♂.
 Fig. 11. " " " *P. repanda*, sp. n.; ♂.
 Fig. 12. " " " *P. pullata*, sp. n.; ♂.

Fig. 13. Pleural appendages, ♂ hypopygium, *P. virgata* Coquillett.

Fig. 14. Pleural appendages, ♂ hypopygium, *P. pullata*, sp. n.

Fig. 15. " " " " *P. flavonota*, sp. n.

Fig. 16. " " " " *P. repanda*, sp. n.

PLATE XVI.

Fig. 1. Wing of *Tipula yusou*, sp. n.

Fig. 2. " *T. nipponensis*, sp. n.

Fig. 3. " *T. aino*, sp. n.

Fig. 4. " *T. serricauda*, sp. n.

Fig. 5. " *T. yamata*, sp. n.

Fig. 6. " *T. insulicola*, sp. n.

Fig. 7. " *T. coquilletti* Enderlein.

Fig. 8. " *Dictenidia fasciata* Coquillett

PLATE XIX.

Fig. 1. Hypopygium of *Tipula yusou*, sp. n.

Lateral aspect; t = 9th tergite; pl = pleura.

Fig. 2. Hypopygium of *T. nipponensis*, sp. n.

Lateral aspect; t = 9th tergite.

Fig. 3. Hypopygium of *T. yamata*, sp. n.

Lateral aspect; t = 9th tergite.

Fig. 4. Hypopygium of *T. aino*, sp. n.

Dorsal aspect of the 9th tergite.

Fig. 5. Hypopygium of *T. aino*, sp. n.

Pleural appendages, lateral aspect.

Fig. 6. Ovipositor of *T. serricauda*, sp. n.

Ventral aspect; t = tergal valve; 5 = sternal valve.

Fig. 7. Hypopygium of *T. coquilletti* End.

Ventral aspect; 8s = 8th sternite; 9s = 9th sternite.

Fig. 8. Hypopygium of *T. coquilletti* End.; 9th tergite from above.

Fig. 9. Hypopygium of *T. coquilletti* End.; pleural appendage from the inside.

Fig. 10. Hypopygium of *T. coquilletti* End.; pleura and its appendage from the outside.

A REVIEW OF THE WORK ON THE POISONED BAIT
SPRAY, DRY METHOD AND MIXED TREATMENT
OF CONTROLLING FRUIT FLIES (TRYPETIDÆ).

BY HENRY H. P. SEVERIN, PH. D., MILWAUKEE, WIS.

As the work on the poisoned bait spray for controlling fruit flies is in its infancy in the United States and beyond the experimental stage in other countries, we have decided to review some of this work in order to set forth some of the methods employed and results obtained. In this paper we shall take up the work of the South African, French, Mexican, United States and Canadian entomologists, and leave the results obtained by the Italian entomologists for a future paper.

It is a well-known fact that fruit flies, after they issue from the pupæ, require 10 days or more before the egg-laying period begins. This interval is a feeding period, and the flies subsist on the nectar of flowers, waxy coating of fruit, juices of injured or cracked fruit hanging on the trees, windfalls, fallen infested fruit and droplets of water. Many fruit-flies show a great fondness for sweets, and one can readily understand why poisoned sweets are so effective in their control. If this poisoned bait is available with the first appearance of the flies on the wing, no doubt large numbers would be killed before the egg-laying period commences.

Mediterranean Fruit Fly (*Ceratitis capitata* Wied.).

Mally (11) of South Africa, apparently unaware of the work of the Italian entomologists started in 1903, began in the season of 1904-5 to spray with poisoned molasses to control the Mediterranean fruit fly, but his experiments were nullified by the scarcity of the flies. Mally's successor, Dewar (4), continued these experiments during the seasons of 1905-7. His results were not conclusive, but they were most encouraging. It was not until the season of 1908-9 that Mally (14) gave a decisive demonstration of the success of the poisoned molasses to combat the Mediterranean fruit fly under South African conditions. "A severe outbreak of the pest in a commercial peach orchard was brought to a sudden and practically complete halt, and the fruit maturing later was marketed under the guarantee of freedom from maggots," while the infestation of the fruit on the control trees increased until practically every fruit was involved.

Fuller (5) in 1909-10, tested the poisoned bait spray to control the Mediterranean fruit fly, and all trials which were made in several citrus orchards to control this pest were "attended with remarkable effects."

In 1912, Lounsbury (9) demonstrated the applicability of the poisoned bait spray to town conditions. His work was carried on under the most unfavourable weather conditions, for rain fell on 23 of the 33 days of experimentation. The garden in which the experiment was performed contained 15 varieties of fruit, and, the author states, "there is probably no other garden in Pretoria where the fly finds conditions more favourable for its welfare." The windfalls from three untreated trees showed respectively: 95 $\frac{1}{4}$ %, 95 $\frac{3}{4}$ % and 98 $\frac{1}{4}$ % of maggoty fruit, against an average of 29% from the treated trees, although the distance between the baited and unbaited ones was only about 150 yards. The fruit picked from sprayed trees showed that 13% was infested, whereas practically every ripe fruit was maggoty on the untreated trees. The author concludes, therefore, that if the spraying is properly carried out the remedy is applicable under town conditions even where the summer rainfall is heavy.

The following formulas were used by these South African entomologists:

TABLE I.

	1904-5	1905-7		1908-9	1912
Molasses (gall.).....	5	7 18	Brown sugar (lb.).....	3 2 $\frac{1}{2}$	6
Arsenate of lead (lb.).....	1	1 1	Paste arsenate of lead (oz.) ...	4 3	6
Water (gall.).....	25	25 25	Water (gall.).....	5 4	8

The lead arsenate and molasses or brown sugar in all of these formulas were simply dissolved in the required amount of cold water. According to Mally (13), the solution must be kept thoroughly agitated, so that the bait will remain of uniform strength. The spray should be applied so that the minute droplets fall over and through the trees. A pint to a pint-and-a-half is sufficient for a good-sized ten-year-old peach or nectarine tree. Rain will dissolve and wash off the sweet ingredient, and the bait should be renewed as soon as the weather permits. The number of applications of the spray will vary according to local conditions and the season. The first application should be made a month before the presence of the maggots in the fruit is ordinarily expected, and after that an application after the expiration of every

10-14 days is thought advisable. Experience alone will enable us to determine the minimum number of applications necessary to insure good results.

In the Hawaiian Islands we also obtained good results with the use of the poisoned bait spray to control the Mediterranean fruit fly, even though our experiments were conducted under the most unfavourable weather conditions. In our work, Mally's last formula (Table I, 1909), was adopted, but with this difference: Mally used 3 ounces of lead arsenate, and we increased the amount to 5 ounces. To check up the effectiveness of the fruit fly remedy in our work 10 kerosene traps were wired in fruit trees located in different parts of a non-isolated orchard containing about 400 trees. The total number of fruit flies captured in these traps in five weeks was 10,239; of this number 10,203 were males and only 36 were females. With the kerosene traps kept in the same trees, the 400 fruit trees were sprayed about once a week during the following five weeks. The total number of fruit flies captured in the oil traps in five weeks during and after spraying was 182, of which 93 were caught during the first six days. After five applications of the bait, it required a thorough search to find an infested fruit in the orchard, whereas before spraying almost every ripe fruit had been "stung" by the pest.

Melon Fly or Bitter Gourd Fruit Fly (*Dacus cucurbitæ* Coq.).

Marsh (15) tested the poisoned bait spray to control the melon fly in the Hawaiian Islands. His baits were prepared by sweetening water with molasses and adding arsenate of lead or Paris green to the solution. The following proportions of the ingredients were used:

Molasses.....	1 qt.
Paris green.....	$\frac{1}{4}$ oz.
Water.....	1 $\frac{1}{2}$ gall.

In the experiment with Paris green the applications were made daily, from September 9 until October 14. "Neither the experiment with arsenate of lead or with Paris green proved effective. The flies were frequently observed feeding on the poisoned liquids, but evidently did not relish them, and so failed to consume a fatal dose."

Fuller (5) stationed in Natal, South Africa, used the poisoned bait spray to control the melon fly. He writes: "Where the treat-

ment has been applied for the melon fly which attacks squashes, marrows, pumpkins and the like, it has proved successful."

We also attempted to control the melon fly with the poisoned bait spray in the Hawaiian Islands. The same formula of the bait which we used to control the Mediterranean fruit fly was adopted to combat the melon fly, except that 1 ounce of a soluble poison, such as potassium arsenate or sodium arsenite, was added to the solution. As the melon fly feeds during the early morning hours the insecticide was applied shortly after sunrise to all of the foliage within a pumpkin patch, and also to the vegetation bordering the same. The results obtained after spraying were rather striking. Before spraying thousands of melon flies could be found resting on the lower surface of the leaves, but several days after spraying only here and there could a specimen be found. In all probability these living flies had recently emerged from puparia, or came in from the feeding grounds or from surrounding cucurbit fields.

A few days after the application of the first spray all of the infested pumpkin vines were pulled out of the ground and raked together in piles. The infested pumpkins were scattered within these piles and then all was burned.

To determine whether the melon flies coming from their feeding grounds or from surrounding fields of cucurbits could be controlled, watermelon seeds were planted in a field adjacent to the former pumpkin patch. The seeds sprouted before we were able to make a vigorous campaign in surrounding cucurbit fields. The watermelon plants were sprayed, but the frequent rains washed off the thin film of sugar and left the plants subject to the attacks of the pests coming from outside sources. As soon as the weather became settled a fresh application of the bait was made to the watermelon plants and surrounding vegetation, but the tender stems of some of the watermelon plants were already infested. Whether the pest, which has been allowed to increase unmolested during the past sixteen years, can be controlled under Hawaiian conditions, when one individual sprays and his neighbours do not, is problematical. In all probability better results could be obtained with the poisoned bait spray in a well-isolated cucurbit field away from the valleys, where rains are less frequent during the summer months.

(To be continued).

NOTES ON THE WINTER AND EARLY SPRING COLEOPTERA OF FLORIDA WITH DESCRIPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY, INDIANAPOLIS, IND.

(Continued from page 144.)

8196.—**Rhinomacer pilosus** Lec. Originally described from Lake Superior, Virginia and California, this weevil has since been recorded from as far south as Agricultural College, Mississippi. A single specimen was beaten from pine at Dunedin, January 29. In his characterization of the family *Rhinomaceridae* LeConte states that the first joint of the antennæ is "a little stouter than the second but not longer." In the Dunedin specimen it is at least one-half longer.

8205.—**Eugnamptus striatus** Lec. A dozen or more were beaten from oak at Dunedin and Ormond. March 19—April 14.

8223.—**Pterocolus ovatus** Fab. This pretty little weevil was also beaten from oak at Dunedin, Eustis, Sanford and Ormond. March 19—April 14, ten specimens having been secured.

8310.—**Pachnæus distans** Horn. Four examples, taken at Ormond on April 11—14, range from 10 to 14 mm. in length. Horn, in his original description, gives the length as 8 mm.

8340.—**Eudiagogus pulcher** Fab. At Sanford, on January 13, several hundred of this handsome weevil were found hibernating beneath the bark of a pine log which lay by the side of a ditch of running water along the edge of a truck patch. It appears to be a common species throughout the State.

10,814.—**Apion lividum** Smith. Quite common on the dead vines of the wild cucumber (*Melothria*) and in dense masses of Spanish moss at Pelican Bay, Lake Okeechobee. A small reddish-yellow species which at first sight is liable to be taken for an *Anthonomus*.

10,829.—**Hyperodes (Macrops) hornii** Dietz. Beneath boards, along the margins of a shallow fresh-water lake just back of Dunedin, this species and *H. anthracinus* Dietz, were taken in numbers. With them were also several other species of *Listronotus* and *Hyperodes* as yet unidentified. *H. hornii* was also found at Ormond and Lake Istokpoga. January 21—April 14.

Lixus lupinus sp. nov.

Elongate, cylindrical, robust. Black, shining, evenly and rather thickly clothed with a fine, prostrate, gray pubescence which, on the sides of thorax and elytra, is condensed into a broad, prominent marginal stripe. Beak short (2.3 mm. from eye to tip), stout, cylindrical, coarsely, closely and deeply punctate and with a fine but distinct carina reaching three-fourths to tip. Antennæ inserted one-third from tip, the second and third joints of funiculus subequal, the two together slightly longer than the first. Thorax as long as wide, sides parallel from base to middle, thence gradually converging to apex, the latter feebly bisinuate; disc with numerous very coarse shallow punctures, somewhat irregularly placed, their intervals finely reticulate-punctate, without median impressed line but with a broad shallow depression in front of scutellum and a fine carina on apical third. Elytra three times longer than thorax and one-fourth wider at base, sides parallel for three-fourths their length, thence feebly diverging into a rounded apex; disc with a large shallow concavity behind the scutellum and with regular unimpressed rows of rather large distant punctures, their intervals finely granulate-punctate. Abdomen densely pubescent, finely and densely punctate, with numerous scattered very coarse punctures. Length 11—13 mm.; width 3.5—4 mm.

Seven specimens beaten singly from the flowers of the hoary lupine (*Lupinus diffusus* Nutt.) near Dunedin between January 24 and March 18. Resembles *placidus* Lec. but that species has the first and second joints of funiculus equal and the thorax channeled for two-thirds its length. In fresh specimens of *lupinus* the pubescence of beak, thorax and elytra is so dense as to almost conceal the surface sculpture. I had at first thought this a *Cleonus* but as I am unable from the literature to clearly distinguish the differences between *Cleonus* and *Lixus* I sent it to Washington. Mr. Schwarz pronounced it a *Lixus* and wrote: "No one has hitherto been able to point out any generic differences between *Lixus* and *Cleonus* but they differ in habitus and mode of life."

10,845.—**Lixus amplexus** Casey. Quite frequent near Sarasota on the flowers of the large thistle *Carduus horridulus* Pursh. Feb. 13—27.

Lixus leptosomus sp. nov.

Elongate, cylindrical, very slender. Black, shining, very sparsely clothed with fine gray pubescence except along the sides of the thorax and elytra, where it forms a narrow but conspicuous stripe; antennæ and tarsi reddish brown. Beak short, stout, cylindrical, densely and finely reticulate-punctate, feebly carinate. Antennæ inserted at middle of beak, the first joint of funiculus stouter but subequal in length to second which is one-half longer than third. Thorax cylindrical, one-fourth longer than wide, base and apex truncate, disc without smooth median line or basal impression, coarsely and sparsely punctate, the intervals with very fine sparse punctures. Elytra at base not wider than thorax, two and one-third times as long, sides parallel for four-fifths their length, thence gradually converging to a subacute apex; disc with rows of small distant punctures, the intervals very finely and sparsely punctate. Abdomen densely pubescent, finely and sparsely punctate. Length 7 mm.; width 2 mm.

One specimen swept from low herbage along the border of a cypress swamp. Sanford, April 9. The only other described species to which it appears to be closely allied is *L. tenellus* Casey, from which it differs in the relative length of antennal joints, in the beak being densely instead of "extremely sparsely" punctate and in the relatively longer thorax and greater length of body.

11,029.—**Neomastix punctulatus** Dietz. Quite frequent on the flowers of the Ericad, *Andromeda nitida* Bart., at Dunedin, Sanford and Ormond. January 19—April 15.

8684.—**Prionomerus calceatus** Say. One example of this common northern weevil was taken at Lake Istokpoga February 29. I do not find it mentioned in any Florida list.

8719.—**Conotrachelus aratus** Germ. Two specimens were beaten from oak, one at Dunedin, March 28; the other at Sanford, April 4.

8724.—**Conotrachelus belfragei** Lec. Of this, the most handsome of the genus, a single example was beaten from pine at Eustis, April 6th. It was described from one specimen taken in Texas by Belfrage.

8774.—**Acalles ventrosus** Lec. Quite common beneath boards along the margin of fresh-water lakes near Dunedin and Kissimmee. January 18—March 19.

Tyloderma punctata Casey. Very common with the preceding; also at Sarasota and Ormond. Mating in February and March. Very distinct from *T. æreum* Say with which it is usually confounded. A single specimen of the latter was taken at Lake Okeechobee.

8797.—**Cryptorhyncus apiculatus** Gyll. A single example of this rare species was taken at Dunedin January 20; also from the border of a lake.

8821.—**Tachygonus lecontei** Gyll. One of these curious little weevils was beaten from oak at Ormond. April 15.

8826.—**Craponius inæqualis** Say. Quite frequent at Dunedin, Eustis and Ormond. January 23—April 13. Beaten from the wax-myrtle or bayberry

11,110.—**Baris æneomicans** Casey. Frequent at Dunedin; also taken on Sanibel Island and at Kissimmee. Occurs in low moist meadows.

8907.—**Madarellus undulatus** Say. One specimen from Utopia, east shore of Lake Okeechobee. The thorax is much more coarsely punctate than in those from Indiana.

8978.—**Rhodobæus tredecimpunctatus quinquepunctatus** Say. One taken by sweeping at Sanford. April 9. Schwarz records it as occurring on thistle flowers. The elytra are wholly black except a narrow reddish stripe along each side margin. The central spot of thorax is large, fusiform, reaches almost to apex, and in the Sanford specimen unites at base with the two hinder lateral spots which are obliquely merged along the base. It is a distinct southern colour variety, which in my opinion should be kept in the lists.

8983.—**Sphenophorus inæqualis** Say. Single specimens were taken at St. Petersburg and Eustis beneath cover in low damp soil. January 20—April 7.

9002.—**Sphenophorus retusus** Gyll. One at Dunedin. January 16.

11,215.—**Sphenophorus minimus** Hart. One at Dunedin,

February 7. This is quite frequent in low sandy localities in Indiana.

9019.—**Gononotus lutosus** Lec. Eight specimens were found beneath drift along the beach of Clearwater Bay at Dunedin. January 21—February 8.

A NATIONAL COLLECTION OF CANADIAN INSECTS.

The Secretary of State, with the concurrence of the Minister of Agriculture, has appointed the Dominion Entomologist, Dr. C. Gordon Hewitt, Honorary Curator of Entomology in the Canadian National Museum, Ottawa.

For a number of years the Entomological Branch of the Department of Agriculture has been laying the foundation of a representative collection of the insects of Canada. This collection, together with several collections which have been acquired by the Museum, constitute the basis of a National Collection. In it will be incorporated the insects collected and received by the Entomological Branch and by the Museum. As the National Museum is under the direction of the Director of the Geological Survey and Deputy Minister of Mines, increased facilities will be afforded for securing entomological collections made by surveying and exploring parties, for example, the Canadian (Stefansson) Arctic Expedition is collecting insects for the National Collection. The collections will be stored in cabinets similar to those now in use in the United States National Museum at Washington, and it will be a great satisfaction to Canadian entomologists to know that the collections will be housed in a fire-proof building. It is hoped that this important move in the interests of Canadian entomology will receive the support of collectors throughout the country. Collectors having duplicate material will greatly assist in building up the collections by sending such extra specimens of local insects as they may be able to spare for inclusion in the National Collection. Especially is it to be desired that types of Canadian species shall be deposited in the National Museum, where they will be properly cared for.

The Entomological Branch of the Department of Agriculture will continue its practice of naming insects for collectors, and such collections and correspondence relating to the same should be addressed to "The Dominion Entomologist, Ottawa."

AMERICAN TRICHOPTERA—NOTES AND DESCRIPTIONS.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

(Continued from p. 205.)

Hydropsyche partita, n. sp. (Figs. 58-59.)

Black; head and thorax with grayish white hair; palpi nearly black; antennæ yellow, with spiral black line; abdomen black above, pale beneath; legs pale yellow, anterior femora rather darker. Wings brown, densely irrorate with whitish, nearly all over, the apical part very plainly so, a longer pale mark on hind margin before arculus; hind wings gray, darker on costal tip. Fork 1 longer than pedicel, fork 2 extends a little way on discal cell, fork 3 with short pedicel, median cross-vein its length out on median cell; in hind wing fork 1 is very short, fork 2 a long distance on discal cell; male with eyes wide apart, not enlarged.

Expanse 23 mm.

From Switzer's Camp, San Gabriel Mts., June, Mt. Wilson, 10 Aug., and Pasadena, May, all California (Grinell); Pecos, New Mexico, July, Aug., and Vineyard, Utah, July (Spalding).

Hydropsyche venularis, n. sp. (Fig. 62.)

Black; head and thorax with whitish hair; palpi very dark; antennæ yellow, annulate with brown; legs pale yellow. Wings pale, the cubitus heavily bordered with dark brown or black, anal also bordered, a large, elongate streak near stigma, sometimes broken by pale spots, a black spot at end of first apical vein, apical part of wing often infusate, elsewhere dark spots, often along veins, and some patches of gray hair, all marks tend to be longitudinal; hind wings gray, tip darker. Eyes of male large, approximate. Venation as in *H. scalaris*. Male superior plate with minute emargination, the second part of lower appendage very short and broad, with bifid tip.

Expanse 22 mm.

From Washington, D. C.; Great Falls, Va.; Dane Co., Wisc.; St. Louis, Mo., June to Sept. I had thought this might be *H. reciproca* (*indecisa*), but that species is near *H. scalaris*.

July, 1914

Hydropsyche slossonæ, var. **recurvata**, n. var. (Fig. 73).

Very similar to *slossonæ* in appearance and structure, the genitalia of male on same plan, the penis having practically the same structure, but the superior plate has only very short processes, instead of the long ones of true *slossonæ*.

From Go Home Bay, Georgian Bay, Ont. (Walker).

Diplectrona californica, n. sp. (Fig. 63).

Head black, with some yellowish hair; palpi brown; antennæ brown, annulate with pale, strongly crenate beneath; legs pale yellowish. Wings brown; quite broad; stigmal area swollen below in both wings, fork 1 but little longer than pedicel, fork 3 longer than pedicel, fork 4 reaching far back, before thyridial cross-vein; in hind wings fork 1 almost reaches to the discal cell, fork 3 hardly longer than 1, in both wings discal cell is over three times as long as broad.

Expanse 10 mm.

From Claremont, Calif. (Baker).

Psychomyia diversa, n. sp. (Fig. 64).

Black; palpi brown; antennæ dark, faintly annulate with pale, black hair on face, brown on warts and some yellowish on front of vertex, thorax with black hair; wings black, especially dark along the costa; no marks, some yellowish hair scattered through the black; femora pale yellowish, in the male, tibia and tarsi dark or nearly black, in the female, pale, and in the female the wings are generally less dark than in the male; male genitalia pale, the upper lateral pieces are longer and not as broad as in *P. canadensis*; in fore wings the tip of the discal cell is oblique and the fork 2 reaches one-half way back on the cell, fork 3 begins beyond fork 4.

Expanse 10 mm.

From Black Mt., north fork of the Swannanoa River, N. Car., May.

Philopotamus.

Fork 1 very short; hind tibiæ not more hairy than rest of legs; tip of female abdomen does not form a long ovipositor. The genitalia of our two species (*distinctus* and *americanus*) are figured.

Dolophilus.

Fork 1 reaches to discal cell; hind tibiae of male very hairy; in female the tip of abdomen forms a long ovipositor; in our species the discal cell is not angulate above.

I have two species of this genus as defined above; the characters used to distinguish the European species from *Philopotamus* do not apply to our forms.

Dolophilus major, n. sp. (Fig. 66).

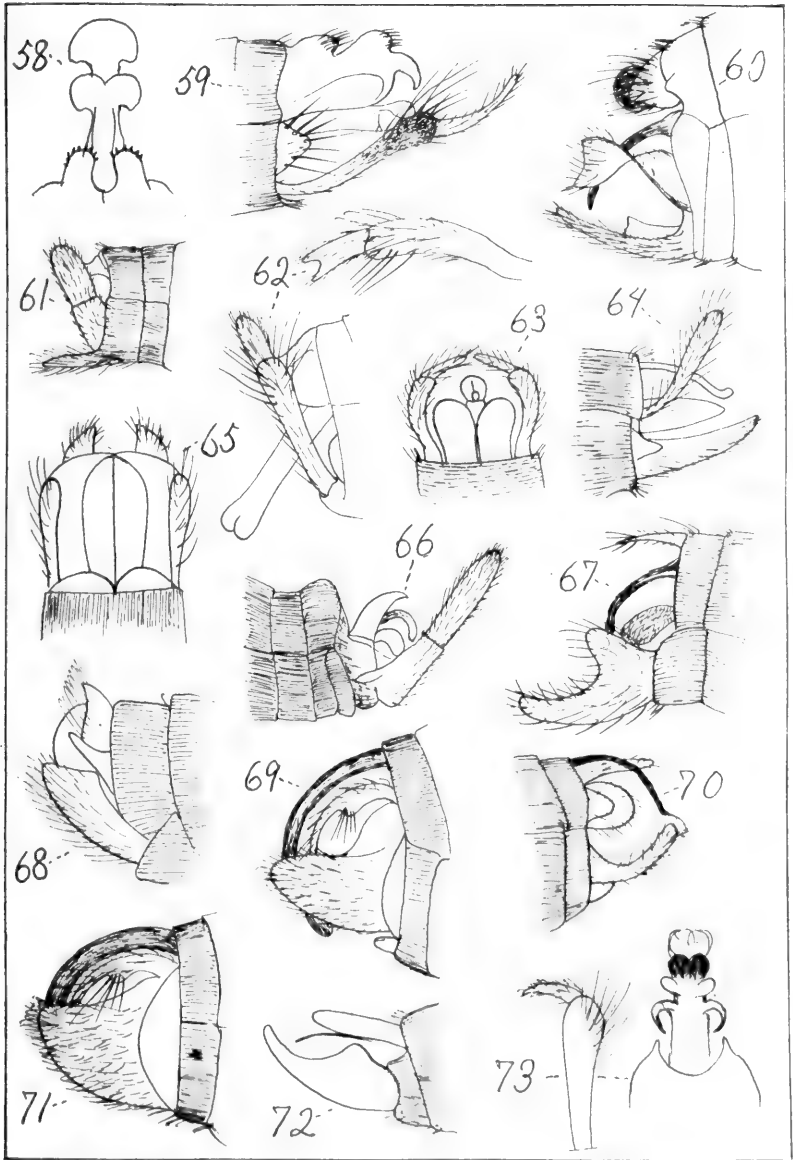
Black, with black and golden-yellow hair; golden hair on front of vertex and base of thorax; palpi brown, antennae dark, annulate with black, coxa and femora rather dark, rest of legs paler; abdomen black; wings black; fore wing beautifully spotted with golden hair, spots rather small, and mostly subequal in size and situate in the cells, each apical cell with four to ten of them, all over wings; hind wings blackish. Wings long, fork 1 reaches to the discal cell, fork 2 is its width on discal cell, fork 4 a little before fork 3, both long, discal cell nearly three times as long as broad; hind wings with forks 1 and 2 very narrow, as long as in the fore wings.

Expanse 22 mm.

From Black Mt., north fork of the Swannanoa River, N. Car., May. I have no female, and its large size seems out of place in this genus, but the genitalia and long fork 1 will not fit in *Philopotamus*.

Dolophilus breviatus, n. sp. (Fig. 61).

Face dark; antennae brown, annulate with yellowish; palpi brown; gray hair between antennae, and on vertex and thorax, a tuft of black hair near each eye; abdomen brownish; legs yellowish, brownish on tarsi; hind tibiae with much long pale hair. Wings dark, densely irrorate with golden, a large golden spot before and one beyond stigma, costal area interrupted once with golden; the golden on wing is so dense a reticulation that the dark appears to be broken into many little rectangles; hind wings gray, blackish at tip. Fork 1 reaches to discal cell in both wings, in fore wings forks 3 and 4 subequal, in hind wing fork 3 is much longer than pedicel; the third joint of maxillary palpi much longer than fourth; in female there is a long yellowish ovipositor.



NEW AMERICAN TRICHOPTERA.

Expanse 12 mm.

From Coy Glen, Ithaca, N. Y., July, and Black Mt., north fork Swannagoa River, N. Car., May.

Plectrocnemia canadensis Bks. (Fig. 37).

My *Polycentropus canadensis* must be referred to *Plectrocnemia*, unless a new genus is made for these small forms. The female has the mid legs with dilated tibia and tarsi, but fork 1 is present in both wings, and discal cell closed in both wings. In fore wings fork 1 is as long as its pedicel, fork 2 back to discal cell, fork 3 with short pedicel, fork 4 back as far as fork 2. In hind wings fork 1 is about as long as pedicel, fork 2 reaches to cell. The male genitalia are figured. It occurs in many places in Eastern States.

Plectrocnemia cinereus Hagen. (Figs. 25, 26).

This is a larger species than *P. canadensis*, but the male genitalia, which are figured, are similar.

Plectrocnemia adironica n. sp. (Fig. 60).

Palpi brownish; antennæ pale, broadly annulate with brown; vertex with gray hair in middle, black hair on sides; whitish hair on thorax; abdomen black above, yellowish beneath, legs pale yellowish. Wings gray, with blackish marks along costa and cubitus; blackish spots at end of veins, yellowish between them, rest of wing with pale brown areas, mostly with yellowish hair; hind wings pale, darker at tip. In fore wings no fork 1, fork 2 reaches a little way on discal; fork 3 with short pedicel, fork 4 hardly longer, not as far back as fork 2, fork 5 broad near base; in hind wings fork 1 is nearly as long as its pedicel, fork 2 back on cell, fork 5 very broad; the male genitalia have a rather long median ventral plate.

Expanse 20 mm.

From Axton, Adirondack Mts., N. Y., 12-22 June (MacGillivray). The absence of fork 1 in the fore wings makes its generic position rather doubtful; if the loss is accidental, it is a *Plectrocnemia*.

Phylocentropus vestitus Hagen. (Fig. 35).

I cannot see any difference in the male genitalia between the large spring specimens and the small autumn specimens, both of

which occur here. I have one specimen in which fork 2 is stalked in all four wings, a very unusual variation, as fork 2 is normally the most constant of all the forks. I figure the male genitalia.

Neureclipsis signatus Banks. (Fig. 72).

My *Polycentropus signatus* belongs to this genus, I figure the male genitalia.

Holocentropus interruptus n. sp. (Fig. 71).

Brown, with white and gray hair; palpi pale yellowish; face with dark brown hair, white hair on vertex and thorax; antennæ yellowish, annulate with brown; legs pale yellow. Wings brownish, with many spots and dots of whitish hair, the costal area is interrupted three times with white, a white mark over stigma, beyond are white spots between ends of veins, larger spots on basal middle region, elsewhere mostly small, but often connected, fringe black at ends of the veins, hyaline marks not noticeable. Fork 1 is shorter than pedicel, sometimes only one-half as long, fork 3 is twice as long as its pedicel. Lower appendage of male is broader at base than in *H. flavus*. A slender appendage on each side of body like *Diplectrona*.

Expanse 17 mm.

From Hampton, N.H., June (Shaw); Dane Co., Wisc., July (Vorhies); and Squam Lake, N.H., July (Allen).

Holocentropus orotus n. sp. (Fig. 69).

Palpi brown; antennæ yellowish; face blackish, vertex with white hair in middle, black on sides, thorax white haired; abdomen brown, yellowish beneath; legs yellowish, tarsi darker. Wings brown, with some white spots, three in the costal area (one each side of stigma), around the tip are white spots between veins, and a few in middle of wing, but not as numerous as in *H. interruptus*; hind wings gray, with blackish fringe. Fore wings with discal cell about equal to the pedicel, fork 1 very short, fork 3 as long as pedicel, fork 4 reaches only a little before fork 3. Genitalia similar to *H. interruptus*, but the lower appendages are not as broad, and their upper tips are produced inward so that they touch each other.

Expanse 16 mm.

From Clear Creek and Chimney Gulch, Golden, Colo. (Oslar).

Holocentropus longus n. sp. (Figs. 65, 68).

Palpi pale, dark on last joint; face dark, with black bristles above; vertex black with white hair; antennæ yellowish, annulate with brown; thorax with white hair; legs yellowish; wings brown, irregularly spotted with white, four, white marks on costal area before stigma, spots between veins on margin, and many elsewhere, often connected; hyaline marks not distinct. The fore wings are longer than usual, fork 5 with sides parallel for most of its length, in type fork 1 is a mere rudiment at margin, but in another specimen (♀) it is longer than pedicel, in this female there is a short fork 1 in one hind wing.

Expanse 20 mm.

From Framingham, Mass., June (Frost), and Digby, Nova Scotia (Russell), June.

Polycentropus centralis n. sp. (Fig. 67).

Palpi yellowish; antennæ pale, annulate with dark; face brown, vertex with yellow hair in middle, black by eyes, thorax with golden hair, abdomen brown above, yellowish below; legs yellow. Wings dark brown, rather densely spotted with patches of yellow hair; anal and cubital veins more heavily black than others; hind wings gray, blackish at tips; fork 1 about as long as pedicel, venation otherwise like *P. confusus*. Size, rather smaller than *P. confusus*, and lower male appendages of different shape.

From St. Louis, Mo., June.

Polycentropus confusus Hagen. (Fig. 70).

This is common in Northern States; the male genitalia are figured.

(To be continued.)

BOOK REVIEWS.

A TEXTBOOK OF MEDICAL ENTOMOLOGY. By Walter Scott Patton, M.B. (Edin.), I.M.S. and Francis William Cragg, M.D. (Edin.), I.M.S., London, Madras and Calcutta, 1913.

The science of medical entomology, although of very recent origin, has developed so rapidly within the past decade and the

literature is scattered through so many periodicals that it has become a difficult matter, even for the specialist, to keep in touch with all that is being written on the subject.

A comprehensive textbook of medical entomology has therefore been urgently needed and the appearance of the monumental work by Captains Patton and Cragg will be welcomed not only by entomologists but also by medical practitioners in tropical lands and by students of protozoology, with which subject medical entomology is so closely associated.

This voluminous work extends over 764 pages and includes no less than 89 full-page illustrations. Its bulk, however, is not the result of diffuseness, for the diction is clear and concise, but of the vast quantity of information it contains. Considering the wide field it covers it is not too large for a useful work of reference.

Perhaps the most striking feature of the book is the large amount of original matter both in the text and the illustrations, which are uniformly excellent. Much space is devoted to the anatomy and physiology of blood-sucking insects, particularly to the structure and mechanism of the mouth-parts, and to the description of methods of breeding and laboratory technique.

The general features of insect anatomy and physiology are illustrated by reference to the *Diptera*, particularly the various blood-sucking types, a number of which are described in considerable detail, but none of the orders that contain species of interest from the medical standpoint are neglected, each order forming the subject of a chapter of its own, except the *Diptera*, which include two chapters, in addition to the one in which the anatomy and physiology are treated.

In each chapter the subject is discussed from every standpoint, the anatomy, taxonomy, relation to disease and bionomics, all receiving adequate attention. Valuable information is also given on methods of collecting, dissecting and preserving and each chapter concludes with a careful bibliography. The analytical keys to the genera and species have been taken from the best sources available.

The last two chapters deal respectively with laboratory technique and a general discussion of the relation of *Arthropods* to their parasites.

Altogether the authors are to be congratulated on the splendid

fruit of their labors, for the work would have been a credit to any country, and is therefore the more remarkable for having been written entirely in India.

EVOLUTION OF THE COLOUR PATTERN IN THE MICROLEPIDOPTEROUS GENUS LITHOCOLLETIS. By Annette Frances Braun. Journ. Acad. Nat. Sci., Phila. (2), XVI, p. 105-168; with 26 text figures and pls. III and IV with 99 coloured figures.

In this work Miss Braun, who is well known to readers of the Canadian Entomologist for her work on the Tineidæ, has made a careful study of the numerous species of the genus *Lithocolletis*, with the object of determining the primitive colour pattern of the genus and the principles involved in its evolution among the various species. The work is based upon a comparative study of the adults of 95 species as well as the development of the pupal wings in 11 representative forms.

The general conclusions arrived at are as follows: The primitive pattern of the fore wing consists of a series of seven pale yellow transverse bands separated by unpigmented areas, the arrangement of the bands having a definite relation to the course of the longitudinal veins. These primitive bands constitute the ground colour of the wings and tend to become broader during both ontogenetic and phylogenetic development, in some species suffusing the entire wing. Dark markings appear only at the limits between the ground colour and the unpigmented areas, but these markings once firmly established in the species become independent of extension of the ground colour.

It is suggested that "the uniform yellowish ground colour which suffuses the wing in the higher Lepidoptera, beginning at the base and spreading distalward, is the outcome of a phylogenetically older type of marking, originally banded, and later fused to a uniform colour, and that the markings are a second series superimposed upon the first." The occurrence in some of the higher Lepidoptera of dark bands in pairs seems to be an indication of their origin on each side of a primitive band of the ground colour, as in *Lithocolletis*.

The work is illustrated by many text-figures and two coloured plates on which the figures of 92 species are grouped in the form of a phylogenetic tree.

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No. 8

AMERICAN TRICHOPTERA—NOTES AND DESCRIPTIONS.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

(Continued from p. 258.)

LEPTOCERIDÆ.

Molanna flavicornis, n. sp. (Fig. 46).

Body black, including thorax above, head and thorax clothed with whitish gray hair, basal joint of antennæ dark, beyond wholly pale yellowish (in both sexes); palpi pale, legs pale yellowish, more or less infuscated on femora. Wings yellowish gray. Venation similar to *M. uniophila*, alike in both sexes, venation pale; in fore-wing the cubitus united to the median at a rather obtuse angle, but separates at a very acute angle, as in other species; in the hind wings fork 2 has diverging sides.

Expanse 27 mm.

From Husavick, Man., July, and Winnipeg, Man., May, (Wallis).

Triænodes dentata, n. sp. (Fig 45).

Yellowish gray, head and basal joint of antennæ densely clothed with long yellowish hair; antennæ pale, joints narrowly dark at tips, legs pale. Wings gray, with much gray and yellowish hair, near outer margin there is much black hair, the outer fringe mostly black, deep black at outer angle, posterior fringe gray, a black spot at the arculus, and another about half way from it to base; hind wings yellowish gray, with gray fringe, venation in both pairs pale; costa of fore wings (in ♂) densely hairy. Venation as in *T. ignita*, but the fork 1 is still shorter.

Expanse 18 mm.

From Johnstown, N. Y., June (Alexander), and Hampton, N. H., July (Shaw).

Leptocella stigmatica, n. sp. (Fig. 48).

Face pale, vertex dark with yellowish or gray hair; basal joint of antennæ brown, rest with pale on basal part of the joints, gradually darker beyond; palpi pale; thorax brown, with short yellowish white hair; the abdomen and legs yellowish. Wings gray, in male a large dark brown spot on the stigmal region back to the radial sector, the anastomosis dark-margined, and veins elsewhere faintly dark-margined, fringe black on outer margin; hind wings gray, with gray fringe, black at upper tip. Fore wings very slender, the apical cells short, fork 1 longer than pedicel, fork 3 reaches nearly to the anastomosis, discal cell longer than second apical, not much swollen above; hind wings very broad, basal venation can be traced in a strong light, similar to that of *L. exquisita*. Lower male appendage with blunt tip.

Expanse 27 mm.

From Jemez Mts., New Mexico, June and July (Woodgate).

Leptocella intervena, n. sp. (Figs 15, 50).

Pale yellowish, with white hair; antennæ rather broadly annulate with dark brown. Fore wings white, in the apical part there are short dark streaks in the cells not touching the veins, these streaks form incomplete bands across the wing, other dark marks along the anal margin; a few black streaks in the middle of wing, but not so distinct as in apical part of wing.

Expanse 21 mm.

From Zavalla Co., Nueces River, Texas, 26 and 27 April (Hunter and Pratt) at light. Type in National Museum.

Æcetina interjecta, n. sp. (Figs. 2, 5).

Face yellow, vertex dark, palpi and antennæ pale, latter with tips of joints narrowly black; thorax brown; abdomen pale brown, yellowish near tip; legs pale yellow. Wings gray, veins darker, a long dark cloud near the stigma; hind wings gray, with darker gray fringe. Fore wings with costal margin much curved near tip, fork 1 reaching to discal cell, veinlets of anastomosis much disjointed; hind wings with fork 1 very short, fork 3 twice as long, and fork 5 reaching nearly one-half way to base.

Expanse 14 mm.

From Go Home Bay, Georgian Bay, Ont., 23 Aug. (Walker).

Leptocerus angustus, n. sp. (Fig. 40).

Body dark, head with gray hair; palpi black, with gray hair. Basal joint of antennæ yellowish brown, rest dark, extreme bases of joints whitish; legs pale. Wings gray, with many black hairs near tip, a white point each side of dark stigma, and another white spot at arculus, outer fringe interruptedly dark and white, a long black streak on margin beyond arculus; hind wings gray. Fore wings with fork 3 reaching before fork 1, anastomosis with upper vein disjointed from others, which are nearly interstitial, discal cell reaching fully twice its width before thyridial cell.

Expanse 20 mm.

From Go Home Bay, Georgian Bay, Ont., 1 Aug. (Walker).

Leptocerus retractus, n. sp. (Fig. 41).

Gray; face yellowish, with white hair; palpi dark gray; vertex dark brown; abdomen pale yellowish, darker at tip; legs pale, but tibiæ rather gray. Wings gray, with yellowish brown hairs, hyaline dots near base of discal cell, and middle part of costal area hyaline, the median and anal veins for some distance narrowly lined with hyaline. Wings not very long; fore wings with discal cell very long, narrowed near tip, the veins of anastomosis much disjointed and oblique; fork 1 twice as long as pedicel, the double fork (of female) barely longer than fork 1. In hind wings the first and third forks about equal.

Expanse 16 mm.

From Muskoka River, Ont., 30 June, and Go Home Bay, Ont., 8 Aug. (Walker).

Leptocerus inornatus, n. sp. (Fig. 42).

Yellowish brown, white hair on face; palpi gray; antennæ yellowish, narrowly annulate with brown; mesonotum dark brown; abdomen yellowish, brown at tip; legs yellowish, fore tarsi white, plainly annulate with brown, mid-tarsi less distinctly marked, hind tarsi all pale. Wings brownish, with brown veins, no marks, clothed with fine white and gray hair. In fore wings fork 1 has a pedicel about as long as fork, fork 3 plainly longer than its pedicel, end of discal cell much beyond the median cross-veins.

Expanse 23 mm.

From Victoria, Texas, 23 March (Mitchell). Type in National Museum.

Leptocerus futilis, n. sp. (Figs. 44, 49).

Body black, head with white hair; palpi dark, with white hair, basal joint of antennæ dark, rest whitish with dark tips to joints; thorax with white stripes in front, and tufts over base of wings; legs pale. Wings dark gray, veins dark, surface clothed with very short yellowish hair, a pale spot at arculus; fork 3 extends more basad than fork 1; the three cross-veins of anastomosis widely disjointed; discal cell extends hardly its width before thyridial cell.

Expanse 21 mm.

From Go Home Bay, Ont., 11 July (Walker).

CALAMOCERATIDÆ.

Psiloneura, n. gen.

In both wings forks 1, 2, 3, 5, the discal cell is closed, in fore wings a cross-vein from base of fork 1 (or before) to the radius; discal cell moderately short; spurs 1, 2, 4 all very short; antennæ wide apart at base; maxillary palpi with joint 2 much longer than any others.

Type.—*P. mæsta*, n. sp.

Philoneura mæsta, n. sp. (Fig. 12).

Brown; palpi brown, face with few yellow hairs; antennæ dark brown; vertex with golden and black hair; thorax blackish near base of wings; abdomen black; legs yellowish; wings grayish brown, with very short yellowish hair; face broad, antennæ wide apart, about two-thirds as long as the fore wings, venation as figured, the corneous dot in fork 2 is one-fourth the way from base, instead of near base as in most species. In fore wings fork 1 extends two-thirds of way back on discal cell, the cross-veins before base of fork up to radius.

Expanse 22 mm.

From Cambridge, Mass., Sept.

Astoplectron, n. gen.

Type.—*Heteroplectron boreale* Prov. Similar to *Heteroplectron*, but no fork 4 in fore wings of either sex, and in ♂ no fork 3, and in hind wings the discal cell is closed. In hind wings forks 1, 2,

3, 5. In fore wings fork 1 reaches far back on cell, fork 3 hardly as long as fork 2; there is no cross-vein from radial sector to radius, spurs 2, 4, 4; basal joint of the antennæ about as long as the vertex.

Astoplectron connexa, n. sp. (Figs. 24, 55).

Similar in appearance to *A. boreale* Prov.; body and wings brown, without markings, legs paler; basal joint of antennæ dark. Differs from *A. boreale* in that the vein at upper side of fork 1 is angularly bent up toward radius, and connected to radius by a cross-vein, this just alike in both fore wings; in three males of *A. boreale* there this vein is straight; besides the proportions of the cells are slightly different. The male appendages are a little shorter than in *A. boreale*.

Expanse 18 mm.

From Great Falls, Va., 12 June.

SERICOSTOMATIDÆ.

Olemira costalis, n. sp. (Fig. 34).

Brown; palpi covered with long, dense, black hair; antennæ brown, basal joint black beneath; vertex pale in middle, vertex and thorax with some yellow hair; legs yellowish; wings gray, nearly uniformly coloured, fringes darker. In male the costal area is swollen and reflexed over the wing, just as in *O. americana*, except that this reflexed part is only about one-half as wide as in *O. americana*; venation as in that species, but in the hind wings the discal cell is a little longer; genitalia similar to that of *O. americana*.

Expanse 15 mm.

From Woodworth's Lake, Fulton Co., N. Y., 19 August (Alexander). *O. americana*, besides the type locality, I have seen it from Riverside, Mass., and Falls Church, Va.

Micrasema falcata, n. sp. (Fig. 52).

Brown; palpi yellowish; antennæ dark at base; head and thorax with gray hair; abdomen black, with white hair; legs pale, with white hair. Wings brown, with scattered yellowish and black hairs; venation similar to that of *M. charonis*; discal and median cross-veins interstitial, fork 1 reaching back on discal cell further

than in *M. charonis*, and fork 2 has a very much longer pedicel, longer than the discal cell.

Expanse 10 mm.

From Great Falls, Va., 12 May.

Micrasema charonis, n. sp. (Figs. 3, 47, 51).

Jet black; head and thorax with black hair; legs rather brown; abdomen with rather long, erect hairs above; spurs very short, not as long as width of the joint. Venation as figured; maxillary palpi long, slender, upcurved, reaching to tip of basal joint of antennæ, sparsely hairy.

Expanse 10 mm.

From Black Mts., North Fork Swannanoa River, N. Car., May. The first record of this genus from the United States.

Mormomyia vernalis Bks. (Figs. 1, 4, 28).

I have this species from Tryon, N. Car. Among the original series are two specimens with slightly longer wings, and both have fork 4 well developed in each fore wing; both are males, and their genitalia do not appear to differ from typical specimens.

Schizopelex hesperus, n. sp. (Fig. 10).

♀.—Brown; vertex and thorax with white hair above; antennæ brown; wings brown, densely and evenly clothed with short golden hair, no markings; hind wings gray, with sparse golden hair, abdomen brown; front and mid legs brownish, hind legs yellowish. Venation similar to *S. lobata*, but fork 2 is acute at tip.

Expanse 28 mm.

From Vinyard, Utah, 10 July. Differs from *S. lobata* in the white hair of head and thorax.

EXPLANATION OF PLATES.

- Fig. 1.—*Mormomyia vernalis*, hind wing.
 Fig. 2.—*Æcetina interjecta*, fore wing.
 Fig. 3.—*Micrasema charonis*, wings.
 Fig. 4.—*Mormomyia vernalis*, head.
 Fig. 5.—*Æcetina interjecta*, genitalia.
 Fig. 6.—*Stenophylax hesperus*, genitalia above.
 Fig. 7.—*Anisogamus infernalis*, genitalia.

- Fig. 8.—*Limnephilus spinatus*, genitalia.
Fig. 9.—*Limnephilus spinatus*, genitalia above.
Fig. 10.—*Schizopelex hesperus*, wings.
Fig. 11.—*Neuronia smithi*, genitalia.
Fig. 12.—*Psiloneura moesta*, wings, palpi.
Fig. 13.—*Limnephilus argenteus*, genitalia.
Fig. 14.—*Limnephilus æqualis*, genitalia.
Fig. 15.—*Leptocella intervena*, fore wing.
Fig. 16.—*Glossosoma penitus*, genitalia.
Fig. 17.—*Limnephilus secludens*, genitalia.
Fig. 18.—*Paragapetus moestus*, fore wing.
Fig. 19.—*Glossosoma penitus*, genitalia, beneath.
Fig. 20.—*Paragapetus moestus*, genitalia.
Fig. 21.—*Stenophylax hesperus*, genitalia.
Fig. 22.—*Anisogamus disjunctus*, genitalia.
Fig. 23.—*Paragapetus moestus*, hind wing.
Fig. 24.—*Astoplectron connexa*, wings.
Fig. 25.—*Plectrocnemia cinerea*, genitalia, above.
Fig. 26.—*Plectrocnemia cinerea*, genitalia.
Fig. 27.—*Limnephilus secludens*, genitalia, behind.
Fig. 28.—*Mormomyia vernalis*, genitalia.
Fig. 29.—*Limnephilus productus*, genitalia, above.
Fig. 30.—*Philopotamus distinctus*, genitalia.
Fig. 31.—*Limnephilus æqualis*, genitalia, above.
Fig. 32.—*Stenophylax flavata*, genitalia, above.
Fig. 33.—*Stenophylax flavata*, genitalia, behind.
Fig. 34.—*Olemira costalis*, genitalia.
Fig. 35.—*Phylocentropus vestitus*, genitalia.
Fig. 36.—*Limnephilus productus*, genitalia.
Fig. 37.—*Plectrocnemia canadensis*, genitalia.
Fig. 38.—*Philopotamus americanus*, genitalia.
Fig. 39.—*Rhyacophila acropedes*, genitalia.
Fig. 40.—*Leptocerus angustus*, genitalia.
Fig. 41.—*Leptocerus retactus*, genitalia.
Fig. 42.—*Leptocerus inornatus*, genitalia.
Fig. 43.—*Rhyacophila bipartita*, ♀ plate below.
Fig. 44.—*Leptocerus futilis*, genitalia.

- Fig. 45.—*Triænodes dentata*, genitalia.
Fig. 46.—*Molanna flavicornis*, genitalia.
Fig. 47.—*Micrasema charonis*, head.
Fig. 48.—*Leptocella stigmatica*, genitalia.
Fig. 49.—*Leptocerus futilis*, genitalia, above.
Fig. 50.—*Leptocella intervena*, genitalia.
Fig. 51.—*Micrasema charonis*, genitalia.
Fig. 52.—*Micrasema falcata*, genitalia.
Fig. 53.—*Rhyacophila bifila*, genitalia, ♀.
Fig. 54.—*Rhyacophila bipartita*, genitalia.
Fig. 55.—*Astopteron connexa*, genitalia, palpus.
Fig. 56.—*Rhyacophila bifila*, ♀, beneath.
Fig. 57.—*Agapetus malleatus*, genitalia.
Fig. 58.—*Hydropsyche partita*, penis.
Fig. 59.—*Hydropsyche partita*, genitalia.
Fig. 60.—*Plectrocnemia adirondica*, genitalia.
Fig. 61.—*Dolophilus breviatus*, genitalia.
Fig. 62.—*Hydropsyche venularis*, genitalia.
Fig. 63.—*Diplectrona californica*, genitalia.
Fig. 64.—*Psychomyia diversa*, genitalia.
Fig. 65.—*Holocentropus longus*, genitalia, above.
Fig. 66.—*Dolophilus major*, genitalia.
Fig. 67.—*Polycentropus centralis*, genitalia.
Fig. 68.—*Holocentropus longus*, genitalia.
Fig. 69.—*Holocentropus orotus*, genitalia.
Fig. 70.—*Polycentropus confusus*, genitalia.
Fig. 71.—*Holocentropus interruptus*, genitalia.
Fig. 72.—*Neureclipsis signatus*, genitalia.
Fig. 73.—*Hydropsyche recurvata*, genitalia.

OBITUARY.

Mr. Frank E. Moeser, a collector of Lepidoptera and a keen observer of their life histories, died at his home, 239 Guilford St., Buffalo, N.Y., on May 15th, being forty-five years of age. His work among the local Noctuidæ especially, proved of interest, in that material brought to notice by Grote, when the latter was with the Buffalo Society of Natural Sciences, was again collected by him. He is survived by a wife, daughter and son. H. BIRD.

INSECTS AND PAIN.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

In various books on entomology one often comes across the statement that insects do not suffer acute sensations of pain as do the higher animals. Different facts are cited to prove this, the most familiar being the case of a butterfly that was pinned alive, escaped and returned to its feeding among flowers with apparently no inconvenience. Kirby and Spence quote the action of a bee eating honey though deprived of its abdomen. Dr. John B. Smith found that if he cut off the abdomen of a fly it would live for twenty-four hours after, with practically no digestive system, very little nervous system and most of its heart gone and when the head was removed it lived for the same length of time. The interesting feature was that no apparent symptom of pain was developed.

It is also said that if a dragonfly be captured, held loosely by the wing and the tip of its abdomen presented to its mouth, it will proceed to eat at once as far as it can reach.

Referring to the human system many experiences commonly called painful are only unpleasant or disagreeable. This confusion is due to the fact that painful things are always unpleasant. Painfulness however is quite distinct from unpleasantness. The same stimuli which result in sensations of pressure, warmth and cold may also bring about painfulness if they are long continued or repeated often enough.

There are various theories accounting for pain sensations, the oldest one teaching that there were no specific pain organs, but that sensations of pain were brought about by continued or excessive reactions of other end-organs especially those of pressure. This theory was disproved by the discovery that certain anaesthetics destroyed pain sensations independently of pressure sensations. For instance if one's tooth is treated with cocaine, no pain is felt upon its removal but one is conscious of the pressure of the dentist's instrument.

Another theory is that pain is produced only by the excitation of distinct end-organs of pain. This theory is based on the discovery of pain spots on the skin. However the spots which are sensitive to pain and not to pressure have been found to occur

only on the elbow joints and membranous coverings of the eye. This lack of spots is explained by assuming that more stimulation is required to excite pain end-organs than pressure end-organs.

A third theory is that pain end-organs are not distinct from pressure end-organs but are exposed pressure organs situated under unusually thin parts of the epidermis and that pain is not due to any activity of these end-organs but to "a transformation in the gray matter of the spinal cord of nerve excitations conveyed from these exposed pressure end-organs."

Returning to insects we find that they have well developed nervous systems and that their organs are well supplied with nerve endings. Moreover many insects give signs of discomfort when handled or mutilated. There is no doubt but that they are highly susceptible to pressure stimuli. In fact end-organs of touch such as hairs and bristles are distributed over the entire integument.

Pain sensations however are hard to distinguish in insects from those of touch. One argues that the mutilated insects heretofore referred to experienced no pain simply because they exhibited no signs of suffering. What then constitutes a symptom of pain in insects? Who is qualified to judge? Many pain racked persons go about their duties without exhibiting any signs of pain other than changes in facial expression. Of course extreme mutilation of the human body results in almost immediate death while in the case of insects death is not immediate. All pain however is an exhausting experience and injurious to the organism. With insects final exhaustion is simply deferred.

In the case of the dragonfly eating its own body, it is hard to find a human parallel unless we cite mentally unbalanced persons who inflict serious injuries upon their person. One might argue that they would not do this if it were painful and yet we are positive such actions are painful.

The character of the insect nervous system is unlike our own and the surface of their bodies is usually rigid and hard and probably not sensitive to pressure and pain in the same way as our own bodies so that we have no reliable guides as to their sensations of pain. Man judges most things by himself and when this guide fails he is at a loss to explain certain happenings in a

satisfactory way. It seems therefore that the evidence for assuming that insects do not suffer acute sensations of pain is not by any means complete. We simply do not know and have no reliable means at present of finding out.

A NEW FOSSORIAL WASP FROM QUEENSLAND.

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

Zoyphium crassicorne n. sp.

Male: Length about 5mm.; black, with the legs entirely orange; clypeus, labium and mandibles pale ferruginous, the clypeus with an inconspicuous dusky median patch; antennæ pale ferruginous, the flagellum with a dusky shade above; wings hyaline, stigma and outer nervures dark rufous, inner nervures pale ferruginous; front, vertex and mesothorax dullish, with extremely close, minute (microscopical) regular punctures; ocelli in a triangle, lateral ocelli not quite as far from eye as diameter of one; antennæ placed low down on face, distance from antenna to lower margin of clypeus rather less than distance of antennæ apart; antennæ clavate, 12-jointed, the scape short and thick, the club very large, compressed apically; face and lower half of front with short glittering hair, silvery on front, very pale golden on face; eyes slightly converging above; lower margin of clypeus with a pair of low rounded tubercles, far apart; mandibles with a large rounded tooth on lower margin; tegulæ short, pale rufo-testaceous; meta-thorax with short silvery hair at sides, its basal area with a fine median raised line, the apical half of which runs through a broad shining depressed or excavated area; tibiæ with apical part spinose; tibial, spurs stout, finely ciliate-denticulate; basal nervure going basad of transversomedial; marginal cell long, pointed on costa; three sub-marginal cells, the first receiving first recurrent nervure some distance from its end, the second triangular; abdomen shining, very minutely punctured, the apex presenting a broad slightly rounded truncation, with obtuse but salient angles.

Hab.—Brisbane (*H. Hacker*). Collected May 13, 1912. Queensland Museum 63. The type of *Zoyphium* is *Z. sericeum* Kohl, 1893. In Kohl's species the venation differs from that of *Zcrassi corne*. in some rather striking details; the second recurrent nerveur joins the second submarginal cell about the middle (far

beyond the middle in *crassicorne*), the third submarginal cell is as broad above as the length of the second transversocubital nervure (hardly more than half as broad in *crassicorne*), the median cell of the hind wings is obtusely pointed (very broadly truncate in *crassicorne*). Turner remarks: "None of the species of *Zoyphium* described by me have the tooth on each side of the second (first) dorsal segment mentioned by Kohl in his description of the genus"; *Z. crassicorne* is also without such a tooth.

From the other species of *Zoyphium*, *Z. crassicorne* is distinguished as follows:

(1) From *Z. erytkrosoma* Turn. by the small size and quite different colour.

(2) From *Z. rufonigrum* Turn. by the black thorax. The male antennæ are very much thicker apically, with a very much larger club, than in *rufonigrum*; the penultimate joints in *crassicorne* are much broader than long. The tooth on the lower side of the mandibles is more broadly rounded than in *rufonigrum*.

(3) From *Z. kohlii* Turn. by the smaller size and red clypeus. The venation is also different; in *kohlii* the basal nervure goes more basad of the transversomedial, the marginal cell is shorter, and the second recurrent nervure joins the second submarginal cell about the middle.

(4) From *Z. frontale* Turn. by the three submarginal cells and the entirely black scutella.

(5) From *Z. doddi* Turn. by the larger size; first recurrent nervure joining first submarginal cell considerably more than three-quarters from base*; antennæ further from each other than from the eyes; hypopygium not produced into a spine at apex; eyes distinctly converging above. This is no doubt the nearest relative.

(6) From *Z. dipteroides* (Turn.) by the smaller size and black color,

(7) From *Z. funebre* (Turn.) by the orange legs, wholly black pronotum, &c.

(8) From *Z. rufipes* Rohwer by the smaller size, black thorax, &c.

In one view, the antennæ of *Z. crassicorne* appear broadly truncate at end.

*It joins the cell 608 microns from base and 128 from apex.

ON SOME CENTRAL AMERICAN DERMAPTERA IN
THE UNITED STATES NATIONAL MUSEUM.

BY MALCOLM BURR, D. SC., LONDON, ENGLAND.

The following notes form a list of a number of Central American Dermaptera submitted to me for study. Although there are no species new to science among them, some of the records of scarce and little known species are of considerable interest.

Diplatys jansoni, Kirby.

Panama—Canal Zone, Paraiso, 5. ii. and 7-10. v., 1911, 2 ♂; 8-9. ii. and 22. iv., 1911, 4 ♀ ♀; 5. ii. and 1. v., 1911, 2 larvæ (Schwarz).

It was formerly suggested that *D. severa* Borm. was a mere melanic form of this species, but the two are undoubtedly distinct. It is desirable that the genital armature of the American Diplatyinae be examined, for which purpose material in alcohol is urgently needed. New genera will probably be required for this and the following species.

Diplatys jansoni superficially resembles a staphylinid beetle.

Diplatys gracilis Stål.

Panama—Canal Zone, Porto Bello, 20. ii., 1913. ♂. (Schwarz.)

This species has not hitherto been recorded from Central America, but only from Peru and Brazil. It is a rare insect in collections. I consider *D. sahlbergi* a mere variant.

Pyragra fuscata Serv.

Mexico—Omealca, V. C. 16. iv., 1908. ♀ and larva. (Knab.)

Guatemala—Dept. Solola, Olas de Moka, 3000 feet., ix., 1908. 2 larvæ. (Engelhardt.)

Echinopsalis guttata Borm.

Panama—Porto Bello, 25. ii., 1911, and Paraiso, 17. i., 1911, both larvæ. (Schwarz.)

Recorded from Nicaragua, Costa Rica and Colombia. It is a rare species.

August, 1914.

Eulabis saramaccensis Zach.

Panama—Canal Zone. Frijoles, 1 ♂; Paraiso, 19. i., 1911, 1 larva; 5. ii., 1911, 1 ♂, "in fruit trap"; 21. iii., 1911, 1 ♂; 3. v., 1911, ♂ ♀. (Schwarz.)

This species has but recently been described by Zacher from Surinam. In nature specimens have probably often been mistaken for *Anisolabis annulipes*.

Psalis americana Beauv.

Panama—Porto Bello, 27. iii., 1912, 2 larvæ. (Busck.)

Labidura riparia Pall.

Mexico—Tampico, vii., 1912, 1 ♀. (Schwarz.)

Spongophora croceipennis Serv.

Guatemala—Dept. Solola, Olas de Moka, 3000 feet, ix., 1908, ♂. (Engelhardt.)

Costa Rica—Tuis. 2400 feet, ♀. (Lankester.)

Purex frontalis Dohrn.

Costa Rica—La Florida, 500 feet. 2 ♀. (Lankester.)

Recorded from Peru and Ecuador.

Purex parvicollis Stål.

Panama—Porto Bello. 25. ii., 1912, ♀. (Schwarz.)

A very scarce species, only known Rio de Janeiro (Stål), and a contemporary specimen in my own collection.

Vosto: similis Borm.

Mexico—Orizaba. 13. iii., 1908. ♀. (Knab.) Vera Cruz, Cordoba. 24. ii., 1908. ♀. (Knab.)

Panama—Canal Zone, Tabernilla. 9. v., 1907. ♀. (Busck.)

This species has remained unrecognized since its description by Bormans from specimens from Colombia. I only know of his original specimens in the Vienna Museum and in my collection.

Vostox insignis Stål.

Panama—Canal Zone, Tabernilla. ♂. (Busck.) Lion Hill. ♂. (Busck.) Paraiso. 20. ii., 1911. ♀. (Schwarz.)

Spongovostox ghilianii Dohrn.?*Panama*—Canal Zone, Paraiso. 5. iv., 1911. ♀. (Schwarz.)*Mexico*—Tampico. vii.; 1912. 1 ♂. 2 ♀. (Schwarz.)**Spongovostox alter** Burr.*Panama*—Canal Zone, Paraiso. 9. ii. and 2. iv., 1911. ♂♂.
(Schwarz.)**Spongovostox apicedentata** Caud.*Mexico*—Aguas Calientes. ♂. (Schwarz.)**Labia curvicauda** Motsch.*Panama*—Canal Zone, Paraiso. 1. ii., 1911. 1 ♂, 2 ♀.
25. iv., 1911. 1 ♀. (Schwarz.)

A cosmopolitan species.

Labia equatoria Burr.*Panama*—Porto Bello. 20-25-26. ii., 1911. 2 brachypterous
and 2 macropterous ♀. (Schwarz.)**Labia bilineata** Scudd.*Panama*—Canal Zone, Paraiso. 5. iii., 1911. ♀. (Schwarz.)**Prolabia formica** Burr.*Panama*—Canal Zone, Paraiso. 1 ♂, 14 ♀ and some
larvæ. Numerous dates, January-May, 1911. (Schwarz.)**Prolabia annulata** Beauv.*Panama*—Canal Zone, Paraiso. 2 ♂, 6 ♀. January-
May, 1911. (Schwarz.). Frijoles, "on flowers of Lengua de
Vacca", ♀. (Schwarz.) Tabernilla. 1. v., 1907. ♂, ♀. (Busck.)
Bohio. 7. ii., 1911. ♀. (Schwarz.) Port Limon. ♂. (Knab.)This species has been discussed in detail by me in Proc. U. S.
Nat. Museum, and I have not altered the opinions there
expressed.**Prolabia arachidis** Yers.*Guatemala*—Champerico. 3. viii., 1908. ♂. (Knab.)**Prolabia mexicana** Borm.*Mexico*—Vera Cruz, Cordoba. 23. iv., 1908. ♀. (Fenyès.)

Sparatta nigrina Stål.

Panama—Porto Bello. 27-28. ii. and 12. iii., 1911. ♂, 2 ♀.
(Schwarz.)

Doru lineare Esch.

Panama—Canal Zone, Tabernilla. 14. vi., 1907. ♀. (Busck.)

Mexico—Vera Cruz, Cordoba. 2-11. iii. and 26. iv., 1908. 3 ♂, 3 ♀. (Knab.)

It is interesting to note that by external characters this genus scarcely differs from *Forficula*, except in the slender forceps and spined pygidium. The validity of the genus is confirmed by a study of the genital armature. The metaparameres are regularly convex externally, straight internally and acute at the apex, which is unusual in *Forficula*.

Doru bimaculatum Fabr. will have to be removed to a distinct genus, as the metaparamera are apically rounded, as in *Forficula*, but it differs in several features from that genus.

Ancistrogaster variegata Stål.

Panama—Canal Zone, Paraiso. 10. iv., 1911. ♀. (Schwarz.)

Mexico—Vera Cruz, Cordoba. 10. ii., 1908. ♀. (Knab.)

Ancistrogaster spinax Dohrn.

Guatemala—Dept. Solola, Olas de Moka, 3000 feet. v., 1908. 1 ♂, 2 ♀. (Engelhardt.)

Vlax toltecus Borm., or **intermedius** Burr.

Mexico—Vera Cruz, Orizaba and Cordoba. 13. ii., 1908. 2 ♀.
(Knab.)

Dinex americanus Borm.

Panama—Canal Zone, Bohio. 7. i., 1911. 2 ♂. (Schwarz); (one is of the form originally figured by de Bormans, the other has the anal points and armature of the forceps scarcely developed). Paraiso. 26. i., 1911. ♀. (Schwarz.) Frijoles, "on flowers of Lengua de Vacca." ♂. (Schwarz.)

Neolobophora ruficeps Burm.

Panama—Canal Zone, Culebra. ♂. (Rousseau.)

A REVIEW OF THE WORK ON THE POISONED BAIT SPRAY, DRY METHOD AND MIXED TREATMENT OF CONTROLLING FRUIT FLIES (TRYPETIDÆ).

BY HENRY H. P. SEVERIN, PH.D., MILWAUKEE, WIS.

(Continued from p. 246).

Olive Fly (*Dacus oleæ* Rossi.).

After the Italian entomologists, De Cillis and Berlese, had demonstrated the effectiveness of the poisoned bait spray to control the olive fly, Chapelle (2 and 3) and Ruby, of France, carried on a series of similar spraying experiments to combat this same pest, and confirmed the results obtained in Italy. The work of the Italian entomologists with the dry method and mixed treatment of controlling the olive fly was also tested by the French scientists.

In 1907 two of Dr. De Cillis' formulas (Table II) were used by the French scientists. As some of the ingredients of these formulas were rather expensive, Dr. Berlese began to experiment along more economical lines, and in 1908 one of his formulas (Table II) was tested. The following table shows the formulas which were used in France from 1907-1909:

TABLE II.

	1907	1907	1908	1909
Molasses (45 to 50% sugar)	65	40	98	90
Honey	31	40	..	..
Sodium arsenate	2	2	2	2
Glycerine	2	..	..	..
Water .....	..	18	..	10

In 1907 the formulas were diluted in the proportion of 10 kilogrammes of the solution to 100 liters of water, but in the next two years 20 kilogrammes of the solution to 100 liters of water was used. The 20% concentration gave the diluted solution a syrupy consistency and consequently a better adherence to the leaves.

The number of applications of the spray, dose per tree and cost, including labour, was as follows:

	1907	1908	1909
Number of applications of spray	5-6	3-4	6
Dose per tree .....	.5-1	.3-.5	.5 liters
Cost of treatment per tree	4-9	1 1/5-1 3/5	4 cents

The first application of the spray was made about fifteen days before the egg-laying period began. The bait was uniformly applied August, 1914.

plied to the interior and exterior of the tree, so that the droplets adhered to the upper and lower surfaces of the leaves. The time required to spray one tree was estimated at half a minute to a minute.

Non-isolated orchards.—During a number of years spraying experiments were carried on in a number of olive gardens which were adjacent to one or more untreated olive plantations, and consequently more intimately exposed to the invasion of the fly. In 1908 three small orchards encircled by neighbouring olive groves were treated. In 1909 a number of orchards composed of about 2,000 trees, and in contact at numerous places with neighbouring olive gardens, was sprayed. In 1907 two non-isolated orchards were sprayed. The first contained about 2,500 trees, and was encircled by olive groves. The second was composed of about 3,000 trees, grouped in a score of orchards, and was situated at the junction of two rivers and rose in a succession of terraces on the side of a hill to an elevation of 600-800 meters. The results obtained are shown in Table III. The two columns of figures under the heading, "olives infested in treated orchard," represent different varieties of olives, the same variety being used as a check under the heading, "olives infested in untreated orchard." Compare the first column of figures with the third, and the second with the fourth.

TABLE III.

Number of trees.	Applications of spray.	Olives infested in treated orchard.		Olives infested in untreated orchard.	
		%	%	%	%
145	4	32.5	40	60.25	80.5
150	4	31.75		62.5	
630	4	7.5	15.5	10.	36.25
2000	6	17	33.8	73.	82.
		Periphery			
		Centre			
2500	5	4	5.6	96	97.4
		Periphery			
		71.2	68		
		Centre			
3000	5	51.25	47.75	89	87.5
		Along river			
		54.3	48.4		
		50-100 meters on hill			
		37.9	29.3	70.1	70.1

From this table it is evident that in the small, non-isolated olive gardens the treatment reduced the infestation between 40 and 50 %. According to the authors, by increasing the number of applications of the spray, the infestation could be reduced still more.

The Italian entomologists obtained excellent results in small, non-isolated olive groves by applying 6-7 sprays. It would be necessary to renew the bait after each heavy rain.

In the large, non-isolated olive groves the central part is protected by the spray, while the fruit along the periphery is generally attacked by the maggot in a proportion which increases according to the nearness of the infested olive plantations not treated.

Isolated orchards.—During a number of seasons Chapelle (2) and Ruby conducted a series of spraying experiments in small, isolated olive gardens. In one experiment 620 trees were sprayed during two successive seasons. This orchard was isolated by about one kilometer (3,280.8 feet) from other olive groves. The results obtained are given in Table VI.

Olive groves containing 10,000 trees were treated with the dry method of control in 1911 (Table VII) and with the poisoned bait spray in 1912. These olive gardens were scattered over a large area, and were owned by a score of proprietors. The vast area of olive trees was well isolated, being situated at a distance of 500-600 meters from the neighbouring olive plantations.

The insecticide was composed of 15 kilogrammes of molasses, $2\frac{1}{2}\%$ of sodium arsenate in 100 liters of water. One application of the spray was made on July 8, just previous to the emergence of the first brood of olive flies, and another treatment was given on September 6, at the time when the second brood of flies were issuing. The second spray was applied to the more exposed parts of the large area of olive trees, only two-thirds of the orchard being treated. One man was able to spray 700-900 trees in a day. Each tree received about .3-.4 of a liter of the bait. The cost of the treatment, including labour, was estimated at 1 cent per tree. The results of examining the crop on October 5 and November 5 are recorded in Table IV.

TABLE IV

	Olives infested in treated orchard.						Olives infested in untreated orchard.					
	%	%	%	%	%	%	%	%	%	%	%	
Oct. 5, 1912	4	2	7			63		57	30			
Nov. 5, 1912	10	6.5	5	9	6	14	60.5	66.5	85.33	75	100 81	

It is unquestionable that the isolation and perfect homogeneity of the olive groves treated contributed to this remarkable success. The authors emphasize the need of co-operation of olive growers in the same vicinity, so that a large area of olive trees may be treated.

The attack of *Dacus* upon olives results not only in the premature dropping of the fruit, but also causes a very serious diminution in the yield of the oil. Figures are given to show that in order to produce the same quantity of oil, the ratio of olives required from untreated to treated trees is about 5-3.

Dr. Cazeneuve (2) declares that mortal accidents have occurred with animals which have eaten sprayed olives or vegetation growing underneath or in the neighbourhood of treated trees. The authors could not confirm any accidents of this kind.

Can arsenic be found in the manufactured oil of olives obtained from treated trees? Chemical tests by Gassend (2) of olive oil obtained from olives taken from trees sprayed 2 or 3 days before the crop was gathered showed traces of arsenic estimated at less than .000001 gr. per liter. Negative results were obtained with the oil when the normal interval elapsed between the last application of the spray and the harvesting of the olives.

The poisoned bait spray has some disadvantages. According to Berlese, the spray stains the olives. The insecticide also stimulates the development of fungi when a low per cent. of sugar is present in the sweet substance, but in order to overcome this difficulty, the bait ought to contain at least 30% sugar (glucose or saccharose). According to the French scientists the fear of propagating fungi with heavy and numerous doses of the spray disappears from the work of 1912. The small quantity of diluted molasses is washed off with the first heavy rains.

Dry Method.

The dry method of controlling fruit flies consists in suspending in the trees, a container holding the poisoned sweets in such a way that the bait is constantly within the reach of the rapidly flying fruit fly. This system would have the advantage of (1)

abolishing spraying and thus warding off the danger from fungi; (2) reducing the cost of labor; (3) overcoming the unfavourable action of rains which wash off the sweet ingredients of the spray and (4) doing away with the inconvenience of lack of water in certain regions. In southern Italy the fruit fly remedy offers a serious difficulty on account of lack of water to dilute the stock solution, but with the dry method of control very little water is used.

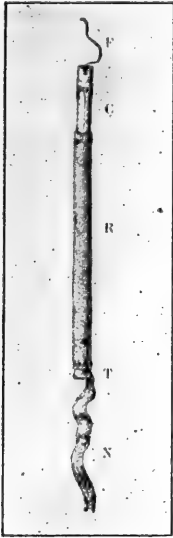


FIG. 23.—Tube containing poisoned molasses; F, suspending wire; C, bamboo; R, roll of blotting paper; T, cork; N, canvas ribbon. (After Berlese).

One system used in France in 1908 and classed under the dry method of controlling the olive fly was to place the poisoned bait in a bottle provided with a cork through which passed a wick. This wick extended into the poisonous mixture and acted like the wick of a lamp. The molasses was slightly diluted with water and mixed with potassium or sodium arsenate (2%).

This dry method of control was used in 232 and 340 trees of two isolated olive orchards. In the olive garden containing 232 bottles, from 5.75 to 6.75% of the olives were maggoty, whereas in an untreated olive grove bearing the same variety of olives, from 6.75 to 22.75% were infested. The results of the second experiment are recorded in table V.

TABLE V.

Method of Treatment.	Number of trees.	Olives infested in treated orchards.		Olives infested in untreated orchards.	
		%	%	%	%
1907 sprayed	340	33.25	9.9	80.75	98.75
1908 bottles	340	8.8	12.6	69.4	79.4
1909 sacs	340	11.34	14.0	40.57	58.33

The results of the last experiment appear most encouraging but it must be noted that this olive garden was well isolated and had been sprayed with success during the previous year; it may be possible that there was a reduction of the pest during the year when this dry method of control was used.

Another system classed under the dry method of control was tried on a small scale in France in 1908 and on a large scale in 1909. This method consisted in suspending in the tree a canvas sac (10-14 inches in length and about 2 inches in diameter), which contained about $1\frac{1}{2}$ lbs. of a mixture of poisoned molasses, sawdust and bran (Fig. 24). The insecticide transudes directly through the canvas and when a rain washes off the bait, the poisoned molasses filters through again. The proportion of the ingredients used in the canvas sacs was as follows:

Arsenical molasses.....	71%
Sawdust.....	21%
Bran.....	8%

An excess of bran gives too much porosity to the mixture and favors evaporation. The addition of water to the molasses accelerates dessication, a thing to avoid most. To lessen dessication it is necessary to tightly stuff the sacs. After filling the bags, drops of liquid ooze out and this loss can be avoided by allowing the sacs to drain over a vessel for several hours or even two days.

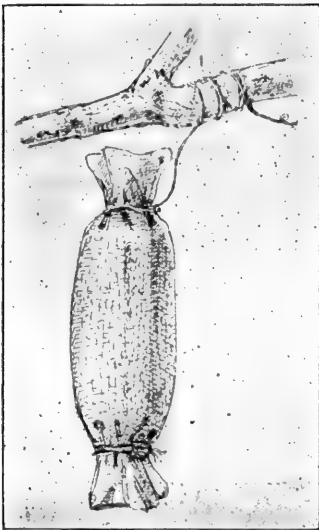


FIG. 24.—Canvas sac stuffed with a mixture of bran and poisoned molasses. (After Berlese).

The sacs thus prepared are placed in the interior of the trees at a region as accessible as possible. Once during the summer, water was added to the bags on account of the sacs becoming dry at their upper end; this was due to the oozing of molasses through the canvas and to evaporation. Later when the first rains and dew of September occur, the atmos-

pheric humidity insures excellent conditions. The cost, including all expenses, amounted to \$4.00 per sac. The results obtained in two isolated olive gardens are given in tables V and VI.

TABLE VI.

Method of Treatment.	Number of trees.	Olives infested in treated orchard.		Olives infested in untreated orchard.	
		%	%	%	%
1907 sprayed	620	7.5	17.5	80.75	98.75
1908 sprayed	620	1.8	1.4	69.4	79.4
1909 sacs	620	16.0	14.0	40.57	58.33

It is evident from tables V and VI that the use of these sacs in isolated olive gardens did not give as good results as the use of the poisoned bait spray during the previous years.

In a non-isolated orchard containing 675 olive trees, each tree was provided with a sac. This orchard had never been sprayed. The results showed that 15 to 32.5% of the olives were infested in this olive garden, whereas in a neighbouring olive plantation bearing the same variety of olives 26 to 39.67% were attacked by the pest. It is apparent that little value can be attributed to this dry method of control in a non-isolated olive grove.

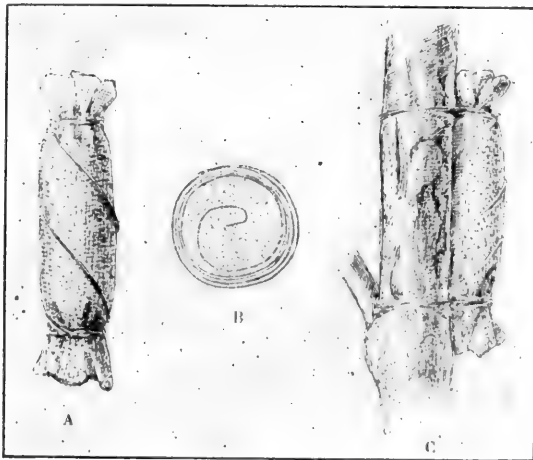


FIG. 25.—A, roll of absorbent paper stuffed with a mixture of bran and poisoned molasses; B, same in section; C, fastened to a branch. (After Berlese).

A third system classed under the dry method of control was to wire to the branches of an olive tree, a sheet-iron or galvanized-

iron pan (about 14-20 inches in diameter; 6-8 inches deep) containing the poisoned molasses. Pieces of rags floating at the surface of the poisonous mixture, enable the insect to come to rest within reach of the bait. Each pan contained about 2 kilogrammes of poisoned molasses (3% arsenate of soda) diluted with a small quantity of water. The evaporation during the dry summer caused the molasses to lose its syrupy state and 2 liters of grape juice were added to each pan. In 1910 this dry method of control was undertaken in two isolated olive gardens. A glance at table VII shows the results obtained,

During this same year, this method was tested on a large scale in Italy under the direction of Dr. Berlese. The results as published by this scientist were most favourable.

In 1911, Chapelle (2) and Ruby repeated the experiment on a large scale. A score of olive groves containing 10,000 trees was selected. This large area of olive trees was isolated by 500-600 meters from the neighbouring olive plantations. The pans were regularly distributed at the rate of 1 for every 40 trees. Each pan contained from 5-6 liters of the following solution:

Molasses.....15 kilogr.
Sodium arsenate..... 3 "
Salt water100 liters

From the beginning of summer up to the first rains of autumn, 6 liters of water was poured into each pan. The results are shown in table VII.

TABLE VII.

	Number of pans.	Number of trees.	Olives infested in treated orchard.				Olives infested in untreated orchard.			
			%	%	%	%	%	%	%	%
1910	13	620	25.66				18.40			
1910	80	3,000	1.66	1			8.0	2.8		
1911	250	10,000	14.1	25	44.67	0	7.0	8.0	1.32	2

According to the figures in the above table the treatment with the use of the pans has no practical value.

The three systems classed under the dry method of control as practised by the French entomologists have not given as satisfactory results as the poisoned bait spray.

(To be continued.)

THE THIRD GENUS OF THE FAMILY ELASMIDÆ (HYMENOPTERA).

BY A. A. GIRAULT, NELSON, N. Q., AUSTRALIA.

The following genus and species was found just too late to be included within the supplement to the Elasmidæ (memoirs Queensland Museum, II., 1913). It was first mistaken for *Euryischia* Howard, the species being characteristic for that genus because of its slenderness and pale legs. The genus differs from *Euryischia* in bearing complete parapsidal furrows, a slender, conical abdomen, and in lacking the prominent projection caudad of the submarginal vein near its apex, moreover the coxæ are not compressed but cylindrical. Otherwise, it is very similar to Howard's genus *in all details* and in general appearance.

Family Elasmidæ.

Euryischomyia, new genus.

Type—The following species:

Euryischomyia washingtoni, new species.

Female—Length, 1.00 mm. Slender, the abdomen conic-ovate.

Jet black and like the species of *Euryischia*, but the legs, except hind coxæ and femora, lemon yellow, also the tegulæ and the fore wings bear a clearly delimited, broad, jet black band across them under the marginal and most of postmarginal veins, the distal margin just reaching apex of stigmal vein, the proximal margin nearly straight; wings otherwise hyaline. Scutum with hardly more setæ than the scutellum which is nearly naked, the few sparse setæ whitish. Thorax finely scaly. Mandibles bidentate, the second tooth broadly truncate. Two ring-joints, the three funicle joints subquadrate, the third wider than long. Bristles under submarginal veins short, not more than two. Submarginal vein entire and continuous. Hind coxæ greatly enlarged, cylindrical, ovate; the hind femora compressed. Tarsi 5-jointed.

Male—The same but the abdomen shorter, more obtuse at apex.

Described from one male, two female specimens captured

August, 1914.

January 8, 1913, by sweeping in forest along the banks of Cape River.

Habitat—Capeville (Pentland), Queensland.

Types—In the Queensland Museum, Brisbane, one male, one female on a slide.

The species is respectfully dedicated to Booker T. Washington.

HORMOMYIA BULLA, N. SP.

BY E. P. FELT, ALBANY, N. Y.

1867. Walsh, B. D., Ent. Soc. Phil. Proc., 6, p. 226.

1894. Brodie, Wm., Biol. Rev. of Ont., 1, p. 74.

1909. Jarvis, T. D., Ent. Soc. Ont. 39th Rep't, p. 83.

1912. Cosens, A., Can. Inst. Trans., 9, p. 317.

The midge, previously unknown, produces a subgobular, yellowish gall, about the size of a large pea, on *Helianthus* leaves. The deformities are about equally prominent on both sides of the leaf and located irregularly, though usually near the mid rib. This species has been recorded from the Province of Ontario by the late Dr. Brodie, and has been reported as common at Evanston, Ill., by Mr. L. H. Weld, who reared the adults described below, July 23, 1907, and who states that the gall occurred commonly at North Evanston, Ill., on plants growing in a deep, black, rich soil along with compass plants. The gall of *H. helianthi* Brodie Mr. Weld reports as very local at Evanston, Ill., it being found by him in September, whereas the gall of *H. bulla* occurs in July. Unfortunately, the account by Walsh gives only an incidental mention of the gall of *H. bulla*, and we are therefore unable to credit him with having characterized the species. The midge is closely allied to *H. helianthi* Brodie, from which it may be readily separated by its smaller size, longer stems of the antennal segments in the male, and the distinctly longer palpi of the female.

Male.—Length 1.5 mm. Antennæ extending to the third abdominal segment, sparsely haired, pale yellowish; 14 segments, the fifth with stems $1\frac{1}{4}$ and $1\frac{1}{2}$ times their diameters, respectively; August, 1914.

the basal enlargement subglobose, the distal broadly oval, with a length $\frac{1}{4}$ greater than its diameter; the basal circumfili extending to the distal third of the basal portion of the stem, the distal circumfili nearly to the apex of the segment; terminal segment slightly reduced, the stem with a distinct swelling near the middle, the distal enlargement broadly fusiform, with a length about twice its diameter, the apex obtuse. Palpi; first segment short, subquadrate, the second greatly produced, angularly curved, slender, with a length fully seven times its diameter (another male has three papal segments, the second and third subequal). Mesonotum reddish brown. Scutellum and postscutellum fuscous yellowish. Abdomen rather thickly haired, dark reddish brown; genitalia fuscous yellowish. Wings hyaline, costa dark straw. Halteres yellowish. Coxæ and femora basally pale yellowish, the distal portion of femora and the basal portion of tibiæ dark straw, the distal part of tibiæ and the tarsi yellowish. Claws slender, evenly curved, simple, the pulvilli as long as the claws. Genitalia; basal clasp segment short, broad, the terminal clasp segment long, tapering to a subacute toothed apex; dorsal plate broad, broadly and triangularly emarginate, the lobes divergent and broadly rounded; ventral plate short, tapering to a broadly rounded apex.

Female.—Length 3 mm. Antennæ extending to the base of the abdomen, rather thickly haired, brownish yellow; 14 segments, the fifth with the stem about $\frac{1}{4}$ the length of the cylindric basal enlargement, which latter has a length about twice its diameter, the distal third with coarsely reticulate circumfili; terminal segment cylindric, with a length over twice its diameter, broadly rounded apically. Palpi; first segment subquadrate, the second twice the length of the first, rather stout, the third $\frac{1}{2}$ longer than the second, fusiform. Mesonotum shining dark brown. Scutellum and postscutellum fuscous yellowish. Abdomen thickly haired, brownish yellow, the ovipositor somewhat fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxæ and legs mostly a fuscous straw. Ovipositor when extended about $\frac{1}{2}$ the length of the abdomen, moderately stout; terminal lobes with a length $\frac{1}{2}$ greater than the width, the apex broadly rounded and sparsely setose. Type Cecid No. 1267.

A NEW SPECIES OF MYMARIDÆ FROM AUSTRALIA.

BY A. A. GIRAULT, NELSON, N. Q., AUSTRALIA.

Genus *Stethynium* Enoch.1. *Stethynium cinctiventris*, new species.Female.—Length 0.80 mm. Habitus of *Anaphes*.

Black, the abdomen with a broad band of silvery-white around its base, occupying nearly a third of the surface; scutum more or less pallid, especially at caudal half, the parapsides and scutellum white. Legs white or nearly, the antenpæ black, the first three funicle joints cylindrical, the second longest, 1 and 3 more or less equal, a third shorter than 2; 6 subglobular, a third shorter than 5, while 4 is a fourth shorter than 5; proximal club joint nearly half of the club. Fore wings rather narrow and graceful, with about fourteen lines of discal cilia across the widest part of the blade, the longest marginal cilia about half the greatest width. Hind wings rather narrow and curved, with five lines of fine discal cilia near tip, the third and fourth lines soon disappearing. Strigil present. Scutellum rectangular, the mesopostscutellum much longer than it and joined to the phragma (two pairs of sclerites between scutellum and postscutellum). Fore wing with a more or less distinct subfuscous stripe across it at about the middle. Valves of ovipositor slightly exerted. Tibial spurs single.

Male not known.

Described from one female captured by sweeping in a jungle pocket, September 3, 1913 (A. P. Dodd).

Habitat.—Nelson (Cairns), Queensland.

Type.—In the Queensland Museum, Brisbane, the above specimen on a slide with the following specimen:

Genus *Anaphoidea* Girault.1. *Anaphoidea galtoni* Girault.

Male.—Funicle joints each a little over twice longer than broad, otherwise like the female.

From one specimen captured with the female type specimen (Roma, Queensland).

August, 1914

GEOMETRID NOTES — WITH DESCRIPTIONS OF NEW SPECIES AND VARIETIES.

BY L. W. SWETT, BOSTON, MASS.

Stamnodes pearsalli, n. sp.

Expands 34 mm. Palpi short, pinkish-tinged; head roseate gray, between the antennæ is a reddish line. Thorax and abdomen fawn-coloured, tinged with reddish. Wings fawn-coloured or grayish brown, with a pinkish tinge in the fringe and on the costa. There are four black patches on the fore wing at the costa; from the body to the first spot the costa is reddish. The first black spot is about 3 mm. from base of wing; between first and second black spots there is a whitish streak, beyond which the costa is grayish. The third spot is about 10 mm. from base of wing and is larger than the others; it is apparently the beginning of a faint black line or shading, which runs out almost at right angles with costa to M_1 , then runs back in a straight line until it reaches the inner margin at about two-thirds out. This line is shaded with white on the outside, and shows as a white patch at the costa, about 1 mm. in width. Beyond, to the outer margin, the wing is fawn without markings, except a fourth black patch near the apex; fringe long and pinkish. I can see no discal spots on hind or fore wings. Hind wings fawn-coloured like fore wings, but without markings. Beneath the markings are much more striking than above. Costa grayish with pinkish striations to the third black spot or about 12 mm. out from base, there is a trace of a faint white line beyond. Near the apex is an oblong gray patch surrounded with reddish striations. At the end near the apex there are two sharp teeth. Perhaps in some specimens this patch might be called triangular. The entire central portion of the fore wings is lightish and rather transparent. On the outer margin, just below apex, is a reddish triangular spot. The hind wings are fawn-coloured, densely striated with red. Towards the outer margin and running for a short distance with M_1 is a red line, running from just above centre of the wing towards outer margin, and fading out just before reaching there. From inner margin another broad, red line runs toward outer margin for about 4 mm., then falls from sight; it is shaded by a white line.

August, 1914.

Holotype.—One ♀ from Mt. Lowe, California, April 11, 1913, received through the kindness of Mr. Harry H. Newcomb.

I take pleasure in naming this species after my friend, Mr. R. F. Pearsall, who has done so much to clear up this group.

Cleora newcombi, n. sp.

Expands 29–30 mm. Palpi short and grayish, head whitish between the antennæ. Fore wings dark gray, heavily striated with black, body and thorax dark gray, the body with characteristic geminate black spots. The basal black band is quite broad on fore wings, starting from a black patch on costa, about 4 mm. out from base, and curving in towards body. The line is geminate with black shading. Beyond this line, about the centre of the wing, a line starts from the black spot on the costa and runs straight across the wing to the inner margin. About three-fourths out from body a third black line runs sinuately across the wing, bending in towards body as it reaches inner margin at about the middle. This black line is accentuated on the veins by black dots. Beyond there seems to be a double row of lunules, gray centred and blackish outside; about the centre of the fore wing at outer margin they form a patch much lighter than the rest of the wing. The discal spot, when present, is very faint. Hind wings of same colour as fore wings, basal band black, running in a regular curve to outer margin, the black discal spot large and prominent. Extra discal black line very close to discal spot; starting from inner margin it curves upward towards discal spot, then suddenly runs straight to outer margin. Quite close to this extra discal line and running parallel to it is another somewhat paler line; beyond there is a clear space, then a curved, wide, black band shaded with whitish and appearing almost as lunules. The scollop of the hind wing is bounded by a narrow black line, fringe long and grayish. Beneath fore wings lighter gray than above, except towards the body and on costa, where it is heavily striated with black. There is a prominent black discal spot, but no further markings, except the black shadings. Hind wings pale ashen with no lines or markings except black discal spot.

Holotype.—One ♂, Venice, Calif., July 11, 1913, H. H. Newcomb.

Paratype.—One ♂, Venice, Calif., May 6, 1913, H. H. Newcomb.

I take pleasure in naming this species after my friend, Mr. H. H. Newcomb, who has rendered me valuable assistance in the way of specimens.

***Sicya macularia*, var. *lewisii*, n. var.**

Expands 26 mm. Palpi a little longer than *macularia*, shaded with pink. Wings shaped much as *macularia*, but with less of a curve below apex, outer margin being straighter. Wings lemon yellow without markings to outer margin, except rosy shading along costa, a minute black discal spot and a red spot on centre of inner margin. A reddish brown line runs from near apex to inner margin beyond this line, the entire outer margin is chocolate brown. Along the median vein there is a chocolate shading, but so pale as to look like a streak. The hind wing is paler than fore wing, a reddish, irregular line runs from inner margin to outer in a curve. Beyond this line the margin is chocolate colour, as the fore wing. Beneath the fore wings are marked as above, with chocolate outer margin. Hind wings have small reddish discal spot, and the outer line appears as spots on the veins, outer margin pale chocolate.

Holotype.—One ♂, Mt. Wilson, Calif., July 11, 1913, H. H. Newcomb.

I name this variety in memory of my father, Lewis Swett, who assisted me in many ways in building up my collection of Geometrids.

This seems to be a distinct species, but *macularia* is so variable it is possible that this is a tendency towards melanism, and I prefer to regard it as a variety.

***Cingilia catenaria*, var. *immacularia*, n. var.**

Expands 40 mm. This variety has the same colourings as to head, thorax and body as the normal form. The wings are smoky white, without any trace of lines, except a black dot close to body, just beyond this is a faint dot on costa, then on median vein and on vein 1A. The edge of the wing has minute black dots at end of veins. Beneath the wings are paler than above, only the black

discal spots showing through. This, apparently, is a rare variety and worthy of name, it is so entirely different from the common *catenaria*.

Holotype.—One ♂, Norway, Maine, S. J. Smith.

All the types described in this paper are placed in my collection at the Museum of Comparative Zoology, Cambridge, Mass.

THE MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The following Resolution was unanimously passed at a meeting of the Montreal Branch and copies have been forwarded by the Secretary to the relatives of the late Henry H. Lyman.

Resolved.—"That the members of the Montreal Branch of the Entomological Society of Ontario have learned with great sorrow, that when the 'S. S. Empress of Ireland' sank on the 29th day of May, she had on board one of our oldest and most active members, Mr. Henry Herbert Lyman, accompanied by Mrs. Lyman, and that both are amongst those who are lost.

From the time that Mr. Lyman joined our Society in 1875 up to the Annual Meeting held last month, in his successive capacities as a Member of the Council, President, Vice-President and Treasurer, he has been so intimately connected with the work we have been able to accomplish that it is difficult to realize and express the extent of the loss we have sustained.

His wide knowledge of the butterflies, both in nature and in literature, his extensive travels to the great museums of this Continent and of Europe, his friendly help and criticism, and frequent hospitality at his late residence 'Thornhill' where so many enjoyable meetings have been held, will long be gratefully remembered; as well as the encouragement in the study of Nature produced by his numerous papers published in the various scientific periodicals, which papers he invariably read first at our gatherings.

We beg to extend to the members of his family the expression of our sympathy in their double bereavement, and assure them that the feeling of loss is not confined to this City, but is shared by Entomologists throughout America and beyond the seas."

GEO. A. MOORE, SECRETARY.

SOME PROCTOTRYPOID EGG-PARASITES OF SUGAR-CANE INSECTS IN JAVA.

BY ALLAN P. DODD, NELSON, N. Q.,
AUSTRALIA.

In a small collection of egg-parasites received from Mr. P. van der Goot, Entomologist, Javan Sugar Experiment Station, Pasoeroean, Java, were three vials containing Proctotrypoidea as follows:—

No. 1.—“Bred from the eggs of *Diatrea striatalis*. Described by Dr. Zehnter as *Ceraphron benificiens* Zehnter.” In “Des Zuckerrohr und seine Kultur,” Kruger, 1899, p. 350, *Ceraphron benificiens* Zehnter is figured. The specimens received agree entirely with this figure, and I have no doubt the specimens received by me are Zehnter's *Ceraphron benificiens*. This species is not a *Ceraphron*, but belongs to the family *Scelionidæ*, subfamily *Telenominæ*, genus *Phanurus* Thomson, and should, therefore, be known as *Phanurus benificiens* Zehnter.

No. 7.—“Reared from eggs of an unknown moth on leaves of sugarcane.” These parasites are the same as the foregoing, namely *Phanurus benificiens* Zehnter.

No. 5.—“Reared from eggs found on sugarcane; eggs enclosed.” The eggs are probably those of a *Pentatomid*. The parasite is herewith described:—

Family *Scelionidæ*.

Subfamily *Telenominæ*.

Genus *Telenomus* Haliday.

1. *Telenomus saccharalis*, sp. nov.

Female—Length 0.55 mm; very small for the genus. Coal black, legs and antennæ golden yellow, last four antennal joints dusky yellow.

Antennæ 11-jointed, scape slender, equal to combined length of pedicel and funicle joints; pedicel much wider and longer than each funicle joint; funicle joints small; first and second funicle joints subequal, longer than wide; third shorter; fourth as wide as long; fifth transverse; club 4-jointed, much wider than funicle, its joints much wider than long, second the widest.

August, 1914.

Forewings narrow, hyaline; when closed extending beyond tip of the abdomen; marginal cilia long, equal to one-third greatest wing width; the discal cilia very fine and dense; submarginal vein attaining the costa at about two-fifths wing length; the marginal vein nearly as long as the stigmal which is oblique, knobbed at tip; the postmarginal twice as long as the stigmal.

Abdomen much narrower and shorter than the thorax.

(From one specimen, two-thirds inch objective, one inch optic, Bausch and Lomb.)

Male—Antennæ 12-jointed, first and second funicle joints small, a little longer than wide; third distinctly longer, as long as pedicel; fourth and fifth subequal, as wide as long; six-nine subequal, wider than long; last joint as long as pedicel.

The male type has the fifth and sixth funicle joints of one antenna, and the sixth and seventh of the other united in one joint.

(From one specimen, same magnification). Described from a ♂ and a ♀, labeled as above.

Habitat—Java.

Host—Eggs of a Pentatomid (?).

Types—In the Queensland Museum, Brisbane, Q'ld, a male and a female on a slide together.

DEPARTMENT OF ENTOMOLOGY—ONTARIO AGRICULTURAL COLLEGE, GUELPH.

After a long connection with the College, extending from his student days to the present year, Mr. Tennyson D. Jarvis has resigned his position as Associate Professor of Entomology and Zoology. He is now living at Grimsby East and devoting himself to the cultivation of a fruit farm. In consequence of this change, the following appointments have been made: Mr. Lawson Caesar, Provincial Entomologist, promoted to be Associate Professor; Mr. A. W. Baker to be Lecturer, and Mr. G. J. Spencer to be Demonstrator. These gentlemen are all graduates of the College and have received the degree of B.S.A. from the University of Toronto.

C. J. S. B.

FIELD NOTES AND QUESTIONS.

(Notes on rare or otherwise interesting captures, habits of insects, etc., will be gratefully received by the editor).

Heliomata infulata Grote. This pretty little Geometer is usually very rare here, perhaps only half-a-dozen specimens having been observed in twenty years, but one day at the end of May 1913, while collecting in a locust thicket I noticed several specimens flying and managed to secure two. A heavy shower came up, compelling me to seek shelter, but after the rain I returned to the spot and captured 20 specimens inside two hours. A few days later I again visited the spot and was likewise disturbed by rain but this proved advantageous as the moth which generally is very shy and swift on the wing, appeared quite sluggish and easy of capture. Eighty specimens were taken in all in a space of about 7 acres. In the surrounding district of 100 acres of apparently the same conditions only a stray specimen or two could be discovered.

Fred Marloff, Oak Station P.O., Allegheny Co., Pa.

How Lepidoptera Winter. We are not infrequently asked in what stage butterflies and moths pass the winter months? It is not an altogether satisfactory answer to say that every one of the four stages is represented, as the enquirer is sure there *must be* some rule and the others be exceptions. In Newman's "Text Book of British Butterflies and Moths" 1913, there are 117 pages devoted to a list of species, giving collecting notes in tabular form and it may be of interest to know how the British species, including the micros figure out, as doubtless in the cooler parts of North America the proportion will be about the same. Counted roughly and omitting species of doubtful occurrence, out of 68 Butterflies, 9 winter as eggs; 38 winter as larvæ; 12 winter as pupæ; 9 winter as imagoes; of 781 moths, 108 winter as eggs; 306 winter as larvæ; 330 winter as pupæ; 37 winter as imagoes; so that about 80% winter either as larvæ or pupæ, almost exactly half of each; 15% as eggs and 5% as imagoes.

A. F. Winn, Westmount, Que.

Sphingidæ at Sugar. While collecting on St. Therese Island, on the Richelieu River, from July 16th to 19th last, several species of hawk moths visited the sugared patches, not resting, but hovering as they do over flowers. Those taken proved to be 6 *Sphinx kalmiæ*, 1 *Ampelophaga chærilus*, 2 *Ceratonia amyntor*.

W. Chagnon, St. Johns, Que.

Notes on the Eggs of Macronoctua onusta Grote.

A female of this moth was picked up from a window sill in the business part of Montreal on September 22nd, and boxed for eggs after being fed on sugar and water. Next morning a little cluster of greenish eggs was on one side of the box but evidently the moth did not like the conditions as she was wandering about, poking her extended ovipositor into all parts of the box and the 11 eggs laid were not deposited in an orderly manner, some being flat, some on their edges others on top of one another.

The moth was transferred to a breeding cage with a supply of leaves of *Iris germanica* from the garden, and at once began climbing up and down the leaves. She soon selected a leaf with a long crack at the base. Into this crack an egg was placed and others were laid alongside of it in a row, the moth remaining in one position merely moving her body. Other eggs were laid during the day between the edges of the leaves where they overlap and this is probably where most are placed in nature to pass the winter.

When laid the egg is pale greenish but in a few days turns purplish. It is very much flattened on top and bottom and may be likened in shape to a vest button. The width is .6mm. and height .27mm., rounded at the edges. The ribs are shallow and show most on the sides. Hatched May 27-29.

Mr. Henry Bird tells me the larvæ will feed on *Gemmingia chinensis* as well as on the various species of *Iris*.

A. F. Winn, Westmount, Que.

SCUTIGERA FORCEPS IN ONTARIO.

In the June number of the "Canadian Entomologist" I notice that Dr. Gordon Hewitt has recorded an occurrence of *Scutigera forceps* in Canada. During the past four or five years I have received several specimens of this Centipede taken in Ontario for identification; two of these taken in Toronto I still have. It is probable that this myriapod is more common than is supposed; for if found by housekeepers it is more likely to be immediately smashed than brought for the attention of naturalists.

C. W. Nash, Provincial Biologist, Toronto.

Bombycia improvisa and *tearlii* Hy. Edw. A correction.

On page 184 of the May number appears a note by Mr. Cockle, which calls for "a correction of a correction." He states that Holland is in error in referring *tearlii* as a synonym of *improvisa*. So far that is correct, but the specimen figured by him on Plate XL, fig. 27 as *tearlii* is neither that species nor *improvisa*, but has been described by Barnes and McDunnough as *fasciata*, (Journ. N. Y. Ent. Soc., XVIII, p. 160, Sept. 1910). Those authors figure both Henry Edwards' species in their "Contributions", Vol. I, No. 4, Plate XII, ff. 4 and 19, and the female type of *fasciata* is shown in fig. 5 of the same plate. *Improvisa* and *fasciata* occur together on Vancouver Island, whence *fasciata* was described. *Tearlii* occurs in Alberta. I should prefer that the above correction were made by others, but proffer this as an alternative.

F. H. WOLLEY DOD, Midnapore, Alta.

BOOK REVIEWS.

THE ENTOMOLOGIST'S MONTHLY MAGAZINE. We beg to offer our our hearty congratulations to the editors of "The Entomologist's Monthly Magazine", (London, England), on the completion of the fiftieth year of its publication. The first number was issued on June 1st, 1864 under the editorial direction of Messrs. H. T. Stainton, R. McLachlan, E. C. Rye, Rev. T.

Blackburn and Dr. H. Guard Knaggs—five of the most distinguished entomologists of the day. The present writer had the good fortune to be in England that year and made the acquaintance of the two first named, and subsequently corresponded with Dr. Knaggs, the author of "The Lepidopterists' Guide" of which three editions have been published. Mr. Stainton, editor of the "Entomologists' Annual" and author of an admirable manual on the "British Butterflies and Moths" and various works on the Tineina, extended the hospitality of his house at Lewisham to entomologists during one evening in the week, everyone being made welcome and given the opportunity of consulting his extensive collections and valuable library. These gatherings led to the formation of many warm friendships and brought isolated workers into touch with the leading devotees of the science.

As time went on the pioneers of the Magazine one by one passed away and their places were filled by others equally able and distinguished, so that the publication has never failed to maintain its early reputation and attractiveness, and we may confidently hope that it will continue for another half century to record the observations and investigations of the insect world for generations to come.

The jubilee number is made especially interesting by the record of its editorial management during fifty years and the portraits of the eight founders and editors.

C. J. S. B.

NEW SOUTH AMERICAN SCIENTIFIC JOURNAL. Prof. Charles E. Porter, occupying the chair of general zoology and applied entomology and also director of the recently established Museum and Laboratory of Economic Zoology at the National Agricultural Institute of Santiago, Chili, has undertaken the publication of a new scientific journal under the title "Anales de Zoologia Aplicada". This journal is to be especially devoted to original studies on species beneficial to and parasitic on man, domesticated animals and cultivated plants in America. The well-known "Revista Chilena de Historia Natural", edited by Prof.

Porter, is being continued, but only for systematic papers. The "Anales de Zoologia Aplicada" will be published quarterly, in 8° on excellent paper, profusely illustrated with text figures and when necessary with plain or coloured plates. The "Anales de Zoologia Aplicada" will accept original contributions on American parasites (Protozoa, Vermes, Arthropoda), which may be in English, French or Spanish. Announcements of books, other scientific periodicals and instruments relating to the subject matter of the journal will be printed on coloured special pages. The director wishes to exchange the "Anales de Zoologia Aplicada" with all special journals of economic zoology and entomology. The subscription price is 25 Francs a year. Advertisements on coloured pages 25 fr. per page for each number. The address of the director of the new journal is:

Prof. C. E. Porter, C.M.Z.S., F.E.S., Casilla 2974, Santiago, Chili.

The enterprise should have all the encouragement possible.

FREDERICK KNAB.

OBITUARY

EDWIN FIRMSTONE HEATH

We regret to record the death of Mr. E. Firmstone Heath, of the Hermitage, Cartwright, Man. For some time he had been ill, but not until the early days of April was he confined to his bed. When medical aid was summoned it was found that his heart was in a very critical condition, and this was accompanied by congestion of the lungs. After five weeks of intense suffering he died on May 14th, 1914.

Mr. Heath was born at Standhill, Kingswinford, County of Stafford, England, on August 9th, 1840. He was the eldest son of the late Edwin Heath of the 88th Regiment (Connought Rangers). He inherited a love for entomology from his father, and at an early age began to form a collection of insects. For the last 25 years he studied the insects of Manitoba, more particularly the Lepidoptera. He was a most enthusiastic collector, and brought together a representative collection of the Lepidoptera of that province. The late J. B. Smith corresponded regularly with him

and determined many of his specimens of Noctuidæ. Many of these collected at Cartwright, Man., were described as new species by Dr. Smith. For many years Mr. Heath was a valued correspondent of the late Dr. James Fletcher, and it was through Dr. Fletcher that the writer became acquainted with him. I have been in constant communication with Mr. Heath, particularly with regard to important captures, records of which have been included in the "Entomological Record", published annually in the Report of the Entomological Society of Ontario. Like other Canadian entomologists, I have always found him a most enthusiastic collector and an exceedingly interesting correspondent. I shall indeed miss his friendly and helpful letters.

Mr. Heath was a regular contributor to this journal, his papers being chiefly records of Lepidoptera occurring at Cartwright. Many of these were new records for the province.

The last article he published appeared in the April, 1914, issue of the Canadian Entomologist, and was entitled, "A Phalangid Drinks Milk".

A. G.

The following note was received from the late Mr. E. F. Heath about a year ago, but by an oversight its publication has been unduly delayed.

THE EDITOR OF THE CANADIAN ENTOMOLOGIST,

Dear Sir:

On the night of the 8th inst. (1912), I captured at my "sugared" trees a specimen of *Thysania zenobia* Cram. in very good condition. I can only account for its appearance on the supposition that it must have come north, in the pupal stage, in a bunch of bananas, or by some such means. That I should get it is the more extraordinary for I lie between three villages, the nearest being four miles distant, and the other two, six and seven miles respectively.

Yours faithfully,

E. FIRMSTONE HEATH.

The Hermitage, near Cartwright, Man.

Mailed August 14th, 1914.

The Canadian Entomologist.

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LONDON, SEPTEMBER, 1914

No. 9

NOTES ON MYRIAPODS FROM DOUGLAS LAKE, MICHIGAN.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

The Chilopods and Diplopods here listed and described were all collected near the University of Michigan Biological Station at Lake Douglas, Mich., during July and August, 1913, by Mr. G. F. Sutherland, by whom they were sent to the writer for identification. All the specimens were taken from decaying logs.

The new *Nampabius* is represented by numerous individuals of both sexes. It is the largest known species of the genus and is geographically the most remote from what seems to be the centre for the group. Its habits would seem to correspond with those which I have noted for various other species in the genus, these having similarly been taken in greatest abundance under the bark of decaying logs.

Judging from the number of individuals in the collection, the new *Parajulus* is much the most common species of the genus occurring in the decaying logs at Douglas Lake. It is a strongly marked species, easily distinguishable from others known to occur in the region.

Class CHILOPODA.

1. *Geophilus rubens* Say.

This widespread species, at once distinguishable from others of the region by the characteristic geminate black stripe along dorsum, is represented in the collection by numerous specimens.

2. *Linotænia chionophila* (Wood).

Also a very common and widespread species in the Northern United States and in Canada. In the collection are three adults and three very young specimens.

3. *Bothiopolys multidentatus* (Newport).

A species common throughout the Middle Western and the Eastern States. Many specimens.

4. *Nadabius iowensis* (Meinert).

A species very common in the Middle West. About a dozen specimens.

5. *Sonibius bius* (Chamberlin).

Previously known from Saunders in the upper peninsula. Two specimens.

6. *Nampabius michiganensis*, sp. nov.

Dorsum from light brownish yellow to brown of dilute chestnut caste, the caudal plates commonly darkest. Head darker, more distinctly chestnut. Antennæ like head; the colour becoming denser and more reddish distad. Prosternum and prehensors somewhat lighter than head, but decidedly darker than venter, which is yellow or brownish yellow and darker caudad or usual. Caudal legs darkest.

Body conspicuously narrowed cephalad from eighth plate. Widths of head and of first, third eighth, tenth and twelfth plates to each other as 47: 41: 45: 56: 55+; 54.

Head slightly wider than long (47:45) comparatively rather wide cephalad. Caudal margin mesally incurved. Two short longitudinal furrows on caudal portion, these moderately diverging cephalad.

Antennæ short, but somewhat longer than in most related species. Uniformly and considerably attenuated distad, the terminal portion slender. Articles freely joined; sides straight; short, decreasing regularly from the second distad. Ultimate article distinctly shorter than the two preceding together.

Ocelli mostly 10 to 12 in 3, or, less commonly, in 4 series; e.g., 1+4, 4, 2; 1+4, 4, 3; 1+1, 4, 3, 2, the ocellus of the top row in this case being at anterior end of patch. Single ocellus much largest, the others decreasing regularly and considerably cephalad. Organ of Törnösvary in outline small; below anterior end of eye patch.

Prosternal teeth acute, subequal, sides straight, the interval well rounded; line of apices recurved. Sinus wide at bottom as usual; its sides rather long, moderately converging. Sides of anterior portion of prosternum straight or nearly so, slanting directly from spine, 1.47 times wider than long in type. Distance between chitinous spots 2.57 times width at level of bottom of sinus, 4 times the dental line.

First dorsal plate in type 1.64 times wider than long. Eleventh and thirteenth plates, but especially the latter, with posterior angles very slightly produced as usual.

Coxal pores mostly 2, 3, 3, 2; 2, 3, 3, 3 or 3, 3, 3, 3.

Spines of the anal legs, $\frac{0,0,2,0,0}{0,1,1,1,0}$, claws 2; of the penult, $\frac{0,0,2,0,0}{0,1,1,1,0}$, claws 2; of the thirteenth, $\frac{0,0,2,1,0}{0,0,1,1,1}$; of the twelfth, $\frac{0,0,2,1,1}{0,0,0,1,1}$ or $\frac{0,0,2,1,1}{0,0,1,1,1}$; of the sixth to eleventh, $\frac{0,0,0,2,1}{0,0,0,1,1}$; of the third to fifth, $\frac{0,0,0,1,1}{0,0,0,1,1}$; of the second, $\frac{0,0,0,0,1}{0,0,0,0,1}$; of the first, $\frac{0,0,0,0,0}{0,0,0,0,0}$.

Claw of the female gonopods of the usual tripartite form, the teeth acute, the median longest and the lateral subequal. Basal spines decidedly broader than usual, much as in *Tidabius*, those of each pair close together; moderately long. Outer spine longer and broader than the inner; its sides subparallel from base to apical division, which is short and acute, or weakly incurved at middle; edge of apical portion usually finely crenulate. Inner spine of similar shape to that of the outer or with sides sometimes converging from base to apical portion.

Length 7—10 mm.

This species is very distinct from any previously known. It is aberrant in a number of features, such as the large single ocellus and the broad basal spines of the female gonopods. It is the largest known species, and the one farthest from what seems to be the centre of distribution for the genus. The process on the penult legs of the male is much like that of *virginiensis*; but *michiganensis* differs clearly from that species in its much greater length, which is about twice that of *virginiensis*, in the spining of the legs, and in the form of the basal spines of the female gonopods. *N. fungifuopes*, the species that has been taken geographically nearest to it (Western New York), is readily separable from it, as from all others now known, in lacking dorsal spines on the posterior legs; also the form of the process on the penult legs of the male is distinctly different.

Many specimens of this species were taken.

Class DIPLOPODA.

7. *Polyzonium rosalbum* (Cope).

One specimen.

8. **Spirobolus marginatus** (Say).

One adult and one immature specimen. A widespread form.

9. **Parajulus venustus** (Wood).

A form common in the region. Three specimens.

10. **Parajulus canadensis** (Newport).

A species common in the North-Eastern States and Canada. Six specimens.

11. **Parajulus**, sp. Jr.

Two very young specimens of uncertain species.

12. **Parajulus dux**, sp. nov.

General colour brown, often very light. A distinct longitudinal median dorsal black line which is commonly interrupted. The usual series of black spots over the repugnatorial glands, but each spot embracing one or more light areas, and so often inconspicuous. A dark transverse line across dorsum and connecting the two lateral spots of each segment. Also below the spots a dark line or band is more or less developed; this band is areolated with light spots and is often inconspicuous or scarcely evident. A broad black band across anterior border of first plate, anal scutum often blackish. Eyes black. Antennæ dusky brown to black, the distal article commonly pale. A solid black band between antennæ with a light spot in each end near antennæ. Vertex marked with close network of coarse dark lines. Lower part of head dusky, more or less areolated with light dots; a larger light area below each antennæ and along labial margin, above which and ectad of lateral light areas there is commonly a dark band.

Sulcus of vertex fine, ending near upper level of eyes. A deep setigerous foveola on each side of anterior end of the sulcus, the female sometimes more or less extended laterad.

Eyes large, subtriangular, but the sides convex. Ocelli mostly between 42 and 52 in 7 to 9 transverse series, e.g.:

7, 7, 7, 6, 6, 5, 3, 1; 9, 9, 8, 7, 6, 5, 3, 1.

First dorsal plate with lateral border rounded, not at all angularly produced. Distinctly but not strongly margined. Two striæ across lateral ends and a number of less deep short ones above these across caudal border.

Second segment deeply striate ventrally and over lower portion of sides, the striæ well separated above, but closer together

ventrally. Succeeding segments also similarly deeply striate, the striae coarse and well separated above, nearer together ventrally, not occurring above level of dark repugnatorial areas.

Repugnatorial pore small, in most segments a considerable distance removed from the suture, which at its level is straight or only slightly and broadly excurved.

Anal tergite with tip acute and spinous, clearly exceeding the valves, distally weakly and evenly decurved, but by no means so strongly or angularly as in *canadensis*.

Anal valves not mesally distinctly margined, at most broadly somewhat raised, the border crossed by transverse striae.

Anal scale with caudal margin widely convex; mesally slightly indented.

Mandibular stipes in male concavely excavated; produced caudad below the excavation.

Promentum of gnathochilarium in male much enlarged as usual; elliptic in outline.

First legs in male strongly enlarged as usual; uncinata; penult article conspicuously crassate proximally, though less so than preceding article, and narrowing much distad, its inner side nearly straight.

Second legs of male with coxæ much enlarged and produced mesally into a long linguiform process, which is broadest proximally and narrows distad, though widening a little at very end, which is truncatè. Legs reduced as usual.

Anterior division of first gonopods of male broad, clavate, distally rounded, in lateral view concealing wholly, or nearly so, the caudal division, which is somewhat shorter than the anterior and narrows strongly distad except at tip, where it enlarges again a little and is distally subtruncate.

Posterior gonopods in ventral view almost concealed by the first, above which they do not rise. Each curves mesad near level of distal end of first gonopods and then proximad. A semi-membranous pointed blade-like branch arising from base and a little surpassing posterior branch of first gonopods.

Number of segments 44, or near that number.

Length: 25—32 mm.

In the general superficial appearance of the gonopods this species resembles *P. canadensis*; but the posterior division of the

first gonopods is shorter and is distally truncate, while the second gonopods are more decidedly different. *Canadensis* is a darker species which may be at once distinguished in both sexes from the present one by the much longer and more strongly and abruptly decurved spinous tip to the anal scutum. The wide separation of the small repugnatorial pore from the suture is a characteristic of importance.

This species is represented in the collection by numerous specimens.

13. **Polydesmus serratus** Say.

Polydesmus canadensis Newport.

This common *Polydesmus* is represented by numerous specimens.

14. **Branneria carinatum** Bollman.

Two specimens; the first to be added to the few specimens in the collection of the author of the species.

SOME NOTES ON PARASITISM OF CHRYSOPIDS IN SOUTH CAROLINA.

BY E. A. MCGREGOR,
Bureau of Entomology, Washington, D. C.

In 1890 Dr. Howard published notes on "The Parasites of the Hemerobiinae."* In this article the author records *Telenomus* sp. as an egg parasite of "either *Chrysopa* or *Hemerobius*." As secondary parasites reared from larvæ or cocoons, † he mentions *Hemiteles hemerobiicola* Ashm., *H. rufiventris* Riley and *Mesochorus (?) chrysopæ* Ashm. At that time Doctor Howard prophesied that several species of the proctotrupid *Helorus* would eventually be found to be primary parasites of Chrysopids. This prediction has been substantiated by the present writer's work. Moreover, the two rearings of *Isodromus iceryæ* at Batesburg, as indicated in Table II, add additional proof to Dr. Howard's

*Proc. Ent. Soc. of Wash., Vol. II, pp. 123-124.

†Since first preparing this paper on Chrysopid parasites, all of which had been bred from cocoons, we have been able to conduct some observations on Chrysopid eggs. In all 93 eggs were collected, and from these were bred 7 parasites—all of the species *Telenomus chrysopæ* Ashm. Computed on the basis of 7 parasitized eggs out of 93, an estimated egg parasitism of 7.5% is found to obtain. The total parasitism, then, from species issuing from the egg (7.5%), and from species issuing from the cocoon (48.4%), is computed to be about 55.9%.

belief that the species was erroneously described as a parasite of *Icerya purchasi* and is in reality a true parasite of Chrysopids.

Certain studies of red-spider predators were conducted at Batesburg, South Carolina, during the season of 1913, and it was noticed that a considerable percentage of the Chrysopas were parasitized.



Fig. 26—Apical portion of cotton plant, showing the characteristic location of Chrysopid cocoon at C.

that the Chrysopas in cotton fields pupate very characteristically in the apical buds at the very terminal portion of the stalk. The pubescence of the nascent foliage at this point is densely concentrated and of a grayish appearance, thus approximating the texture of the cocoon and affording considerable protection for it. This is shown in the accompanying figure. Of course, occasional cocoons are found in other locations, as, for example, within the involucre bracts of "squares" or in the convolutions of leaves. These are exceptions.

All of the several lots of Chrysopid cocoons collected were observed daily until they either produced adults or parasites, or until they clearly indicated that they were not going to give issue to anything. The final summary of results from this detailed study—in the case of the largest lot—is shown in Table 1.

TABLE I.—Estimated Parasitism of Chrysopids.

Chrysopid cocoons observed.....	99
Cocoons yielding Chrysopids.....	51
Cocoons yielding parasites.....	48
Percentage of parasitism.....	48.4%

A lot of about 100 bred Chrysopids were determined by Mr.

In order to determine the approximate percentage of parasitism of these very beneficial insects Mr. F. L. McDonough, of the Bureau of Entomology, and the writer, collected a large series of cocoons from cotton plants growing in the fields. Adults from these cocoons were reared in the laboratory under conditions as nearly normal as possible.

It is worth recording, since we have never noticed it in print,

Nathan Banks, and it developed that there were three species present: *Chrysopa rufilabris* Banks, *C. nigricornis* Burm., and *C. oculata* Say. The great majority of the specimens were *rufilabris*, while but a few individuals of *oculata* and *nigricornis* were present. The superficial appearance of the three species is much alike, and undoubtedly the habits and life histories are likewise in the main the same.

Mr. J. C. Crawford, who has kindly determined the parasite material, states that the collection, which embraces several hundred specimens, is the most extensive that has been obtained from lace-winged flies. He has also determined that three of the species are new to science, and that their descriptions are now in the course of preparation by him. The following table lists the species in the relative order of abundance and indicates the maximum and average number of individuals issuing from a *Chrysopa* cocoon in the case of each species.

TABLE II.—Relative Abundance of Parasites.

Number of lots.	SPECIES.	Maximum No. per lot.	Average No. per lot.
20	<i>Chrysophagus compressicornis</i> Ashm	20	10
15	<i>Perilampus</i> sp.....	1	1
10	<i>Gonicercus</i> sp.....	18	9
2	<i>Isodromus iceryae</i> M.....	3	3
2	<i>Orthizema atriceps</i> Ashm. (1).....	1	1
1	<i>Helorus</i> sp	1	1

(1) Ichneumonid determined by R. A. Cushman.

It is of interest in this connection to record that *Chrysophagus compressicornis*, in addition to being reared frequently from Chrysopids, was reared upon one occasion from an undetermined *Syrphid* pupa. Likewise, from this same *Syrphid* species, were reared the Chalcidoid flies—*Pachyneuron allograptæ* Ashm., and *Syrphophagus mesograptæ* Ashm.

A REVIEW OF THE WORK ON THE POISONED BAIT SPRAY, DRY METHOD AND MIXED TREATMENT OF CONTROLLING FRUIT FLIES (TRYPETIDÆ).

BY HENRY H. P. SEVERIN, PH. D., MILWAUKEE, WIS.

(Continued from p. 284).

Mixed Treatment.

The mixed treatment is a combination of the spray and a dry method of control. The object of this method is to reduce the number of applications of the spray. One sac was placed in every fifth tree. Two applications of the spray were made during the entire season. The following formula was used:

Molasses.....100 kilogr.
Sodium arsenate..... 2 ..

This stock solution was diluted by adding 100 liters of water to 15-20 kilogrammes of the poisoned molasses. About 1 pint of this solution was applied to a tree. The cost of the mixed treatment amounted to \$2.00 per tree. This method was carried on during three successive seasons and the results are recorded in table VIII.

TABLE VIII.

	Number of trees.	Olives infested in treated orchard.		Olives infested in untreated orchard.	
		%	%	%	%
1909	550	2.5	2.0	45.0	69.0
1909	140	60.66		97.34	
1910	1200	22.85	22.29	86.8	62.0
1910	140	20.4		48.7	
1911	400	57.5		81.5	90.0

The difference in favour of the mixed treatment is apparent, but not satisfactory in all cases. The authors state that the poisoned bait is not so effective in olive gardens containing cultivated shrubs or where the olive grove is near a wood, for the olive fly probably secures shelter and nourishment from the nectar of flowers and sweetened exudation of herbaceous organs. On the other hand, in localities where the orchard is isolated and contains only olive trees, the fly is content with its shelter and seeks nourishment here, and the poisoned bait then produces its maximum effect.

Table VIII shows the effect produced by omitting the treatment for one year. In 1909, from 2 to 2.5% of the olives were maggoty from 550 trees which had received the mixed treatment. In 1910, the same 550 trees which are now included in the 1,200

trees again received the mixed treatment, and from 22.29 to 22.85% of the olives were infested. In 1911, the 550 trees were used as a check or control and 81.5% were infested.

Mexican Fruit Fly (*Anastrepha ludens* Loew).

While working on the control of the Mexican or Morelos orange worm, Betanzos (1) discovered the usefulness of a common poisonous Mexican herb (*Haplophyton camicidum*). A decoction was made by boiling about two pounds of the herb cut fine in 3 gallons of water. After the herb was thoroughly boiled, about 2 pounds of sugar was added, and the whole was then strained and used as a spray. Rangel (1) obtained very satisfactory results from the use of this preparation in combatting the Mexican fruit fly.

Apple Maggot (*Rhagoletis pomonella* Walsh).

O'Kane (16) used a mixture of arsenic, molasses and water to control the apple maggot in New Hampshire. He writes: "Through the co-operation of growers this plan of spraying was tried at several different points. In most the results were negative. It seems probable that in these instances the possible value of the treatment was obscured by the proximity of other infested trees not so treated. Also owing to the pressure of other work the grower was unable to apply the spray as often as would be needed in order to keep the poisoned sweet ready for the flies throughout their egg-laying season. In one instance, however, the treated tree stood alone, and this tree was given repeated sprayings as primarily planned. The variety was August Sweet, and the fruit had been worthless for years. This tree yielded this season practically perfect fruit.

"There is sufficient reason, therefore, for making further tests of this treatment next season. To this end certain trees or blocks of trees have been selected, and the proper conditions provided to insure definite tests next season."

In 1911 experiments were conducted at the Maine Agricultural Experiment Station to control the apple maggot. Johannsen and Patch (8) write: "Our own experiments made this season upon two Talman sweet apple trees, using a spray of arsenate of lead and brown sugar in solution, gave discouraging results."

In 1912, Illingworth (6) published his results obtained with

the poisoned bait spray to control the apple maggot in New York. In 1911, he used the following "fly destroyer" as given by Merck to control the apple maggot.

	Parts.
Syrup.....	4 or 4 pts.
Potassium arsenate.....	1 or 1 lb.
Water.....	.45 or 45 pts.

Two applications of the bait were made on July 22 and 26, about a pint being sprayed to the lower branches of a 20-year-old apple tree. In a table the author gives a daily record of windfalls from a treated tree and the number of larvæ which bored out of the fallen fruit. All the windfalls collected under the baited tree after August 15 to the end of the season were absolutely free from larvæ. From an untreated tree of the same variety in another orchard, 180 drops were gathered on August 23; from these apples larvæ emerged during September, while 115 drops of the same date from the treated tree failed to show a trace of a single maggot. The author concludes, "Hence it is quite evident that the flies deposited no eggs in the fruit of the sprayed tree after the application of July 26."

In 1912, Illingworth used the following formula:

Molasses.....	1 lb. or 25 lb.
Arsenate of lead.....	3 oz. or 5 lb.
Water.....	.4 gall. or 100 gall.

Five applications of the spray were made. The author states, "In the spraying experiments during 1912 most gratifying results were obtained." No mention is made of the number of trees treated and no data are given as to the per cent. of fruit infested of the treated and control trees.

The author's observations indicate that the codling-moth spray of arsenate of lead alone may control the apple maggot if applied thoroughly to the fruit.

Ross (17) tested two spray mixtures, one composed of arsenate of lead, glycerine and molasses, and the other Paris green, glycerine and molasses, but neither yielded satisfactory results in the control of the apple maggot in Ontario.

Cherry Fruit Flies (*Rhagoletis cingulata* Loew. and *Rhagoletis fausta* O. S.).

In the season of 1912 Illingworth (7) adopted similar control measures against the cherry fruit flies. The orchard was four

rows wide and sixteen long, and had never been sprayed before. For several years the cherries in this orchard had been badly infested, and the previous year the fruit was not picked at all, due to the serious infestation of the pest. The following formula was used:

Molasses.....	1 pt.	or	3 gall.
Arsenate of lead.....	3 oz.	or	5 lb.
Water.....	4 gall.	or	100 gall.

Two applications of the bait were made on June 10 and 24. Eleven rows were sprayed and five rows were used as a check. The fruit of the unsprayed trees showed an infestation of fully one-third of the crop, while only one-sixth of 1% was wormy on the treated trees. The sprayed fruit showed also a noticeable lack of brown-rot and of curculio injury.

As in the case of the apple maggot, there is some evidence that arsenate of lead alone, without sweetening, may prove effective against the cherry fruit flies. "Fruit free from the pest resulted in one orchard from merely making two applications of the codling-moth strength (4-100) during the period when the flies were emerging. Although this experiment is not very conclusive, since no checks were left, it indicates clearly the value of spraying cherries."

Currant or Gooseberry Fruit Fly (*Epochra canadensis* Loew).

Lovett (10) attempted to control the currant or gooseberry fruit fly with Mally's formula (Table I, 1908) of the poisoned bait spray. No conclusive results were obtained, but the following brief summary of the season's trials is given:

1. The sweetened poison does attract the fly.
2. Frequent rains during the period of experimentation made numerous applications necessary.
3. "Granulated sugar is rather expensive; it crystallizes quickly and is not so satisfactory as a cheaper brown sugar would probably be."
4. "The crop was injured one half in many localities, and in a few cases the fruit, due to the maggot's attack, was not worth gathering."

Imported Onion Fly (*Pegomya cepelorum* Meade).

We have experimented with the poisoned bait spray to control the imported onion fly under Wisconsin conditions. Sodium

arsenite was used instead of arsenate of lead. Different quantities of a number of brands of arsenate of lead were used, but many onion flies were still alive at the end of a week, even though the bait was renewed daily. The following formula was used:

Molasses	¼ pt.	
Sodium arsenite.....	¼ oz.	(dissolved in boiling water).
Water.....	1 gall.	

The results obtained against the second brood of the pest were most encouraging in a somewhat isolated onion field. As the season's work was started too late to test the effectiveness of the poisoned bait against the first brood of the pest, which is probably more difficult to combat on account of the frequent spring rains which wash off the spray, no definite conclusions can be drawn from the good showing that the spray has made against the second brood.

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A NEW JULUS FROM CALIFORNIA.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

Specimens of the new *Julus* here described have been received for identification from Assistant Secretary Leroy Childs, of the California State Commission of Horticulture. Mr. Childs states that it is very common in the southern part of California and that it is reported as inflicting serious injury to tender vegetables, such as young lettuce. The writer has taken it near Santa Barbara. The types are from Los Angeles.

***Julus hesperus*, sp. nov.**

This species has the size and, to some extent, the general appearance of *J. virgatus* Wood, though it is less slender and lacks the conspicuous median dorsal black line so characteristic of the latter species.

The paler individuals are brown, with the usual series of black spots along each side. Specimens in full colour have the



FIG. 27.—*Julus hesperus*, male, left leg of first pair, mesoventral view.

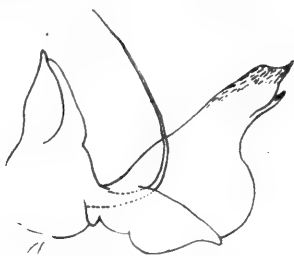


FIG. 28.—*Julus hesperus*, male, gonopods, cetal view.

background typically darker brown or obscure chestnut, with the sides dusky or black, excepting the head and several anterior segments, which are usually light brown, as the last several segments may also be; the wide dark lateral bands embracing the rows of spots leave between them a narrow median dorsal light stripe.

Head with sulcus across vertex sharply impressed, the sulcus terminating anteriorly in a broader, shallow transverse furrow on a level with the dorsal edges of the two eyes. Setigerous foveolæ not evident.

Antennæ slender, clavate, a little shorter than width of body.

Eyes distinct, subtriangular. Ocelli in types from 17 to 20 in 5 or less commonly 4 series, e.g., 5, 5, 5, 3, 2; 5, 5, 4, 3, 1.

First dorsal plate with lower caudal corner rounded or weakly obtusely angular on ventral side; striate below. Other segments striate above and below cephalad to suture; striæ distinct, moderately spaced. Repugnatorial pore circular; tangent to suture, which is not at all angulate.

Anal scutum obtusely angular, simple. Valves not at all or only very obscurely margined. Anal scale simple, with the caudal margin convex.

First legs in male small, strongly bent or hamate, as shown in the accompanying figure.

Gonopods of male concealed. The two pairs widely divergent; anterior ones moderately short; those of the posterior pair contiguous, bilobate. Flagellum very long (see figure 28).

Segments in types 35 to 41.

Length, 11—15 mm.

 SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE
 GENUS *CAPITONIUS* BRULLE.*

BY S. A. ROHWER, WASHINGTON, D. C.

The North American species which are here placed in the genus *Capitoni* have been referred to a number of genera, as may be seen from the bibliography of the species which follows.

Szepliget (Gen. Insectorum, Braconidæ) states that all our species belong to the genus *Cenocoelius* Westwood. According to the type species, as indicated by Viereck, Bull. 83, U. S. Nat. Mus., *Cenocoelius* Westwood is founded on *flavifrons*, which is not yet characterized, but *Cænocoelius* Marshall is synonymous with *Capitoni*. *Capitoni* having priority is used for our species. It may be possible by comparison with the type of *Capitoni* to differentiate the North American species into a different generic group, if certain Neotropical species are typical *Capitoni* of the Neotropical region, but sufficient material is not available for such study. From the material and notes available it is evident that the species of the genus *Capitoni* are parasitic on wood or bark boring Coleoptera, and from the notes it seems that they are all internal parasites pupating after destroying the host within a cocoon in the larval gallery. The following host relations seem to be thoroughly established for the North American species:

Liopus alpha and *Liopus fascicularis* in sumach—Parasitized by *Capitoni ashmeadii* and *Capitoni provancheri*.

Leptostylus (either *macula* or *collaris*) in chestnut—Parasitized by *Capitoni leptostyli*.

Lepturgus facetus in chestnut—Parasitized by *Capitoni provancheri*.

Goes oculata in *Oxydendrum arboreum*—Parasitized by *Capitoni nigrisoma*.

Micrasis in hickory—Parasitized by *Capitoni provancheri*.

Synoxylon in hickory—Probably parasitized by *Capitoni caryæ*.

Saperda candida in elm—Parasitized by *Capitoni saperdæ*.

*Contribution from the Branch of Forest Insects, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.

Table to the Species.

- Abdomen rufous; head and thorax black.....1.
 Abdomen and thorax black.....4.
1. First tergite smooth, the embossed area only indicated
 basally*erythrogastra* Rohwer.
 First tergite more or less striate and with a rather well-defined
 embossed area.....2.
 2. Embossed area of the first tergite not well defined; the striæ on
 the first tergite not extending beyond the
 middle.....*carya* Rohwer.
 Embossed area of the first tergite defined by strong carinæ,
 which extend beyond the middle of the tergite.....3.
 3. Notauli not foveolate.....*sanguiniventris* Ashmead.
 Notauli strongly foveolate.....*saperdæ* Ashmead.
 4. First tergite entirely without sculpture.....5.
 First tergite usually strongly sculptured and always with some
 sculpture at the base.....6.
 5. Legs uniformly pale testaceous; median depression of the
 anterior portion of the prescutum well defined, but without
 defining lateral carinæ.....*leptostyli* Rohwer.
 Legs black or piceous; the median depression on the prescutum
 broader and shallow and with well-defined lateral
 carinæ.....*nigrisoma* Rohwer.
 6. Prescutum sculptured like the scutum; first tergite with strong
 carinæ basally, without other sculpture..*tenuicornis* Rohwer.
 Prescutum more closely sculptured than the scutum; first
 tergite not so.....7.
 7. First tergite with strong carinæ, which reach the apex of the
 segment, but with no predominating median
 rugæ.....*ashmeadii* (D. T.)
 First tergite with the striæ laterally which never reach the
 apex of the segment and with a predominating median stria
 or shining median area separating off a subembossed
 area.....*provancheri* Rohwer.

Capitonus erythrogastra, new species.

Female.—Length 5 mm. Head broad as the thorax; posterior orbits broad; median portion below the antennæ with distinct

punctures which are separated by about twice the width of a puncture; the clypeus, the sides, the front and occiput shining, impunctate or with very sparse, separated punctures; third antennal joint but little longer than the fourth; mesonotum shining, practically impunctate; notauli strongly foveolate; the suture between the scutum and scutellum with three strong rugæ; propodeum strongly reticulate, the dorsal surface with two narrow, transverse impressions; first tergite without sculpture. Black; head and thorax densely clothed with long white hair; legs rufous, the bases of the four anterior femora and the posterior tibiæ piceous; abdomen rufous; wings dusky hyaline, venation black.

Morgantown, West Virginia. Described from two females (one type) collected by A. D. Hopkins, and recorded under W. Va. Agricultural Experiment Station Number Hopk. W. Va. 7790b, and from one female (paratype) from Tryon, North Carolina, collected by W. F. Fiske, and recorded under Bureau of Entomology Number Hopk. U. S. 1645c.

Type.—Cat. No. 18277, U. S. N. M.

Capitonius caryæ, new species.

Female.—Length 5.5 mm. Closely allied to *erythrogastra*, but may be distinguished from that species by the characters in the foregoing table, in having the propodeum rufous, the legs black except the rufous hind femora.

Tryon, North Carolina. Described from two females recorded under Bureau of Entomology Number Hopk. U. S. 3654j, which refers to a note stating that this species is probably parasitic on *Synoxylon* in hickory, material collected and reared by W. F. Fiske.

Type.—Cat. No. 18278, U. S. N. M.

Capitonius sanguiniventris (Ashmead).

Promachus sanguiniventris Ashmead—Proc. U. S. Nat. Mus., 1888, Vol. II, p. 653.

Capitonius saperdæ (Ashmead).

Promachus saperdæ Ashmead—Proc. U. S. Nat. Mus., 1888, Vol. II, p. 652. (A brief reference with a negative description.)

Promachus saperdæ Riley manuscript.

Riley—Ins. Life, Vol. III, 1890, p. 59.

Bracon populator Say—Long's Exped. to St. Peter's River, Vol. II, 1824, p. 323. (The original description will apply to many species in a number of different subfamilies in the Braconidæ.)

This species may be differentiated from the other species of the group by the foregoing table; the propodeum may or may not be rufous; the legs are entirely rufous.

Type.—Cat. No. 18279, U. S. N. M.

Capitonus rugosus (Provancher).

Syngastre rugosus Provancher—Addit. Fauna Ent. Hym. Can., 1886, p. 122.

Capitonus rugosus Provancher—Addit. Faun. Hym. Can., 1888, p. 378.

From the original description this species belongs near *sanguiventris* Ashmead and allies, but none of the species agree with the original description in having the second segment aciculate. If this is true of Provancher's species it is undoubtedly distinct.

Capitonus leptostyli, new species.

Male.—Length 4 mm. Head fully as wide as the widest portion of the thorax, uniformly sparsely punctured, the posterior orbits not as wide as the diameter of the eye; third antennal joint subequal in length with the fourth; prescutum with large, well-defined punctures; scutum polished, shining, with a few small widely-scattered punctures; notauli strongly foveolate; the suture between the scutum and scutellum with five strong rugæ; scutellum sculptured like the scutum; propodeum strongly reticulate without any transverse areas dorsally; abdomen shining without sculpture; the embossed area of the first tergite defined at the extreme base only. Black; head and thorax with long gray hair; palpi pale testaceous; scape and legs pale testaceous; wings hyaline, venation pale brown, costa and base of stigma light brown.

Tryon, North Carolina. Described from five males collected by W. F. Fiske, and recorded under Bureau of Entomology Num-

bers Hopk. U. S. 3072o (type), 3072i, 3028b, 1495h; also a paratype from Ballston (Veitch), Virginia, collected by T. E. Snyder, and recorded under Bureau of Entomology Number Hopk. U. S. 9688o¹. The paratypes indicated with this species may have the head black, piceous or rufous. The notes for this species, made by W. F. Fiske, indicate that it is an internal parasite, which in the last stage becomes external, on *Leptostylus* in chestnut (either *Leptostylus macula* or *Leptostylus collaris*). The cocoons are made in the larval galleries of the host.

Type.—Cat. No. 18280, U. S. N. M.

Capitonius nigrisoma, new species.

Female.—Length 6 mm. Head as broad as the widest portion of the thorax; the posterior orbits narrower than the shortest diameter of the eye; head immediately below the antennæ with the punctures about a puncture width apart; remaining portion of the front with the punctures more widely separated; the posterior orbits and occiput with the punctures very widely separated; third antennal joint one-fifth longer than the fourth; prescutum shining with a few large, well-defined, separate punctures; notauli poorly foveolate; scutum with the punctures more widely separated than those of the prescutum; the suture between the scutum and scutellum with many strong rugæ; scutellum shining, impunctate; propodeum strongly reticulate; dorsal lateral part with reticulations tending to transverse areas bounded by carinæ; tergites shining, without sculpture. Black; head below the antennæ and thorax with long white hair; wings hyaline, venation dark brown.

Male.—Length 5 mm. Agrees well with the above description of the female, except in having the head rufo-piceous.

Tryon, North Carolina. Described from two females and one male, recorded under Bureau of Entomology Number Hopk. U. S. 3658b and c (type, allotype and paratype); paratypes under Hopk. U. S. 1552f. Material collected and reared by W. F. Fiske. The notes under 3658b state that specimens were reared from dead pine infested with Cerambycidae and Buprestidae. The notes under No. 1552f state that this species is a parasite on *Goes oculata* in hickory.

Type.—Cat. No. 18281, U. S. N. M.

Capitoni^s tenuicornis, new species.

Female.—Length 4 mm. Head hardly as wide as the width of the thorax at the tegulae, posterior orbits narrower than the shortest diameter of the eye; face shining with a few widely-separated punctures; posterior orbit and occiput shining, impunctate; third antennal joint slightly longer than the fourth; pre-scutum and scutum similarly punctured; the notauli strongly foveolate; the suture between the scutum and the scutellum with ten longitudinal rugae; scutellum sculptured like the scutum; propodeum reticulate, on the median basal dorsal portion one of the reticulations is larger and roughly diamond-shaped; first tergite with an embossed area on the basal third, which is defined laterally by strong carinae, otherwise without carinae or sculpture. Black; antennae dark piceous; legs dark piceous, but becoming darker basally; head and thorax sparsely clothed with long gray hair; wings hyaline, venation pale brown.

Fort George, Florida. Described from one female from the Ashmead collection and with the Ashmeadian manuscript name, *tenuicornis*.

Type.—Cat. No. 18282, U. S. N. M.

Capitoni^s ashmeadii (Dalla Torre).

Promachus rubriceps Ashmead—Proc. U. S. Nat. Mus., Vol. II, 1888, p. 653 (nec Ratzeburg or Provancher).

Cenocoelius ashmeadii Dalla Torre—Cat. Hym., Vol. V, 1898, p. 72.

Both males and females of this species are in the collections, and can be readily differentiated by the foregoing table. The species is a primary parasite of *Liopus alpha* and *fascicularis* in Sumach.

Capitoni^s provancheri, new name.

Capitoni^s rubriceps Provancher—Addit. Faun. Ent. Hym. Canad. 1886, p. 135 (nec Ratzeburg).

This species is closely allied to *ashmeadii*, but from the specimens available can be readily distinguished from that species by the characters in the foregoing table. It, as well as *ashmeadii*, varies in having the head rufous, rufo-piceous or black. Specimens

of this species have been reared as primary parasites on either *Neoclytus erythrocephalus* or *Agrilus egenus* in locust, by A. D. Hopkins in West Virginia, data recorded under W. Va. Experiment Station Number Hopk. W. Va. 6040a; have been reared from the pupal cells of *Liopus alphas* in sumach at Tryon, North Carolina, by W. F. Fiske, data recorded under Bureau of Entomology Number Hopk. U. S. 1514c; have been reared as an internal parasite of *Lepturgus facetus* in chestnut at Tryon, North Carolina, by W. F. Fiske, data recorded under Bureau of Entomology Number Hopk. U. S. 3012a; have been reared as a parasite on *Micrasis* in hickory at Tryon, North Carolina, by W. F. Fiske, data recorded under Bureau of Entomology Number Hopk. U. S. 3192d. It has also been reared as a parasite of *Liopus fascicularis* in sumach by Dimmock.

THE DESTRUCTIVE INSECTS OF NEW JERSEY.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

Considering the fact that there are 10,385 species of insects listed as occurring in New Jersey, it is surprising how small a proportion of this number is destructive enough to warrant the application of insecticides. The following list, compiled from Smith's "Insects of New Jersey," gives the number of species in each Order which occur in sufficient numbers to be considered destructive and against which measures of control must be directed at various times. It is to be remembered, of course, that there are numerous other species which are classed as injurious, but these do not occur in numbers large enough to make their presence felt, or they confine their attentions to unimportant plants and are therefore not included in the list.

	Number of species —listed	Number of species —destructive.	Percentage of species destructive.
Coleoptera	3092	50	1.6%
Lepidoptera	2120	58	2.7 "
Hymenoptera	1980	9	0.4 "
Diptera	1661	28	1.6 "
Hemiptera	504	8	1.5 "
Homoptera	479	28	5.8 "
Orthoptera	154	5	3.2 "

Of the entire number of species in New Jersey 10,385, which includes all Orders, only 1.7 per cent. is really destructive. Of the entire number of species in the above seven Orders, 1.8 per cent. is destructive. As to the individual Orders, Homoptera has

the largest percentage and Hymenoptera the smallest. This is not strange, considering the fact that all species of the Homoptera are plant-feeders, while the Hymenoptera consists of both beneficial and injurious forms, with the beneficial ones largely in the majority.

The Orthoptera, with its 3.2 per cent of destructive species, also contains a large majority which feed upon vegetation. While most Lepidopterous larvæ feed upon foliage, yet the fact that many feed upon plants and trees not under cultivation by man, or occur in small numbers, brings the percentage down to 2.7.

The Hemiptera are plant feeders, with numerous exceptions; predatory and injurious forms are abundant in the Coleoptera, while the Diptera contains predacious and beneficial species and feeders upon animal and vegetable tissues. In these three Orders the percentages of destructive species are nearly the same.

While the number of species affecting one kind of plant is often large—for instance, Folsom gives 200 attacking Indian corn, 400 the apple, and the oaks 1,000—yet it may be safely said that the insect losses in the State of New Jersey, running as they do well into the millions, are due to the pernicious activities of 186 species, some of which are and any one of which may become notably abundant.

SYNONYMICAL NOTES ON NORTH AMERICAN SCIOMYZIDÆ.

J. R. MALLOCH, URBANA, ILLINOIS.*

Sepedon macropus Walker

This species is identical with *S. nigriventris* v. d. Wulp, so that the latter name must be dropped as a synonym. I have examined a number of specimens from Brownsville, Texas, and Tampico, Mexico, which agree with the description given by Walker and that given by van der Wulp so closely that there is no reason to consider them as other than the same species. The specimens which I have examined are in the collection of the Illinois State Laboratory of Natural History. The Brownsville specimens were collected by C. A. Hart.

*Contribution from Illinois Laboratory of Natural History.

Sciomyza apicata Loew.

This species is a synonym of *S. nigrimana* Meigen. The specimens in the Illinois State Lab. Nat. Hist. collection, from Algonquin, Ill., are in all particulars identical with this European species, which is well described by Schiner, *Fauna Austriaca*, Vol. II, p. 45. The species bears a close resemblance to *glabricula* Fallen, which has been recorded by Coquillett from Alaska, but the latter has short, narrow wings, and the fore tarsi are entirely black.

Sciomyza strigata v. d. Wulp.

This species is a synonym of *S. trabeculata* Loew. I have examined seven specimens in the above-mentioned collection from Tampico, Mexico, December 29, 1908. Van der Wulp obtained his specimens from Mexico City and Vera Cruz, while Loew obtained his from Texas. The species is close in general appearance to *nana* Fallen, differing noticeably in the wing markings. In *nana* the submarginal cell has only one transverse brown mark near the apex, while in *trabeculata* there are five or six distinct fasciæ in this cell. There is also in the latter species a small appendiculate vein, on the posterior surface of the fourth vein, at about the middle of the last section, which I have not seen in any specimen of *nana*.

Tetanocera lineata Day.

This species belongs to the genus *Hidroneura* Handel and is synonymous with *H. rufa* Panzer of the European fauna. Members of *Hidroneura* may be distinguished from other genera in Tetanocerinae by their possession of the following characters: Antennæ projecting straight forward, second joint not longer than third, the latter obtuse at apex and without apical hairs; arista thickened, bare; frontal and thoracic bristles comparatively weak; outer cross vein biangulate.

I have before me three specimens belonging to this species from Algonquin, Ill., Nason, taken on July 20, October 3 and 16; one specimen, Urbana, Ill., May 27, 1889, taken at light, C. A. Hart, and one specimen, Lake Geneva, Wisconsin, taken by sweeping along shore, west end, September 2, 1892, C. A. Hart.

A NEW MESEMBRINE FLY.

BY FREDERICK KNAB,

Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.

The closest allies of the fly here described generally have been included in the genus *Mesembrina*. In 1908 Townsend divided the old genus, dismembering it into *Mesembrina*, *Metamesembrina* and *Eumesembrina*, with the following species as respective types: *M. mystacea* L., *M. meridiana* L., *M. latreillei* Rob.-Desv. (Smiths. Misc. Colls., vol. 51, p. 124). In 1911 Schnabl and Dziedzicki, without knowing Townsend's work, separated *M. mystacea* and *M. meridiana* generically, proposing for the latter the generic name *Neomesembrina* (Die Anthomyiden. Nova Acta, Kais.-Leop.-Car. Deutsch. Akad. d. Naturf., vol. 95, p. 226). *M. meridiana* having been already designated as the type of *Mesembrina* by Westwood in 1840, *Metamesembrina* Towns, and *Neomesembrina* Schnabl and Dziedz. fall as synonyms. Townsend, having discovered the error in nomenclature, in 1912 proposed the generic name *Hypodermodes* with *M. mystacea* as the type (Proc. Ent. Soc. Wash., vol. 14, p. 46). The following new species is congeneric and closely related with *Hypodermodes mystacea* (L.) of Europe, and apparently still nearer the Asiatic *H. decipiens* of Loew (Beschr. europ. Dipt., vol. 2, p. 239; 1871).

***Hypodermodes solitaria*, new species.**

Female.—Head black, the frons about one-third the width of the head; parafacials yellowish-silvery pruinose. Antennæ black at base, the second joint ferruginous, the third deep brown, reddish at base; thickened portion of arista ferruginous. Palpi ferruginous yellow, with numerous short black bristles and a few long ones interspersed.

Mesonotum and scutellum clothed entirely with dull reddish yellow pile, the discal macrochætæ also yellowish, the peripheral ones black. Pleuræ black, the vestiture black, one specimen with some yellowish hairs below wing-base. Sternopleural bristles: 1 - 0.1.

Abdomen black, the proximal portion covered with short black pile, the last two segments above and beneath with long reddish

yellow pile, somewhat brighter coloured than that on the mesonotum and scutellum.

Legs entirely black; claws ferruginous on the thickened basal portion, black distally; pulvilli yellowish brown.

Wings with the venation similar to *H. mystacea*, the apical cell at extreme tip of wing. Last section of the fourth vein very slightly less upward bent than in that species. Basal portion of the wing to the tip of the subcostal vein and the base of the apical cell bright yellow, the veins in that portion ferruginous yellow; portion beyond light grey, clouded with brown in the costal region and along the veins, the veins themselves black. Tegulae yellow, with deep yellow margin and yellow ciliation.

Length: Body about 14 mm., wing 12.5 mm.

Two specimens: High River, Alberta (T. Baird); Glacier Park, Montana, June 28, 1912 (J. R. Parker). Type and paratype in the collections of the U. S. National Museum and the Montana Agricultural College.

The specimen recorded by Prof. Hine from Lake Timagami, Ontario, under the name *Mesembrina mystacea* (Can. Ent., vol. 39, p. 98; 1907), evidently belongs to the species here characterized. The present form differs from *mystacea* particularly in the coloration of the thoracic vestiture and of the tegulae, that species having the vestiture on the posterior part of the mesonotum and on the scutellum black, and furthermore dark brown tegulae with black ciliation. *H. solitaria* agrees much more closely with *H. decipiens*. That species also has the mesonotum and scutellum clothed entirely with yellowish pile and the tegulae yellow. In *decipiens* the last two abdominal segments are clothed with yellowish white pile and the hairs on the cheeks are dirty white. The whitish abdominal hairs, as against their deep yellow colour in our form, can hardly be considered a specific character, since Loew (l. c.) has already pointed out that the colour of this pile is variable in *H. mystacea*; the difference in the colour of the cheek vestiture, being black in our species, must, however, be considered specific.

NOTES ON THE HYMENOPTERA TRICHOGRAMMATIDÆ AND MYMARIDÆ.*

BY A. A. GIRAULT, NELSON, N. Q., AUSTRALIA.

1. **Trichogramma australicum** Girault.

Herr P. van der Goot of Pasoeroean, Java, sent me a large number of both sexes of this species labelled "Pasoeroean, April 25, 1913. Aus *Chilo infuscatellus* Eiern." This is the first known host of the species, though in Queensland it attacks native Lepidoptera.

A female of this species was captured at Nelson, North Queensland, by sweeping jungle, June 16, 1913 (A. P. Dodd).

In another lot sent by Van der Goot, reared from the eggs of "ocler djagoén," an unknown tortricid and dated "Pasoeroean, 2 May, 1913," one of the males bore a single cilium in the cephalic line of the hind wings; no trace of this cephalic line could be found in any of the others. The colour in these two lots varied considerably. Thus in some specimens there were two broad bands of black across the abdomen, one at the tip, the other at base. In others the abdomen was wholly blackish, while in still others it was wholly jet black, the usual bright golden yellow of the thorax very dull and hardly contrasting. These variants were all females.

2. **Paranagrus optabilis** Perkins.

A single male of this species was included within the second lot of the *Trichogramma australicum* noted above. It is probably not from the Lepidopterous eggs.

3. **Trichogrammatoidea nana** (Zehnter).

Herr P. van der Goot also sent me a number of both sexes of this species labelled "Pasoeroean, April 25, 1913. Aus *Diatraea striatalis* Eiern." All of these specimens were pale yellow, with a dusky black band across the base of the abdomen and the extreme tip of the abdomen dusky.

4. **Anagrus armatus** (Ashmead).

This cosmopolitan mymarid I have recently received from Van Dine in Porto Rico through the continued kindness of Dr. L. O. Howard. The two slides bore both sexes, labelled "208—

*Contribution No. 14, Entomological Laboratory, Bureau of Sugar Exp. Stations, Bundaberg, Queensland.

1911. From egg clusters of *Delphax saccharivora* in cane leaves. Collected Dec. 19, 1911. Rio Piedras, Porto Rico. Thos. H. Jones." Both the locality and the host are new. Also a female, with the following new variety:

5. **Aphelinoidea semifuscipennis** Girault, variety *allipes* nova.

Female.—Like *semifuscipennis*, but the antennæ and legs are pallid and the colour more yellowish; also the fore wings differ in details hard to describe, but the marginal cilia are finer and shorter and the discal cilia appear denser.

Two slides from Van Dine through Dr. Howard bearing three females and one male, five females respectively, labelled "126—1912. From egg clusters of a leaf-hopper. Rio Piedras, Porto Rico. Collected Feb. 1, 1912. Thos. H. Jones." The male did not differ from the female. *Types* (of *allipes*) in the U. S. National Museum, Washington, D. C., U. S. A. (Three females on the second slide; the one male and two remaining females practically destroyed.)

6. **Ufens niger** (Ashmead).

Two females from Van Dine mounted on a slide with the *Oligosita* following, labelled "335—1912. From leaf-hopper eggs in cane, collected April 20, 1912. Rio Piedras, Porto Rico. Thos. H. Jones." The species, heretofore, has been known only from the United States. It is associated with commercial crop plants.

7. **Oligosita comosipennis** Girault.

One female with the *Ufens* just noted. The species is connected with commercial crops, and thus is probably widely distributed. The locality is totally new.

8. **Brachistella prima** (Perkins).

Two females on the slide with the preceding two species. This insect was recently described from Mexico, where it was reared from jassid eggs in sugar cane. The spot from the stigmal vein in these specimens crosses to the caudal wing margin; the "irregularly smoky" of the basal part of the wing in the original description forms in these West Indian specimens a first or proximal band across the fore wing at the bend of the submarginal vein. The species is thus characterized by the two-banded fore wings. The specimens agree with the original description otherwise,

except that they bear three lines of discal cilia on the hind wing (visible distad, at least) and the accented part of the second or stigmal stripe of the fore wing is not on the stigmal vein, but just beneath (caudad of) it and is somewhat larger than it. There is no short oblique line of cilia back from the sessile stigmal vein. The discal ciliation is denser than with *Abbella subflava*, while the fore wings are narrower than those of *Brachistella acuminata*.

9. **Brachistella** Girault = *Abbella* Girault.

When arranging the genera of the Trichogrammatidæ, I reduced the value of the arrangement of the discal ciliation of the fore wing to a generic basis and upon this principle *Brachistella* was separated from *Abbella*. However, I am convinced in this case that the characteristic will not hold and that the two are identical. From *Iltys* Girault, *Abbella* differs in bearing a short sessile stigmal vein and a funicle which is shorter than the pedicel. Moreover, *Abbella* is much less robust.

10. **Trichogramma minutum** (Riley).

Dr. L. O. Howard sends me a microscopic mount with six specimens of this cosmopolitan species (three of each sex) bearing the label, "Reared from eggs of *Diatræa saccharalis*. F. W. Ulrich. Santa Lucrecia, Vera Cruz, Mexico. Ent. Ac. No. of D. L. Van Dine. 180—1913." Locality new.

Also two other slides labelled respectively, "Parasites from egg clusters of *Diatræa saccharalis*. Audubon Park, New Orleans, La., Sep. 13, 1912. G. E. Bodkin and T. E. Holloway," bearing seven females; "Parasites from eggs of *Diatræa saccharalis*. Donna, Texas, Oct. 1, 1912. T. E. Holloway," bearing one male, three females. Both localities are new.

All specimens in both of these lots were orange yellow, the abdomen two-banded, one broad stripe across the base and a narrow one across the apex; the male, however, bore a black abdomen nearly to tip, the latter yellow.

A vial of alcohol bearing nineteen females, many coloured as those of the two preceding slides, but others with the abdomen wholly black; also received through Dr. Howard the specimens labelled "311—1913. March 28, 1913. J. R. Bovell, Bridgetown, Barbadoes, B. W. I." The letter accompanying the speci-

mens gave this data. "From G. N. Wolcott, I have received Porto Rico accession 3011—1913. Egg parasite of *Diatræa saccharalis* Fabr." The number 3011 is doubtless a misprint for the number on the specimens, namely, 311. The locality is new.

Another vial of alcohol bearing one male, twenty-three females and the label, "Reared from eggs of *Diatræa saccharalis*, Trinidad, B. W. I., November, 1912. F. W. Urich. Ac. No. of D. L. Van Dine 181—1913." In several of these specimens the posterior line of discal cilia in the hind wings was quite complete and six cilia in the oblique line from the stigmal vein rather common. The abdomen was dusky, with a darker stripe across the base.

A third vial bearing a large number of both sexes of *minutum* and these labels "Ac. No. of D. L. Van Dine 182—1913. Parasites bred from the egg-masses of *Diatræa saccharalis*. G. E. Bodkin, Georgetown, British Guiana, July 20, 1912." In these specimens the abdomen was dusky or else concolorous. The locality new.

And a fourth vial containing two males, twenty-six females, bearing the labels "Reared from eggs of *Diatræa saccharalis*. Ac. No. 172—1913. D. L. Van Dine. Porto Rico." The exact locality was Guanica and the collector Mr. H. Bourne. The date March 4, 1913; parasites issued four days later.

It is interesting to be able to record this parasite from the same host at the same time from such widely separated localities.

FIELD NOTES AND QUESTIONS.

Early Appearance of Pontia Rapæ.

On February 24th, of this year, a freshly emerged specimen of the "imported white butterfly" flew into an open window of a house in this city. It was promptly captured, and turned out to be *P. rapæ* var. *marginalis*, which is the early spring form of *rapæ* in this district. This is the earliest record that we have in Victoria—the nearest to it being March 28, 1903, recorded by Mr. E. M. Anderson. Perhaps a few dates of the Lepidoptera that have appeared during March may be of interest to our Eastern collectors:

Xylomiges candida, March 7th.

Xylomiges hiemalis, March 17th.

- Xylomiges simplex*, March 18th.
Graphiphora hibisci, March 14th.
Mesoleuca gratulata, March 17th.
Mesoleuca vasiliata, March 20th.
Eupithecia limnata, March 20th.
Nyctobia nigroangulata, March 20th.
Rheumaptera rubrosuffusata, March 17th.
Trichochlamys lacteata, March 10th.
Incisalia mossi, March 17th and 20th.

E. H. BLACKMORE, Victoria, B.C.

Gynandromorphous Lepidoptera.

At a meeting of the Montreal Branch reference was made to certain specimens of Lepidoptera exhibiting the characters of both sexes in the one individual, and these, as well as the references at hand in North American literature, indicated that the right side was male and the left side female. The question was raised as to whether this was invariably the case or merely chance in the few on record. Mr. Gibb kindly offered to ask the members of the South London Ent. Society, and the following reply has been received:—

"In answer to the question of the right side being always the male, it has often been so asserted; but I find that one gets it both ways, as the following list will show:

	RIGHT SIDE	LEFT SIDE
<i>Euchloe cardamines</i>	♂	♀
<i>Lycæna ægon</i>	♀	♂
<i>Lycæna icarus</i>	♂	♀ (2 examples)
<i>Lycæna icarus</i>	♀	♂
<i>Lycæna corydon</i>	♂	♀
<i>Smerinthus populi</i>	♂	♀
<i>Smerinthus populi</i>	♀	♂
<i>Endromis versicolor</i>	♀	♂
<i>Eugonia quercinaria</i>	♀	♂
<i>Coremia ferrugata</i>	♀	♂

In the last four species (moths) the antennæ show stronger sexual differences than the wings.

F. E. ADKIN, F.E.S., London, England."

The occurrence of Rhyncholophus sp. on Lepidoptera, observed at Kaslo, B. C.

The occurrence of small ticks on the bodies of specimens of Lepidoptera has often been brought to my attention when examining freshly captured specimens.

I submitted some of the specimens to Dr. C. Gordon Hewitt, who wrote me that they were a species of *Rhyncholophus*, a mite which attaches itself to insects upon which it feeds. All the family are predacious and wander over plants and soil in search of prey.

My records of their occurrence during last spring show a wide range of host; specimens were taken from the following list. The number after the name denotes the number taken from each specimen listed. Amongst the Noctuids I noted

Tæniocampa communis Dyar, 7.

Tæniocampa curtica, 2

Hadena dubitans, 1.

Peridroma nigra, 3.

And on the Geometers

Mesoleuca intermediata, 1.

Cænocalpe magnoliata, 1.

The extreme variation in the size of these mites ranged from 1.4 mm., for the largest, to 0.4 mm. for the smallest specimen.

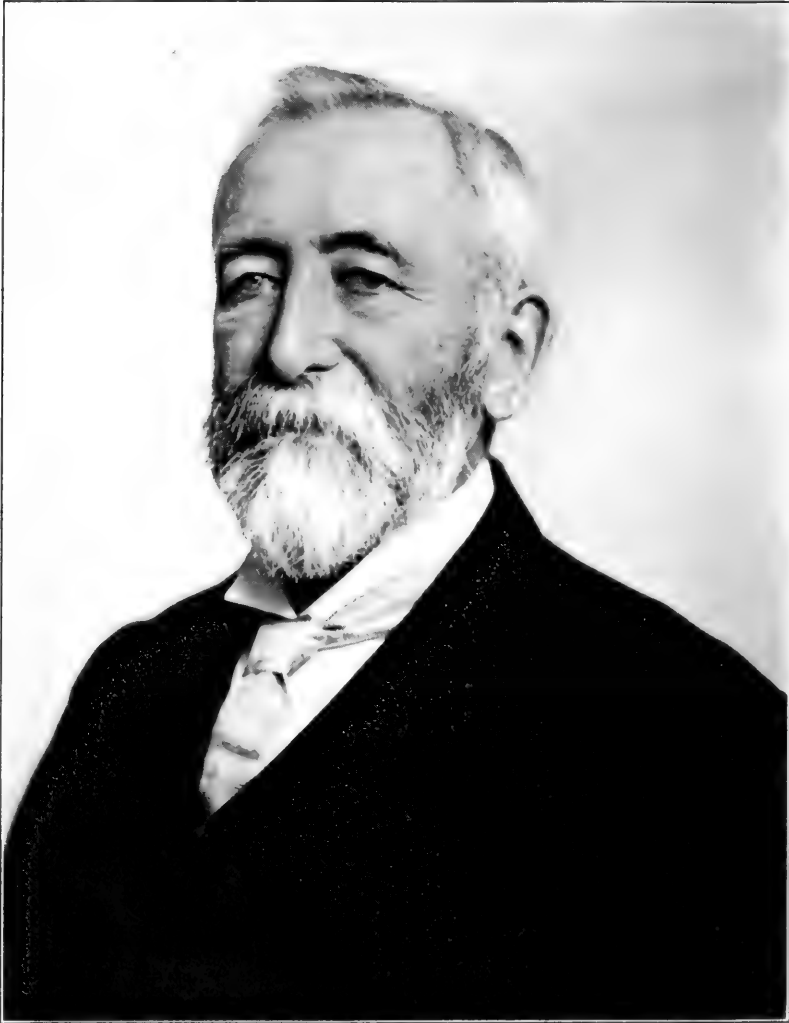
The colour in all cases was bright red, which is maintained in the specimens when mounted, provided that they are not submerged in ether too long, in which case the colour is either entirely lost in the smaller specimens or remains a dull orange.

The usual point of attachment is in the fold between the thorax and abdomen under the wings, but in one case I found one attached to the median nervule on the underside of the primary.

They are very resistant towards cyanide. Moths which had been placed in the killing bottle for over one hour were found to have mites attached, and these proved to be alive when examined the following morning.

J. WM. COCKLE, Kaslo, B. C.





DR. WILLIAM SAUNDERS, C. M. G.

The Canadian Entomologist.

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DR. WILLIAM SAUNDERS, C. M. G.

On Sunday afternoon, September 13th, after an illness which had continued for nearly two years, and which for a twelve-month had rendered him mentally incapable, Dr. William Saunders passed to his rest at his home in London, Ontario, in the 79th year of his age. He was born in Devonshire, England, and came to Canada with his parents when a boy of twelve. His educational advantages were meagre, but he succeeded in obtaining a technical training in Chemistry and set up in business as a retail druggist in London. His agreeable manners, thorough honesty and untiring industry brought him a fair measure of success. His love of nature led him to the collection of wild plants and insects which could be found in abundance in the neighbourhood, and he became an ardent student of Botany and Entomology. Finding many medicinal plants readily obtainable, he began the preparation of fluid extracts, which were so pure and reliable that they soon became widely and favourably known among the medical profession, and led by degrees to the establishment of an extensive and lucrative business both wholesale and retail. Years later, when he became Director of the Experimental Farms of the Dominion, the wholesale business was transferred to his eldest son, Mr. W. E. Saunders, by whom it is still successfully maintained, and the retail department to two of his younger sons, who, however, afterwards relinquished it for other pursuits.

During the five-and-twenty years of his business life, Mr. Saunders found time for taking an active part in many other things. Besides his scientific work in Entomology and Botany, he took great interest in fruit-growing, establishing a farm of his own near the city, and becoming a zealous member of the Ontario Fruit Growers' Association, of which he was a director for many years and President from 1882 to 1885. In connection with his professional work he was appointed Professor of Materia Medica in the Western University, Public Analyst for Western Ontario, and

President for two years of the Ontario College of Pharmacy, of which he was one of the founders. He was an active member of the American Pharmaceutical Society, and Fellow of the American Association for the Advancement of Science. His attendance at the meetings of these Societies held from year to year in various cities of North America caused him to have a widely extended friendship with notable men of all kinds, by whom he was highly esteemed and respected.

The writer's acquaintance with Dr. Saunders began more than fifty years ago, when we were both young men, and soon ripened into a warm friendship, which has continued unbroken until now during all these years. In those early days, when the study of Entomology was so difficult owing to the scarcity of books on the subject, we were in constant correspondence, helping each other in every way we could, and spending each summer some days together, comparing notes, studying specimens and making collecting expeditions. Many happy hours we spent together in early morning tramps to the ponds and woods about London, and in the evening, when his day's business was over, in examining the captures we had made. At that time there were few in Canada who took the least interest in the objects which to us afforded the keenest pleasure, but as time went on we found here and there a congenial spirit, and were led on in 1862 to attempt the organization of an Entomological Society. This was successfully accomplished during the following spring, and last year the completion of half a century's work and progress was celebrated by the Jubilee meeting at Guelph. An account of the proceedings on that occasion and the history of the formation and growth of the Society have been given in the November (1913) number of the "Canadian Entomologist" and the 44th Annual Report of the Society. In 1868 Mr. Saunders and the writer decided upon making another venture and began the publication of the "Canadian Entomologist," to the first two numbers of which we were the sole contributors. For five years the latter was the Editor, and was then succeeded by Mr. Saunders, who continued the management of the magazine until his removal to Ottawa in 1886. Three years previously there was published in Philadelphia his notable book, "Insects Injurious to Fruits," which is justly regarded as a classic by economic entomologists.

A second edition was issued in 1892, and the author had begun the preparation of a third, when his prolonged illness rendered him incapable of accomplishing any literary work. A list of his published articles, bulletins, reports, etc., fills six columns of the Bibliography in the Transactions of the Royal Society of Canada for 1894, and a large number have been added since. In 1881 he had been appointed by the Governor-General of Canada, the Marquis of Lorne, one of the original Fellows of the Royal Society, and in 1906 he was elected President, having thus risen to the highest position of honour for scientific work that can be attained in this Dominion. Twenty years ago it was said of him by an American writer that "by painstaking study and observation he has risen to the topmost pinnacle of fame as an entomologist, horticulturist and experimental agriculturist."

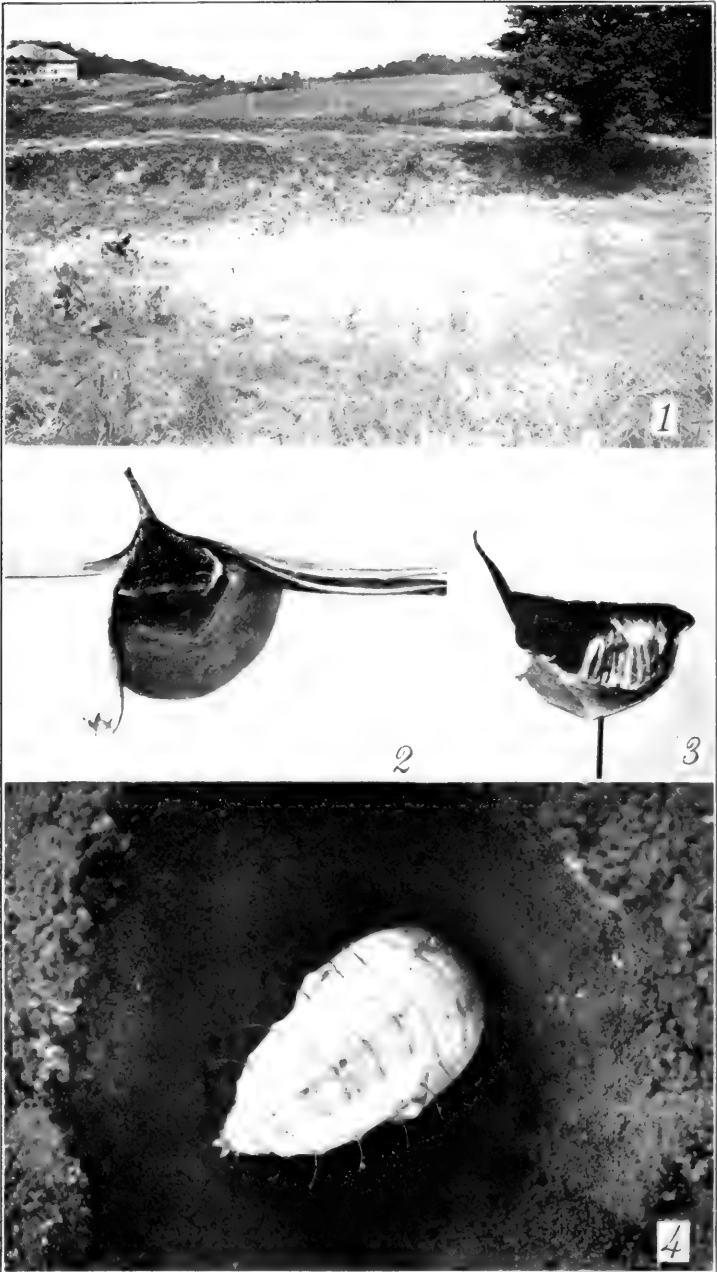
A very important change took place in the life and work of Dr. Saunders in 1886, when he was appointed Director of the Experimental Farms of the Dominion, and left his home and business in London to reside in Ottawa. During the previous year, he was commissioned by the government to visit various Experiment Stations in the United States and to report upon agricultural and experimental work in Europe and America. In this new sphere of labour he applied himself with his wonted vigour, and in the course of a few years was mainly instrumental in bringing these establishments into thorough working order and into a high standard of excellence. Anyone who saw the Ottawa Farm in the autumn of 1886—a large tract of bare land, with workmen busily employed in levelling and removing stumps and boulders with dynamite—and then visited it ten or fifteen years later (as did the writer), could not fail to be impressed with the wonderful work accomplished by the genius of Dr. Saunders in turning a waste into a scene of beauty and a hive of industry. Here have been carried on under his direction a great variety of experiments in breeding and feeding live stock, testing soils and water, growing fruit and ornamental trees of all kinds, selecting hardy varieties, improving the size and quality of any fruits suited to the climate of the Western Provinces, beekeeping, experiments and observations in economic entomology, plant pathology, and various other matters pertaining to the welfare and benefit of the farming community. Especially

noteworthy was his work in crossing varieties of grain and producing new and improved kinds. One alone of these, the Marquis Wheat, is believed to have added millions of dollars to the value of the wheat products of the prairie country. All information thus acquired has been freely afforded to the farmers by distributions of seed, and bulletins and reports on all manner of subjects.

The ever-growing work and its extension in every Province of the Dominion began at length to tell upon the physical strength of the man who was the mainspring of it all. His vitality, owing to advancing years and the inroads of an insidious disease, began to fail, and he felt the time had come for his retirement. Accordingly he resigned about three years ago and went with his wife and daughter for a pleasure trip to Europe—his first real holiday since he went to Ottawa. His friends expected him to return with much improved health, but it was ordered otherwise; he became very ill in England and never entirely recovered. He had completed his life work, his duty was well done, and he has left the record of great deeds accomplished and of vast and widespread benefits conferred upon the people of the land. This account of a remarkable man would be incomplete without a reference to his beloved wife, who was a true helpmeet both in small things and in great, ever cheerful and encouraging, full of kindness and hospitality, perfectly unassuming and free from all affectation, she is loved and esteemed by all who know her, and her children and friends rise up and call her blessed. To her in her desolation and to her family in their sense of loss our sympathies go out in the fullest measure.

The ability and work of Dr. Saunders have been recognized in many gratifying ways. In 1905 he received the distinction of Companion of the Order of St. Michael and St. George, conferred by his Majesty King Edward; honorary LL.D. from Queen's University in 1896 and from the University of Toronto in 1904; the Mantua gold medal for distinction in scientific knowledge. He was a Fellow of the Entomological Society of London and the Royal Microscopical Society; an honorary member of the Pharmaceutical Society of Great Britain and of the Highland Agricultural Society of Scotland; and an ordinary member of a large number of Scientific Societies in the United States and Canada.

C. J. S. BETHUNE.



HYDROPHILUS TRIANGULARIS SAY.

NOTES ON *HYDROPHILUS TRIANGULARIS* SAY*

BY ROBERT MATHESON, PH. D., ITHACA, N. Y.

Although much study has been given to the European species *piceus* and much has been written of its life-history, anatomy and metamorphosis, scarcely anything has been published concerning the American species *triangularis* Say. Since the brief account given by H. Garman in the American Naturalist in 1881 I find but few references to this species in American literature. As this is one of our largest beetles, and is commonly met with in aquatic collecting, I hope this short account gathered from a brief study during the summer of 1912 may be of use to others working in this group.

The beetles undoubtedly hibernate and egg-laying occurs early in June. Garman found the egg-cases about the first of June at Normal, Ill., and in one case the female was in the act of finishing her case. I found the completed egg-cases at Ithaca on June 24 and 26. These egg-cases are peculiar and interesting structures. Although Garman has given a good description of the nidus, it may be worth while to redescribe it, as his paper is now inaccessible to the average worker in entomology.

The egg-case (pl. XXII, fig. 2) is always attached to pieces of floating leaves, bits of weeds, etc., and never, as far as I know, to living plants. The case with the projecting horn-like mast floats gracefully on the surface of the water. The cases must be sought with considerable care, as they are not easily recognized among the floating debris. I have found them most commonly in shallow pools with abundant vegetation and rich in insect life (Pl. XXII, fig. 1.) The leaf to which it is usually attached serves as a float and aids in keeping the mast erect and above the surface of the water. The case is smooth, brownish in colour, the upper surface closely adhering to its support (Pl. XXII, fig. 2.) It measures about 22 mm. wide, 24 mm. long and 15 mm. deep. The horn-like process is usually about 7-8 mm. long, and projects from the front of the case almost at right angles to the upper surface. It is dense, hard and almost black in colour, composed of closely-woven strands of silk. Below it expands into a broad hatchet-shaped plate, as seen in figure 2. It is supposed that this horn, which is really a very

*Contribution from the Entomological Laboratory of Cornell University. October, 1914.

small tube with dense walls, functions in the admission of air into the egg chamber. Whether this is so or not I could not determine in the few experiments I performed. Below the broad expanded base of the spine is a narrow lunar-shaped opening (figs. 2 and 3). This allows the entrance of water beneath the egg-case proper, and through it the newly-hatched larvæ escape. This outer sheet of silk enveloping the egg-case is very thin and semi-transparent. Through it one can readily observe the young larvæ as they hatch and crawl into this space before venturing out into the open pond.

The eggs form a disk-like mass suspended from the roof of the egg-case (Pl. XXII, fig. 3.) They are all arranged vertically, closely applied to each other and in a single layer. Above the eggs the roof is composed of a considerable thickness of rather loosely-woven silk, leaving comparatively large, open spaces. Each egg measures 4 mm. long and about 1 mm. in diameter, yellow in colour, and loosely wrapped in its own coat of silk. Although I have examined these egg-cases carefully, I have never found any water in the portion containing the eggs. It would seem as if the open spaces in the loosely-woven silk and connected with the horn-like process in front serve as a means of air supply for the developing embryos. The number of eggs in a single case is very large, and it is not known how many egg-cases may be made by a single female. In the two egg-cases counted there were 112 and 130 eggs, while Garman found 107 in the one counted by him.

The young larvæ on hatching do not immediately leave the egg-case. On the evening of June 25th I saw quite a number of the newly-hatched fellows crawl out into the space below the eggs, but they did not venture further. Next morning this space was literally swarming with them, so crowded that they could not attack each other. Shortly after they began to emerge; slowly at first and then more rapidly. Soon the small aquarium was a seething mass of wriggling savages. They nipped at each other fiercely, each shying off, but soon one got a death-grip. The successful grip is directly back of the large head (fig. 29), for then the larva is helpless, and the other little savages soon close in and complete the killing. One is not much of a feast for over a hundred hungry chaps, and the first taste is only the beginning. After considerable manœuvring, another is seized and the

feast is again repeated. This would have continued, I presume, till all but one were killed. To prevent it I placed in their midst a young tadpole which had just died. For a short time they seemed shy of it, such a feast was surely too good, but when they closed in it was with a rush. Soon there was nothing to be seen but a wriggling mass of fierce savages tearing and biting at every available spot. As one secured a tender morsel he would rush off with it, hoping to enjoy it in peace, but only to be attacked by his neighbour. This fighting and scrambling continued until the entire tadpole was devoured. Later in the evening of the same day I gave them a dead minnow, and next morning only the bones were left. In the meantime one would occasionally succumb to the attacks of his neighbours, and my stock was slowly decreasing in numbers. On June 28 I placed a living tadpole in the aquarium, and there followed a savage attack on it. The larvæ seized it by the tail, mouth, and eyes, and every available spot where a grip could be secured was tried time and time again. It was not long before they succeeded in overcoming the tadpole, and then followed a feast mingled with occasional cannibalistic attacks. For sometime after this I continued to feed them on tadpoles, and they seemed to thrive.

On July 3rd one larva molted. This one was separated from the rest, and an attempt made to rear it. The next day most of the other larvæ died on account of the extreme heat. The one that had molted continued to thrive on tadpoles, snails or other food which I gave it. It was interesting to see how readily it would remove a snail from its shell by means of its powerful mandibles. The flattened head made it easy to get under the shell, and the mandibles did the rest. On July 24 this larva entered the soil to pupate. It had evidently molted a second time, but I had failed to find the shed skin, or else it was eaten by the larva itself. It took a little over twenty-four hours to dig out a large pupal cell under a stone in the rearing-cage. Pupation occurred on July 26, and the pupa resting in its cell is shown in figure 4. The adult emerged on the 6th. The time of development is then as follows:

June 25.—Young larvæ began emerging.

July 3.—First molt occurred.

July 13 (about).—Second molt occurred (?) (Supposed, not observed).

July 24.—Entered the soil to pupate.

July 26.—Pupa formed.

Aug. 6.—Emergence of adult.

Two other larvæ which I collected the same season pupated on July 15th and the adults emerged on the 25th.

At the time of transformation of pupa to adult it is interesting to observe how long it requires for the beetle to acquire its normal black colour. At the time of transformation to adult the thorax, head and legs are bright reddish brown. The rest of the body is pure white. Gradually it becomes reddish brown, turning to black. In about twenty-four hours after transformation the beetle is perfectly coloured and ready to emerge.

Description of larva.—First stage (fig. 29). The young larva on leaving the egg-case is light brown in colour, later becoming dark velvety brown and measures over 8 mm. in length, from the tip of the abdomen to the tips of the extended maxillæ. The head is large, light brown in colour, somewhat depressed and prominent, the mouth-parts forming a very conspicuous feature. It measures, exclusive of the extended mouthparts, 2 mm. long by 2.25 mm. wide, and appears very

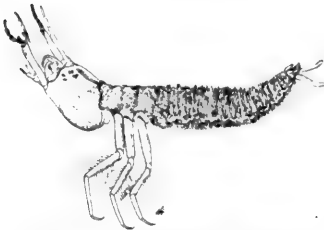


Fig. 29.—*H. triangularis*, young larva just hatched.

large in proportion to the body, the thorax measuring less than 1.5 mm. wide. The antennæ are prominent, each consisting of three segments. The ocelli are six in number, placed in two parallel rows at the side of the head, directly behind and below the antennæ.

The body is densely clothed with dark hairs, giving the larva a velvety appearance. Amongst the hairs may be found scattered brown setæ. The seven abdominal spiracles are prominent. On the dorsal side of the last abdominal segment are openings leading to the large longitudinal tracheal trunks which supply air to all parts of the body. This pair of spiracles, with the two pairs on

the thorax, make in all ten pairs. I have not attempted to determine whether the lateral spiracles are closed or not.

Arising from the under side of the last segment is a pair of light coloured cerci, cylindrical, soft and flexible, measuring .9 mm. in length. The function of these cerci is not known, unless they serve to aid the larva in maintaining itself on the surface film when it requires a fresh supply of air.

The legs are long, of the same colour as the head, and well fitted for walking or running. The femora of all three pairs of legs are also provided with swimming fringes. The larvæ, however, are not very capable swimmers, only swimming short distances between supports.

The mature larva.—(Fig. 30.) The larva ready to pupate measures 40 mm. ($1\frac{9}{16}$ ins.) long and about 9 mm. wide at its

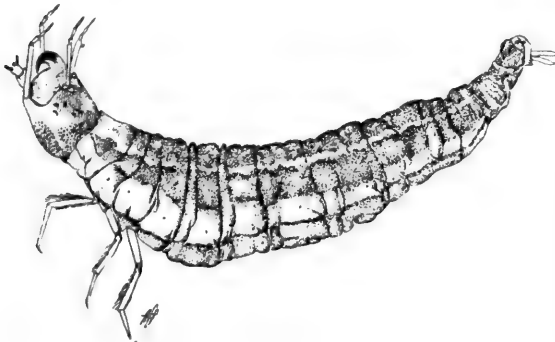


Fig. 30.—*H. triangularis*, mature larva.

widest part. It is dark brown in colour, the head being reddish brown. The under surface of the body is almost a grayish brown. The legs are the same colour as the head. Extending from the anterior margin of the thorax

on each side of the median line to the tip of the abdomen is an irregular narrow grayish brown line. These lines stand out prominently in alcoholic specimens.

The head is large, depressed, reddish brown in colour with numerous darker markings. It is not out of proportion to the rest of the body, as in the case of the young larva (compare figs. 29 and 30). The antennæ are located on the upper side of the head, 4-jointed, 1st joint, 3.25 mm.; 2nd, .24 mm.; 3rd, .64 mm.; 4th, .64 mm. (Figure 31). An antennal sclerite is present and well differentiated. Each eye consists of six ocelli, situated behind and below the antennæ in two parallel rows of three each.

The mouthparts are well developed and prominent. The suture between the labrum and clypeus is very indistinct or lacking. The clypeus-labrum is black, broadly emarginate in front. The mandibles are large and powerful. The right is more slender, longer and more strongly curved with a large tooth on its cutting edge. The left is shorter and thicker, and lacks the large tooth, though a slight elevation marks the position (fig. 31).

A maxilla is shown in figure 31. The maxillæ stand out prominently, particularly in the young larvæ. The cardo is

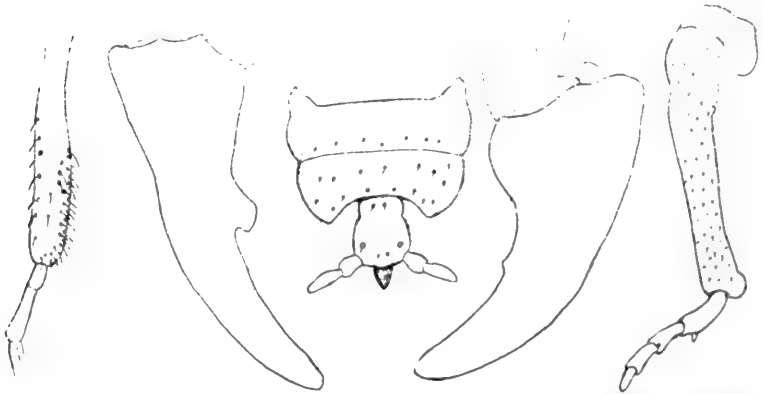


Fig. 31.—(From left to right.) Antenna, right mandible, labium, left mandible, maxilla.

greatly elongated, the lacinia being reduced to a mere joint. The palpus is 3-jointed.

The pupa.—The pupa at time of transformation is pure white in colour, the eyes soon becoming dark, while the prothorax soon takes on a reddish-brown tinge. It measures, including the cerci, 24 mm. long by 14.5 mm. wide at its broadest part. The pupa rests in its chamber, as shown in figure 4, and is quite active when disturbed or exposed to the light, turning over or changing its position by sudden muscular contractions of the abdomen. The tender pupa does not come in contact with the soil, but rests on large, strong spines. (Pl. XXII, fig. 4).

The head lies incurved under the prothorax, and is not visible in a dorsal view. It is perfectly smooth, lacking spines or setæ.

The anterior margin of the pronotum at each side bears three long, backward-curving spines. Near the posterior margin there is a row of eight shorter spines. There are also several very short spines on the disk. On the dorsum of both the second and third thoracic segments is a pair of spines. The dorsal side of each of the first seven abdominal segments bears a transverse row of four spines (Pl. XXII, fig. 4). The spines of the outer row are much longer and dark brown at the tips. The ninth segment terminates in a pair of long, large cerci nearly 3.5 mm. long. In the pupal chamber the pupa normally rests venter downward, resting on the large curving spines of the pronotum and the cerci. On turning over it rests on the dorsal spines of the abdomen and thorax, so that the tender pupa is never brought directly in contact with the soil.

DESCRIPTIONS OF FOUR NEW TABANIDÆ, WITH
REMARKS UPON *CHRYSOPS CURSIM*.

BY C. P. WHITNEY, MILFORD, N. H.

***Tabanus birdiei*, n. sp.**

Female—Length 14-17 mm. Face white, densely covered with white hairs. Palpi yellow, slender, sparsely clothed with short hairs, extreme tip infuscated. Antennæ: two basal joints and base of third reddish yellow. Upper extremity of first joint black and covered with short black hairs. Third joint with upper angle rectangular or even obtuse, the joint beyond angle black. Eyes naked, purple with two green bands. Front wide, parallel, reddish brown, densely covered by white pollen and scattered erect black hairs. Callus prominent, shining brown, nearly square with a short, stout, tapering prolongation above. Thoracic dorsum brown with strongly marked white lines. Abdomen brown and white, the latter predominating and occupying the posterior margins of the segments, expanding into three rows of triangular spots. Venter yellowish, covered with white pollen. Legs tawny, tips of tibiæ and tarsi infuscated. Wings hyaline, large distinct clouds on cross-veins, divarication of third vein and at extremity of anal cell. First posterior cell somewhat coarctate.

Nine females, March and April, West Palm Beach, Fla. Named in remembrance of a young friend to whose kind assistance I am indebted for many fine specimens of Tabanidæ.

October, 1914.

In "Insects of Florida," recently published by Prof. C. W. Johnson, two of the above-described specimens captured in 1912 are mentioned as *cymatophorus* O. S. from which *birdiei* differs by its smaller size, clearer wings, wider front, nearly square callus, and shape of third antennal joint.

***Tabanus milleri*, n. sp.**

Female—Length $8\frac{1}{2}$ -10 mm. Palpi white, with a slight yellowish tinge. Face covered by long white hairs. Antennæ fulvous, upper angle of third joint obtuse, annuli hardly infuscated. Front coarctate, dark yellow, sometimes almost black; no ocellar tubercle. Callus nearly black, rectangular, a line above. Eyes naked, dark green with a purple reflection and one distinct very dark purple band.

Thorax brown, with the usual lighter stripes. Abdomen black, segment margins yellowish white, expanding into three rows of spots, the medial row consisting mostly of white hairs, the lateral spots frequently fulvous, oblique and extending outward basally. Venter fuscous, margins white. Legs pale yellow, distal half of front tibiae and tarsi black, the other legs less infuscated. Wings hyaline, stigma pale yellow, first posterior cell broadly open.

Dedicated to two young friends whose kindly services furnished me a large number of desirable Tabani.

A comparison of twenty *milleri* captured in Florida, at Mianii, St. Augustine and St. Petersburg, with a great number of *sparus*, taken in New Hampshire, affords no constant separating character except the invariably well-defined eye band in this new species. *Sparus* has no band, only a purple reflection. *Pumilus* has two bands, also other distinct differences.

***Tabanus beatificus*, n. sp.**

Female—Length 15 mm. Antennæ black, third joint reddish at base, upper angle rectangular. Face, cheeks and palpi black. Front black, shining, callus transverse, protuberant. Connected above is a roundish convex spot extending across the front and nearly surrounded by light gray pollen. Vertex notched. Eyes naked, purple with three green bands. Thorax black, the gray lines scarcely perceptible. Abdomen black, densely covered with

appressed black hairs, except that laterally on the first three segments the hairs are white, forming broad, continuous grayish stripes of equal width with the median interspace. The fourth segment has traces of these stripes in narrow lateral and posterior fringes. Venter and legs very dark brown. Wings dark fuliginous, first posterior cell slightly coarctate.

One specimen received with other Florida Tabani from Rev. Geo. D. Hulst.

Chrysops ultimus, n. sp.

Female—Length $6\frac{1}{2}$ mm. Face yellow, callosities and palpi black. Antennæ slender, reddish at base, becoming black apically. Front yellowish pollinose, callosity and ocellar region black. Thorax black, with two greenish median stripes, a bright yellow one just above the wings and two below. Scutellum, abdomen and venter black; an obsolete median dorsal stripe. Legs yellow; joints, distal half of tibiae and tarsi infuscated. Wings: root, costal cell, cross-band and apical spot black. First basal cell completely infuscated, second hyaline. The cross-band is convex outwardly, almost reaching the divarication of the third vein and fills the fourth posterior cell. The fifth is semi-infuscate. The apical spot fills the second sub-marginal cell, except a dot at base, and crosses the first posterior. The hyaline triangle is very narrow, but crosses brokenly the marginal cell to the costa.

Taken at West Palm Beach, Florida, April 18th.

Chrysops cursim.

This species was described in the "Can. Ent." for 1879, Vol. II, Page 36.

In "Kansas Acad. of Science," Vol. X (1885-6) Prof. Williston, never having seen the species, remarks, "I do not see wherein this species differs from *C. pudicus* O. S." Presumably upon that authority *cursim* is placed in the "Tabanidæ of the World" as a synonym of *pudicus*.

Although no topotypes of *cursim* have been taken, the species has been found in several localities in New Jersey and Penn., and recognized, notably by Mr. Erich Daecke, who states he has never found intergrades of the two species. A specimen now in the collection of the Boston Soc. of Nat. Hist. was captured by Prof. A. P. Morse at West Peabody, Mass., July 13, 1911.

In comparison, *pubicus* may be said to have a black abdomen with yellow markings and *cursim* a yellow abdomen with black markings. The wing picture of *cursim* is as irregular as that of *delicatulus* and lighter coloured, while that of *pubicus* is dark and well defined.

THREE NEW SPECIES OF ODONATA.*

BY HORTENSE BUTLER, ITHACA, N. Y.

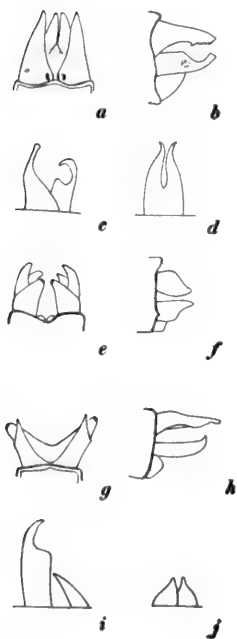
This paper contains the descriptions of three new species of dragonflies which were found while working over the material in the Cornell University collection, in the course of the preparation of a handbook of North American dragonflies.

Ophiogomphus sequoiarum, n. sp.

Total length ♂, 49 mm.; abdomen 34 mm.; hind wing 29 mm.

Total length ♀, 51 mm.; abdomen 34 mm.; hind wing 29 mm.

Face and occiput yellowish green, vertex dark brown, with paler transverse oval spot. Prothorax brown, with double median yellow spot on dorsum. Thorax olive green; on the dorsum a moderate stripe of dark brown, contracted on the collar; humeral and antehumeral stripes of dark brown, confluent above, with a narrow dividing line of olive green. Sides of thorax olive green, with a very narrow brown line on the last suture. Abdomen brownish, with hastate yellowish spots on dorsum of segments 1-9; dorsum of segment 10 more broadly yellow; sides of segments 1 and 2 inferiorly yellow, including the auricles; 8 and 9 also yellowish, excepting extreme margin of 8 apically. Legs dark brown, basal three-fourths of femora yellowish and studded with short, dark spines. Appendages yellowish (figs. a and b). Wings hyaline, costa indistinctly paler, stigma black.



a-d—*Ophiogomphus sequoiarum*.
e-f—*Nehalennia carlotta*.
g-j—*Gomphus abditus*.

Female much like male, dorsum of the abdomen more broadly yellowish.

Male holotype, Three Rivers, Giant Forest, Tulare Co., Calif. 800-6500 ft., 16th July, 1907; collected by Dr. J. C. Bradley; now in the Cornell University collection. Female allotype from Sonoma Co., Calif., and a male paratype from the same place, both in the Cornell University collection. There are also paratypes of both sexes in the Museum of the Brooklyn Institute of Arts and Sciences.

***Nehalennia carlotta*, n. sp.**

Total length ♂, 24 mm., abdomen 19 mm., hind wing 14 mm. Total length ♀, 28 mm., abdomen 21 mm., hind wing 17 mm.

Face pale with a narrow transverse brown stripe on the base of the labrum, and a similar broader stripe on the clypeus; vertex and occiput metallic bluish green, rear of occiput yellow. Dorsum of prothorax and thorax metallic bluish green, pale beneath, sutures and carinae brown. Abdomen metallic bluish green on dorsum, pale beneath. The metallic green is abbreviated and bilobed on segment 8, and reduced to paired triangular basal spots on 9 and 10. Legs pale, dark line exteriorly on femora and tibiae. Appendages (figs. e and f) light brown. Wings hyaline, stigma light yellowish, .5 mm. long, surmounting one cell. Colouring of female similar, but somewhat paler, the metallic bluish green on the terminal segments is less abbreviated.

Male holotype, female allotype, and several paratypes of both sexes, Saranac Inn, N. Y., July, 1900, collected by Dr. J. G. Needham; in the Cornell University collection.

This is the species referred to in Bulletin 68 of the New York State Museum, pp. 218, 249 and 250, as *Nehalennia gracilis*. A closer examination of the material and a comparison with the figures in Dr. Calvert's recent papers on the species of *Nehalennia* (Ent. News, Vol. XXIV, pp. 310-316, 373-374) prove this to be a new species.

***Gomphus abditus*, n. sp.**

Total length ♂, 47 mm.; abdomen 33 mm.; hind wing 29. Total length ♀, 49 mm.; abdomen 36 mm.; hind wing 32 mm.

Face, occiput and vertex yellow, labrum narrowly bordered with brown, clypeus and middle portion of frons obscurely washed with brown. Prothorax brown with an irregular yellow median

line on dorsum. Thorax brown, marked with yellow as follows; A narrow line on the carina, extended laterally and dilated on the collar; a pair of dorsal stripes rounded above, more pointed at their divergent lower ends; a narrow isolated curved antehumeral stripe and a broad mid-lateral stripe, invaded by a narrow strip of brown extending upward before the stigma; yellow underneath. Abdomen dark brown, with hastate yellow basal spots on dorsum of segments 1-9. Segment 10 light brown, without markings. Sides of segments 1 and 2 wholly yellow, including the auricles; 8 and 9 also yellow, excepting the apical margins. Legs dark brown, paler basally; basal three-fourths of femora yellowish. Appendages (figs. g and h) light brown. Wings hyaline, extreme base indistinctly yellowish; stigma yellowish with brown veins, 3.5 mm. long.

Female similar in colouring; brown markings on the thorax broader; hind margin of occiput nearly straight, entirely hairy. On the male it is bare, except at the ends.

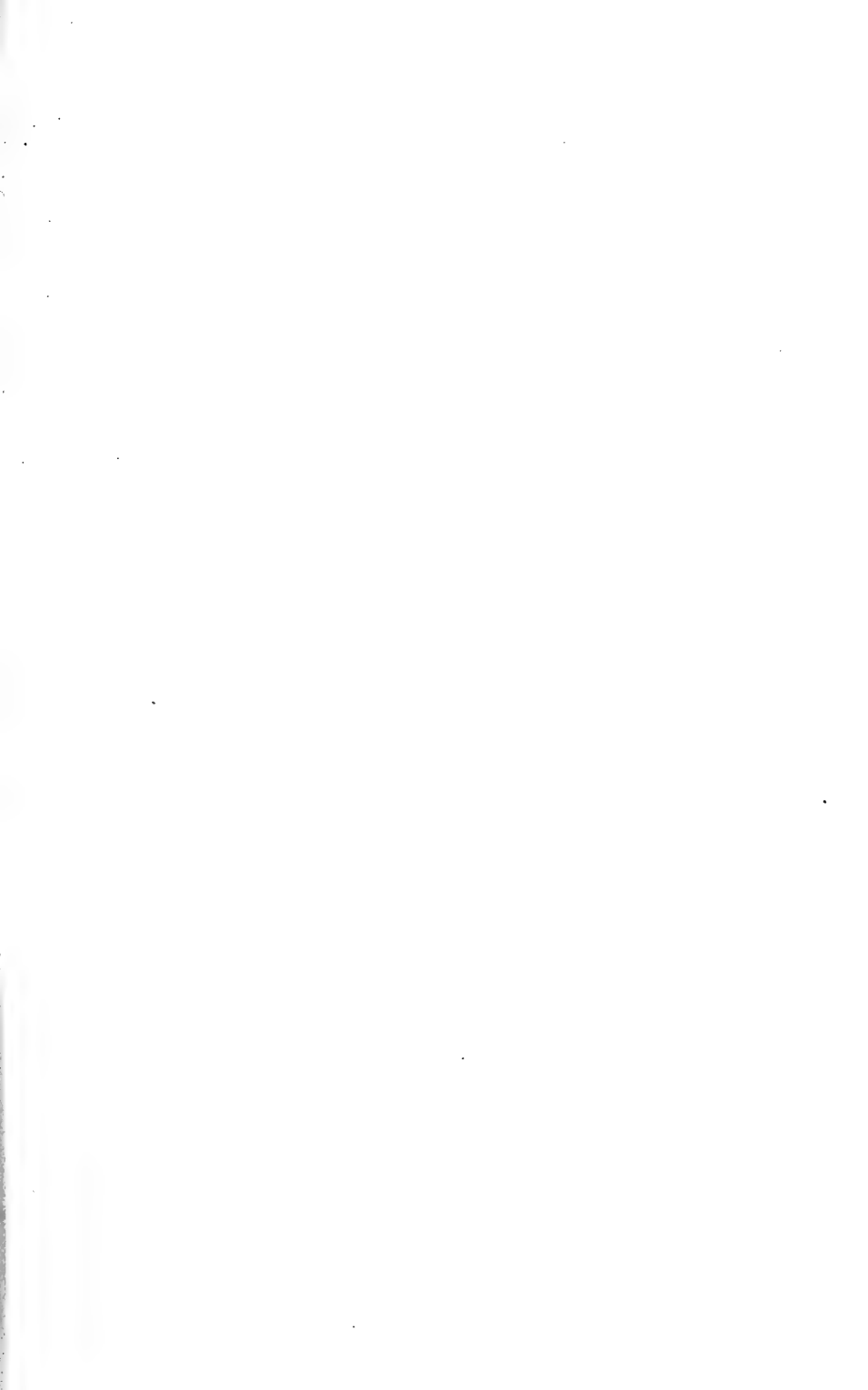
Male holotype, Chicopee, Mass., 20th June; female allotype of same place and date; both in the Cornell University Collection.

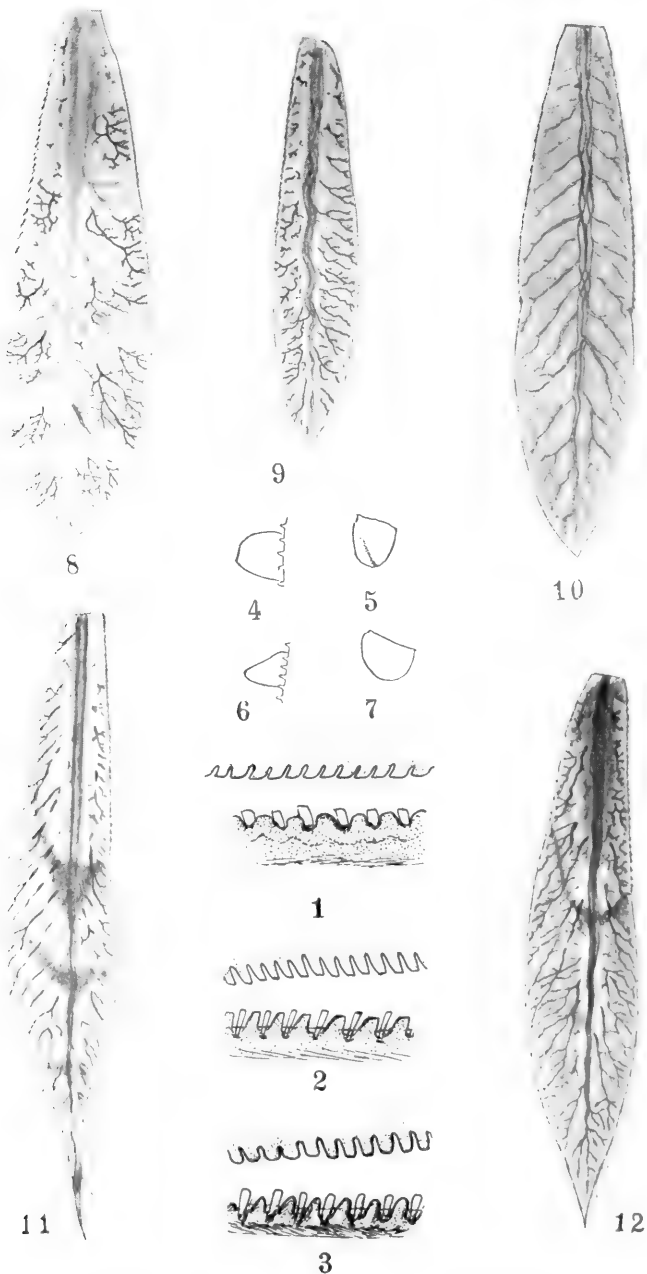
ENTOMOLOGICAL SOCIETY OF ONTARIO— ANNUAL MEETING.

The Fifty-first Annual Meeting of the Entomological Society of Ontario will be held at Toronto on Thursday and Friday, Nov. 5 and 6.

There will be a meeting of the Council on Thursday, at 11 a.m., in the University Biological Building, and at 2 p.m. the regular meetings will commence in the lecture-room of the Canadian Institute, 128 College St. A lantern will be available for those who wish to illustrate their papers with slides.

The Society is fortunate in having obtained the services of Prof. J. H. Comstock, of Cornell University, to deliver the public lecture, which will be given on Thursday evening in the Biological Building. His subject will be "The Habits of Spiders," and will be illustrated by lantern slides from Prof. Comstock's own photographs.





NYPHS OF CANADIAN ODONATA.

NEW AND LITTLE-KNOWN NYMPHS OF CANADIAN
ODONATA.

BY E. M. WALKER, TORONTO, ONT.

Lestes unguiculatus Hagen.

Owing to the lack of material this species was very imperfectly described in my recent paper* on the nymphs of *Lestes* and was not included in the key. Since then I have reared a female imago from a nymph found in an artificial pond close to my house in Wychwood Park, Toronto. I also found another female exuvia. Adults of both sexes were common here and were the only species of *Lestes* present. The reared specimen emerged on July 12, at about 7.30 a.m.

In general appearance the nymph is quite similar to that of *rectangularis* with which it agrees closely in the form and size of the mentum of the labium and the ovipositor. In my key it runs to *rectangularis* and the following alterations may be made in the key to include both species.

DD. Mentum of labium 3.7-4.2 mm. long, rarely reaching beyond middle of hind coxæ; ovipositor just reaching apical margin of segment 10.

F. Inner part of lateral lobes of labium about three times as long as their middle breadth, the marginal teeth about as broad as long, truncated; teeth of middle lobe broader than long, rounded; mental setæ 6 or 7. *unguiculatus*.

FF. Inner part of lateral lobes of labium about four times as long as their middle breadth, the marginal teeth longer than broad, more or less apically rounded; teeth of middle lobe about as long as their basal breadth; mental setæ normally five. . . *rectangularis*.

Nymph.—Labium, when closely applied to ventral surface, extending caudad not quite to the base of the hind coxæ. The slender proximal part of the mentum is about 1.5 times as long as the expanded distal part and just before the latter it is narrowed to about one-sixth of the distal breadth, widening proximad to

*Can. Ent., XLVI, No. 6, p. 194.
October, 1914.

about twice this breadth. Inner part of lateral lobes about three times as long as their middle breadth, the marginal teeth and those of the middle lobe somewhat shorter than in other species, except *congener*, the minute setæ alternating with the latter teeth stout and square-tipped (Pl. XXIII, fig. 1). Row of teeth between the two hooks of the outer part as in *rectangularis*, *disjunctus*, etc. Mental setæ 6 or 7; lateral setæ 3.

Lateral spines on abdominal segments 5-9; 8-13 spinules on lateral carinæ of segment 9. The ovipositor in the reared specimen reaches very slightly beyond the apical margin of segment 10, in the other it just reaches the margin. It is quite similar to that of *rectangularis*.

Gills broadest at about the proximal third, tapering gradually to the slender convexo-acute apices, the breadth at the distal third about two-thirds of that at the proximal third. Transverse bands rather faint in the two specimens examined but probably variable.

The colour pattern is not distinct in the exuviae.

Length of body (without gills) 19.5-20; labium 3.9-4.2; outer-wing-pad 5.3; hind femur 5; gill 9-5; ovipositor 2.

Enallagma hageni (Walsh).

The nymph of this species has been described by Needham (Bull. 68, N.Y. State Mus., p. 254, 1903) but the description is insufficient for the recognition of the species. I have taken the nymphs in large numbers in several localities and have frequently bred them. They are readily known in the field (except from *E. ebrium*) by the spotted gills.

Nymph.—Eyes not very prominent (vide Can. Ent., XLV, No. 6, pl. 1, fig. 6); postero-lateral margins of head moderately convex with a few spinules, the the curve of the postero-median excavation somewhat broader and more flattened. Second antennal joint 3-3.5 times as long as thick. Labium with 3 mental setæ (occasionally a rudimentary fourth) and 5 or 6 lateral setæ; distal margin of lateral lobes with 6 or 7 teeth, the posterior (inner) three larger than the others which are minute and ill-defined.

Spinules on lateral margins of abdominal segments 2-8 increasing considerably in size from the base of each segment to the postero-lateral angles, when they form an irregular group, (fig. 32). Lateral appendages of male (pl. XXIII, figs. 6, 7) in profile subtriangular; viewed dorso-ventrally they appear broader than long, their free margins broadly convexly curved; upper surface slightly sulcate.

Gills (pl. XXIII, fig. 8) oblanceolate, broadest at the distal third, apices rounded or convexo-acute; middle gill about three times, lateral gills four times, as long as broad. About two-fifths to one-half of the upper margin of the median gill and about six-elevenths of the lower margins of the lateral gills are spinulose, the spinules being very minute at base but gradually enlarging to the end of the series where they abruptly terminate. Distally the margins are sparsely fringed with very short delicate setæ. The pigmentation consists of 10 or 12 irregular areas in which the tracheal branches are pigmented, separated by unpigmented areas, giving the gills a spotted or blotched appearance to the naked eye. Sometimes there is some diffuse pigmentation along the median axis.

On the dorsum of the abdomen is a pale median line, on each side of which is a more or less diffusely pigmented area, which sometimes forms a definite stripe. Legs more or less spotted, the femora having an anteapical and sometimes a basal dusky annulus, the tibiae also with a sub-basal annulus. There is also sometimes a dark lateral band on the thorax and abdomen.

Ovipositor reaching caudad well beyond the postero-ventral margin of segment 10; it is slightly surpassed by the sharp-pointed valves which reach the middle of the segment.

Length of body (without gills) 14-18; outer wing-pad 3.6-4.3; gills 4.5-7; hind femur 2.8-3.4.

***Enallagma ebrium* (Hagen).**

Among a number of nymphs of *E. hageni*, obtained at Toronto Island, was a single male of *E. ebrium*, which emerged in the morning of June 4, 1914. This was the first individual to emerge

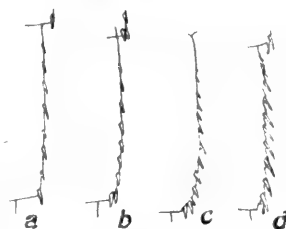


Fig. 32.—Spinules on right margin of seg. 8 in (a) *C. resolutum*, (b) *E. geminatum*, (c) *E. hageni*, (d) *E. carunculatum*.

from this lot of nymphs and I naturally supposed that the others were also of this species as they appeared to be all alike. But not another *ebrium* emerged, all were *hageni*, and on returning a few weeks later to the spot where the nymphs were taken it was found to be swarming with *Enallagmas*, all of which, as far as I was able to determine, were *hageni*.

The nymph of *ebrium* appears to differ from that of *hageni* only in the form of the lateral appendages of the male (pl. XXII, figs. 4, 5). The shape of the head, parts of the labium, gills, etc., are all precisely as in *hageni*. In the single exuvia I have there are three mental setæ and a rudimentary fourth and six lateral setæ on each side; the distal margin of the lateral lobes of the labium bears three teeth of medium size, preceded by 3 or 4 very minute crenulations.

The lateral appendages seen in profile are bluntly rounded and about as deep as long; seen from above they appear much narrower than in *hageni*, especially distally, and the supero-internal surface is distinctly though shallowly and obliquely sulcate.

Length of body (without gills) 14.5; outer wing-pad 4.5; gills 6.8; hind femur 3.6.

***Enallagma geminatum* Kellicott.**

I have bred a single female of this species, the nymph of which was taken in Grenadier Pond, Toronto, and transformed on July 2, 1914. In form it resembles the preceding two species but differs in the slenderer, unspotted gills and the less conspicuous spinules of the lateral margins of the abdominal segments which form a single series terminating in a pair at the postero-lateral angles. (Fig. 32, b.) In this respect it approaches *Coenagrion resolutum*.

The ovipositor is relatively longer than in *E. hageni*, nearly reaching the postero-ventral margin of segment 10, the apices of the valves just reaching this margin.

Labium with 3 mental setæ on each side and an additional rudiment on one side (4, occasionally 3, according to Needham); lateral setæ 5. Distal margin of lateral lobes with 3 rather large teeth preceded by a very short and indistinctly denticulated margin.

Lateral gills (pl. XXIII, fig. 9) slender, about six times as long as the greatest breadth, which is at about the distal third; apices acute. About six-elevenths of the upper margin is spinulose. Distad of this the margins are almost devoid of setæ. Pigmentation confined to the tracheal branches, scattered but not grouped to form blotches. The median gill is absent in the single exuvia I possess.

Length of body (without gills) 11; outer wing-pad 3.6; gill 4.2; hind femur 2.7.

Coenagrion resolutum Selys.

I found this species transforming at Prince Albert, Sask., June 24, 1913, and reared both sexes. I also reared a female at Toronto, which emerged on June 1, 1913, and a male from Wilcox Lake, Ont., which transformed on June 1, 1914. The following description was prepared from the exuviae.

Nymph.—The nymph resembles that of *Ischnura verticalis* very closely but can be distinguished by the shape of the gills, and the lateral appendages of the male, and in the majority of cases by the larger number of mental setæ.

Form moderately slender, being about the same as in *I. verticalis*, *E. hageni*, *E. geminatum*, etc., but less slender than in *E. signatum* and *E. pollutum*. Eyes moderately prominent; posterior margins of head broadly rounded, forming where they meet the eyes a very slight emargination; six or eight spines of various sizes can be seen on the posterior margin from above and a variable, usually larger, number near the margin in ventral view. There is also a series of spinules of very variable number (4-12) along the postero-ventral margin of the eye. Antennæ generally 6-jointed, the 7th. joint, when present, seldom very distinctly indicated. The second joint is 4 or 4.5 times as long as thick.

Labium extending back to about midway between the front and middle coxæ; mentum subtriangular, the apical breadth about four-fifths of the length, the sides in the proximal two-thirds straight and diverging at an angle of about 45°, in the distal third feebly arcuate and diverging at a somewhat greater angle; median lobe strongly depressed, convexo-obtusangulate; mental setæ 4-6; lateral lobes shaped as in *Ischnura* and *Enallagma*, the distal margin

with 5 teeth, which increase in size caudad, and a short end-hook; movable hook half as long as the lateral lobe; lateral setæ 6 or 7.

Lateral margins of abdominal segments 2-9 with a single, nearly straight series of small spinules, which increase somewhat irregularly in size caudad on each segment (fig. 32, a). Gills (pl. XXIII, fig. 10) unpigmented (in the reared female from Prince Albert there is a transverse dark streak near the division), 4.5-5 times as long as the greatest breadth, which is a little distad of the middle; sides distally arcuate, apices acute but not acuminate. There is a distinct transverse division a little beyond the middle, proximad of which the lateral margins are spinulose, distad smooth with fine hairs. All the exuviae except that of the female reared at Prince Albert are practically unpigmented. This one is brownish, the abdomen with a median pale line between two darker ones and the femora each with a pale antepical annulus.

Length of body (without gills) 13-14, outer wing-pad 3.9-4.5; gills 5-6; hind femur 3.0-3.6.

The most accurate means of distinguishing the nymph of this species from that of *Ischnura verticalis* is the form of the gills, which in the latter species, are much more tapering and somewhat acuminate apically and the division is proximad of the middle (pl. XXIII, fig 12). The tracheal branches are also more or less pigmented and there is at least one dark transverse streak. The males can also be distinguished by the form of the lateral appendages (fig. 33), which in *resolutum* are deeper and in profile present a broad posterior surface, not represented in *verticalis*.

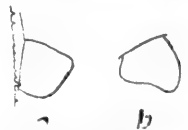


Fig. 33.—*C. resolutum* male, lateral appendage; (a) profile, (b) ventral view.

From the nymphs of *Enallagma* that I possess, viz. *E. calverti*, *hageni*, *ebrium*, *geminatum*, *carunculatum*, *signatum* and *pollutum*, *C. resolutum* differs in the arrangement of the spinules upon the lateral margins of the abdominal segments, which form a single series throughout, not being crowded into a group at the postero-lateral angles. This difference is very slight in the case of *E. geminatum* (fig. 32, b) in which this group of spinules is reduced to a pair. *Resolutum* also differs from these species of *Enallagma*, except *E. calverti*, in the larger number of mental and normally also of lateral setæ, there being usually in *Enallagma*,

3 mental and 5 lateral setæ. In *E. calverti* there are four mental and 6, or sometimes 5, lateral setæ. *Calverti*, however, is much larger with very dark gills, and in all the Enallagmas the gills are more or less pigmented. *E. geminatum* is the most like *C. resolutum* of the species mentioned, but the branches of the tracheae of the gills are less regularly distributed and are distinctly pigmented, and the lateral lobes of the labium have only five lateral setæ (as known at present). In *carunculatum* the lateral appendages of the male are much like those of *resolutum* but the spinules of the abdominal segments are much coarser (fig. 32, d)

Ischnura cervula Selys.

Several nymphs of this species were taken by the writer from the reedy margin of a large pond in the Bow Valley, at Banff, Alta. A female was reared from one of these nymphs at the Biological Station, near Nanaimo, Vancouver Is., emerging on July 20, 1913.

Form of body identical with that of *I. verticalis* the only distinctive character being found in the shape and pigmentation of the gills.

Eyes moderately prominent, posterior margins of head broadly rounded, forming where they meet the eye a very slight emargination. Posterior surface of head with numerous spines, and a series of minute spinules of variable number along the postero-ventral margin of the eye. Antennæ 7-jointed, the second joint 4-4.5 times as long as thick. Labium extending back to about midway between the bases of the first and second coxæ, sides of mentum almost straight, there being only a very slight increase in the angle of divergence at about the distal three-fifths; breadth at base of lateral lobes about five-sixths of the length; median lobe not very strongly depressed, bluntly obtusangulate; lateral lobes shaped as in *I. verticalis*, *C. resolutum*, etc., distal margin with two or three very minute teeth, preceding three much larger ones; end-hook a trifle larger than in *verticalis*; movable hook half as long as the lateral lobe; mental setæ 4 (rarely 5 on one side); lateral setæ 5 or 6.

Lateral margins of abdominal segments with a series of very short black spinules, forming several irregular rows. Gills (pl.

XXIII, fig. 11) gradually widening from base to distal third, where the breadth is about one-fifth of their length, apically acuminate, terminating in a long slender point; division slightly proximad of the middle. There is a pale ill-defined median area of greater or less extent, the peripheral parts being more transparent. The dark pigment is distributed along the median tracheæ, the lateral branches beyond the pale area, and in three transverse, more or less crescentic bands, one at the division, another near the apex and a third between these two; one of these, the basal or the middle band is more conspicuous than the others. The apical band is faint and may be scarcely recognizable.

The colour-pattern in other respects is entirely similar to that of *I. verticalis*. All my specimens are rather conspicuously marked but it is probable that the same variations are found in *I. cervula* as in *I. verticalis*. The general colour of alcoholic specimens is a moderately dark brown, spotted and banded with pale yellowish. The dorsum of the head is marked with a number of pale roundish spots, the thorax is more or less distinctly variegated with pale markings and the abdomen longitudinally striped, there being a pale median line between two broader dark bands, and on each side a dorso-lateral and a lateral pale streak. The legs are pale, distinctly ringed with brown, both femora and tibiæ being darkened at base, and having each two dark annuli.

Length of body (without gills) 11.2-12.5; outer wing-pad 3.6-3.9; gills 6; hind femur 3.

EXPLANATION OF PLATE XXIII.

Fig. 1. *Lestes unguiculatus*, teeth of median and lateral lobes of labium, greatly magnified.

Fig. 2. *Lestes forcipatus*, teeth of median and lateral lobes of labium.

Fig. 3. *Lestes rectangularis*, teeth of median and lateral lobes of labium.

Fig. 4. *Enallagma ebrium*, right lateral appendage of male nymph, profile view.

Fig. 5. *Enallagma ebrium*, same, dorsal view.

Fig. 6. *Enallagma hageni*, right lateral appendage of male nymph, profile view.

- Fig. 7. *Enallagma hageni*, same, dorsal view.
Fig. 8. *Enallagma hageni*, lateral gill.
Fig. 9. *Enallagma geminatum*, lateral gill.
Fig. 10. *Coenagrion resolutum*, lateral gill.
Fig. 11. *Ischnura cervula*, lateral gill.
Fig. 12. *Ischnura verticalis*, lateral gill.

(To be continued)

NEW SOUTH AMERICAN MEMBRACIDÆ.*

BY W. D. FUNKHOUSER, ITHACA, N. Y.

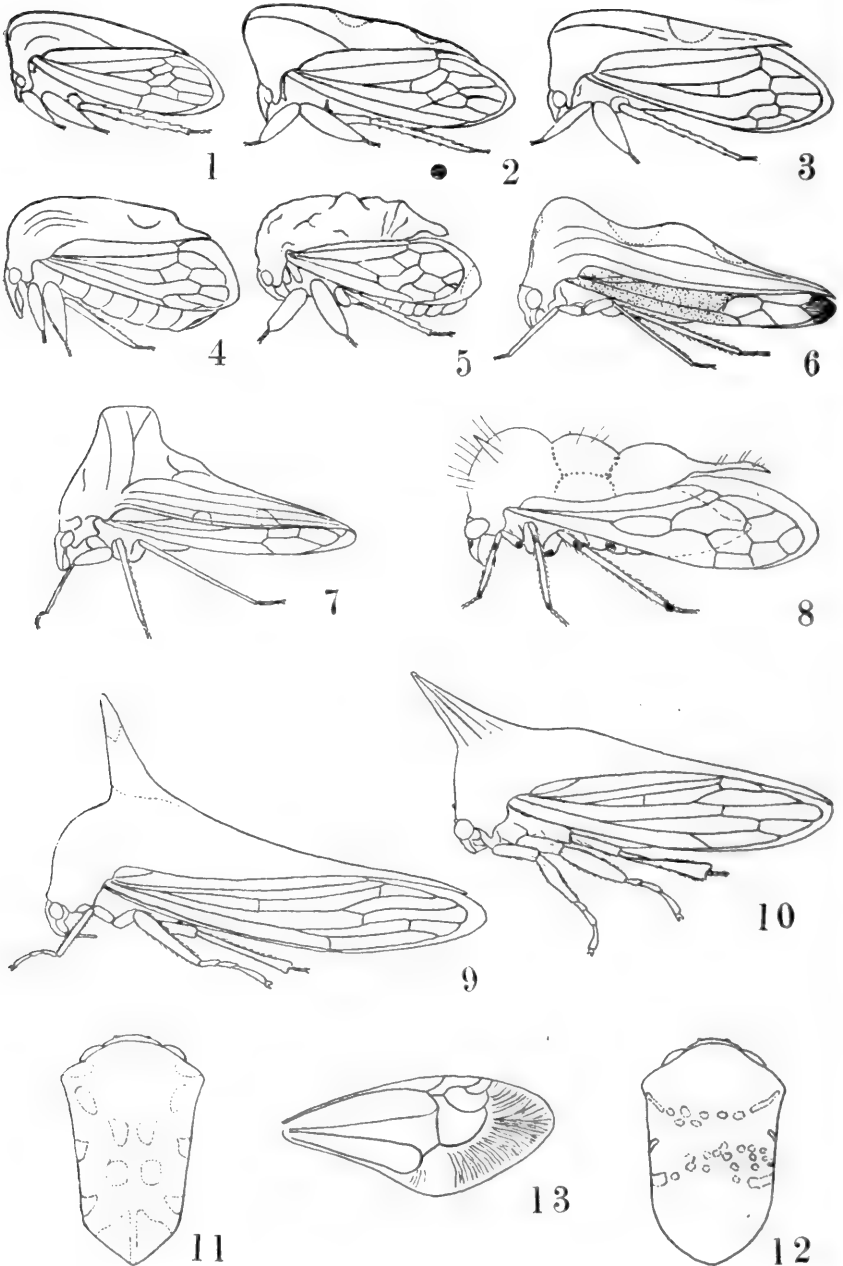
Subfamily MEMBRACINÆ.

1. *Tropidoscyta brunneidorsata*, sp. nov. (Pl. XXIV, fig. 1).

Near *T. pæcila* Germ., but differing in size, colour and in the shape and sculpture of the pronotum. A series of eleven specimens of this species from Peru and one specimen from Bolivia shows practically no variation and no tendency to gradate towards *T. pæcila*, to which it seems most nearly related.

Uniform dark chocolate brown, almost black, except the region between the first two lateral ridges, which is bright yellow brown, showing a characteristic light longitudinal band down the median line when viewed from the dorsal aspect. Obtriangular, humeral angles prominent and round, posterior process long and gradually acuminate. Head twice as long as wide; cheeks not extending beyond internal margin of eyes; eyes dull yellow, mottled with brown; ocelli farther from each other than from the eyes; black spot above each ocellus; face covered with fine, short, golden hairs. Pronotum high and projecting well forward anteriorly; transverse black mark on each side in front; sharp median keel extending from margin of head to tip of posterior process; two distinct ridges on each side, the first beginning close to the median line at the anterior apex of the pronotum, gradually extending away from the line, and ending at the lateral margin half way between the humeral angle and the posterior tip, the second extending as a semi-circular ridge just over the humeral angles, not reaching the lateral margin; dorsal and lateral margins of the pronotum almost straight,

*Contribution from the Entomological Laboratory of Cornell University.
October, 1914



not sinuate or bulbous; posterior extremity reaching just beyond internal angle of tegmina. Entire pronotum very finely punctured and sparsely covered with short golden hairs. Tegmina black at base, gradually becoming brown in middle, with apical third yellow hyaline; three discoidal areas; two transverse rows of light brown spots in central portion, three spots in first row and six in second. Under surface of body black. Legs dark brown, tarsi yellow; first and second pairs of tibiae much flattened.

Type.—Female.

Length, including closed tegmina: Female 4 mm., male 3.2 mm.; width between humeral angles, female 1.8 mm., male 1.6 mm.

Locality.—Marcapata, Peru.

The male, besides being smaller, is much darker and more distinctly punctured, and the wings lack the two transverse rows of spots.

2. *Tropidoscyta binotata*, sp. nov. (Fig. 2).

Close to the preceding, but larger and differs in sculpture and colour. May be easily recognized by the single ridge over each humeral angle, and by two white spots on the median dorsal line.

Head, body, wings and legs uniform yellow, except eyes, which are dark brown, and two white spots on median ridge of pronotum, one just before the middle and one just before the extremity of posterior process; each white spot having a black mark at each end. Head about twice as long as wide, lorae extending slightly beyond internal margin of eyes; finely punctate and pubescent; ocelli farther from each other than from the eyes. Pronotum strongly projecting forward, finely and deeply punctate and sparsely pubescent with golden hairs; median ridge strong and percurrent, very lightly sinuate; posterior process gradually acuminate, somewhat depressed at apex and extending beyond internal angle of tegmina and beyond abdomen; one strong lateral carina on each side, starting at extreme anterior apex of pronotum and extending to a point on the lateral margin, one-third way from humeral angle to posterior end. Tegmina opaque yellow, without markings, base and costal areas densely punctate; three discoidal areas. Legs yellow; fore and middle tibiae much flattened; hind tibiae thin, with black-tipped spines. Tarsi concolorous yellow.

Type.—Female.

Length from anterior apex to tip of tegmina, female 5 mm., male 4.2 mm.; width between humeral angles, female 2.2 mm., male 1.8 mm.

Locality.—Espirito Santo, Brazil.

The male is somewhat darker, the veins of the tegmina much darker and more prominent, the basal half of tegmina and the under surface of the body deep ferruginous or black.

3. *Tropidoscyta maculata*, sp. nov. (Fig. 3).

Near *T. minor* Buckt., but differs in the sculpture of the pronotum, in the markings, and in the venation of the tegmina. May be recognized by the large white spot on the median dorsal line and by the fact that only two discoidal cells are present in the tegmina. This latter character would suggest the genus *Leioscyta* of Fowler, but the position of these cells is quite different from the forms figured by that author, and the high, rough, carinate pronotum at once prevents its admission to his genus.

Deep chocolate brown, except anterior half of median dorsal ridge, which is light yellow brown, spot behind this white hyaline, and apex of posterior process almost black. Head twice as long as wide, very dark brown, faintly punctured, densely pilose with long yellow hairs; ocelli yellow white, farther from each other than from the eyes; eyes brown. Pronotum thickly punctate and sparingly pilose; high percurrent median carina compressed into a sharp thin keel in the middle; one high, sharp, lateral carina on each side, beginning at extreme anterior apex and ending in about the middle before reaching the lateral margin; posterior process acute, extending just beyond internal angle of tegmina. Tegmina black at basal third, becoming ferruginous in middle and smoky hyaline at apical third; base finely punctate; veins somewhat pubescent; two discoidal cells. Legs ferruginous; first and second tibiae flattened; tarsi flavous.

Type.—Female.

Length, female 4 mm., male 3.7 mm.; width, female 1.8 mm., male 1.5 mm.

Locality.—Peru.

The male is uniformly darker, with the white dorsal spot and the apical ends of the tegmina consequently more distinct.

4. **Bolbonota lutea**, sp. nov. (Fig. 4).

A fine, handsome species near *B. globosa* Fairm. In shape and size it much resembles *B. insignis* of Fowler, but differs in colour and sculpture, Fowler's species being shining, black and irregularly rigid, while *lutea* is uniform lemon yellow and almost smooth.

Head, body and legs light lemon yellow throughout. Head comparatively smooth, pubescent, twice as long as wide; ocelli slightly protruding; clypeus roughly diamond-shaped, with lateral angles extending beyond line of loræ, apex produced. Pronotum smooth, densely covered with yellow pubescence; humeral angles prominent and obtuse; percurrent median ridge high and lightly sinuate until just before the posterior apex, where it is abruptly declivous; posterior process blunt and triangular, just reaching internal angle of tegmina; three faint, short ridges over each humeral angle, the middle one most prominent; a depressed constriction just posterior to these ridges on each side of median carina, forming an apparent bulbous swelling before and behind it. Tegmina comparatively narrow, exposing almost one-fourth of the abdomen below; flat, opaque; yellow slightly punctate and pubescent at base. Abdomen yellow and pubescent. Legs concolorous yellow with very fine black-tipped spines at apex of hind tibiæ.

Type.—Female.

Length 4.2 mm., width 2.6 mm.

Locality.—Espírito Santo, Brazil.

Described from four females.

5. **Bolbonota nigrata**, sp. nov. (Fig. 5).

Near *B. melaena* Germ., but differs in the structure of the dorsal surface and in being entirely without spots on pronotum or tegmina.

Entirely shining black, except extreme tips of tegmina, which are hyaline; very rough and corrugated. Head rough, finely punctate, sparsely pubescent; ocelli white, equidistant from each other and from the eyes; eyes dark brown, edged with white. Pronotum deeply and coarsely punctured, covered with irregular ridges and

bulbs. Median ridge percurrent, sharp and sinuate; humeral angles prominent; two large bulbs on each side median ridge, ridge thin between these bulbs; a Y-shaped ridge between humeral angle and first lateral bulb; posterior process blunt, subtriangular, slightly depressed, extending just beyond internal angle of tegmina. Tegmina velvety black, veins somewhat raised, extreme tip of marginal border hyaline. Abdomen black; segments edged with fine white line. Legs black; hind tibiae strongly spined; tarsi flavous.

Type.—Female.

Length, female 3.6 mm., male 2.8 mm.; width, female 2.4 mm., male 2 mm.

Locality.—Bolivia.

The male differs only in size.

Subfamily SMILIINÆ.

6. *Metheisa sinuata*, sp. nov. (Fig. 6).

This species varies greatly in size and colour; the size ranges from four to seven millimeters, and the colour from light cinnamon brown to almost black. The sculpture and pattern of the pronotum, however, are constant. The pronotum is rather more elevated than in the other species of this genus, and is broadly sinuate in the middle; the tegmina usually show four apical and two discoidal cells, though in one specimen one of the discoidal cells is absent; the wings have four apical and no discoidal cells.

Head rough and sculptured; subtriangular, apex very sharp; clypeus almost square, somewhat pubescent; face deeply pitted; proximal margin of the head produced into a ridge. Prothorax elevated; median keel high and thin, sinuate in middle between rounded dorsal elevations, on either side of these elevations and between them a white patch, very distinct, even though the body colour may vary; on each side of pronotum three prominent ridges, deeply and coarsely punctate between them; humeral angles prominent and blunt; posterior process sharp, decurved, reaching just to the apex of the tegmina. Tegmina nearly half concealed by the pronotum; basal two-thirds opaque and roughly punctured; apical third hyaline, black spot at tip. Abdomen extending about

half as far as the tegmina, usually hidden by the opaque basal portion of the latter. Legs usually concolorous.

Type.—Female.

In the type specimen the colour is uniform light brown, with the pronotal ridges and the head slightly darker and shining. The males are, as a rule, darker and more inclined to show mottled patches.

Length (type) 7 mm.; width 2.5 mm.

Locality.—Peru.

(To be continued.)

NEW GENERA AND SPECIES OF SAWFLIES.*

BY ALEX. D. MACGILLIVRAY, UNIVERSITY OF ILLINOIS, URBANA, ILL.

The greater part of the following descriptions have been in hand for some time. Some of the species are of economic importance. The descriptions are offered at this time so that the names can be used by others.

Simplemphytus, n. gen.

Antennæ with nine segments; front wings with the free part of Sc_1 present, but short, the radial cross-vein present and the radio-medial cross-vein wanting; the medio-cubital cross-vein and *media* separating from $Sc+R+M$ at the same point; the third anal vein deeply bowed at middle; the free part of the second anal vein present; the second abscissa of *Cu* subequal in length to the free part of M_4 ; the medio-cubital cross-vein and the free part of M_{3+4} parallel; the hind wings with the spur at the distal end of the cell R_{1+2} wanting, minute, or large; the free part of R_4 and the transverse part of M_2 wanting; the first anal cell petiolate and shorter than the cell in front of it; the posterior metatarsus shorter than all the following segments together. Type *Simplemphytus pacificus*, n. sp.

This genus is closely related to *Emphytus* in habitus and structure.

Simplemphytus pacificus, n. sp.

Female.—Body coal-black, with the distal third of the front femora, the front tibiae, the front metatarsi, and the knees of the

*Contributions from the Entomological Laboratories of the University of Illinois, No. 41.
October, 1914

middle legs, pale rufous or whitish; the antennæ short with the third segment longer than the fourth, the fourth and fifth subequal; the head, including the clypeus and labrum, densely punctured and setaceous, less abundant on the postocellar area; the malar space broad, the clypeus deeply roundly emarginate, the labrum set in the emargination; the supraclypeal area elevated, convex; the antennal furrows broad depressions; indistinct, line-like marks at the occiput; the ocellar basin broad, diamond-shaped, enclosing the median ocellus and extending to the median fovea, which is round, shallow, indistinct, and still less distinct in the male; the mesonotum, the metanotum, the pleuræ, and the pectus polished; the abdomen polished, densely setaceous; the saw guides convex above, straight on the proximal half below, convex on the distal half, joining the upper margin at the middle of the distal end and forming a pointed but bluntly rounded distal end. Length 7—9 mm.

Habitat—Troutdale, Oregon.

Described from specimens received from Professor H. F. Wilson, who reports it as boring into the stems of cherry.

Profenusa, gen.

Antennæ with nine segments; front wings with the free part of Sc_1 tuberculate; the radial cross-vein, the radio-medial cross-vein, and the free part of R_4 and R_5 present; the medio-cubital cross-vein separating from $Sc+R+M$ near the point of origin of the free part of M and strongly divergent caudad with the free part of M_{3+4} ; the anal cells petiolate; the scar of the free part of the third anal vein wanting; the free part of M_4-Cu_1 located midway between the mediocubital cross-vein and the free part of M_{3+4} ; the hind wings with the cell R_{1+2} wanting; the free part of R_4 and the transverse part of M_2 wanting; the free part of the second anal vein present. Type, *Profenusa collaris*, n. sp.

This genus is closely related to *Messa* Leach, from which it is differentiated by the presence of the radio-medial cross-vein.

Profenusa collaris, n. sp.

Female—Body black, with the clypeus, labrum, malar space, the mandibles, the first segment of the antennæ, the tegulæ, a narrow margin to the pronotum, and the legs, for the most part,

whitish. The prothorax, except the parts named, the cephalic part of the mesopleuræ, and the pectus, rufous; the posterior femora more or less shaded with fuscous; the head smooth with antennal furrows interrupted on the middle of the face; the furrows surrounding the postocellar area deep and distinct; the vertical furrows not reaching the occiput; the median ocellus placed on a flat depression; a pit above the antennal socket; the median fovea minute but distinct; the clypeus truncate; the first and second antennal segments subequal, the third segment subequal to one and two together and longer than four; the saw-guides with the dorsal and ventral margins converging and the apex bluntly pointed; the male differs in having the rufous part of the thorax inclined to whitish and extending over the entire pleuræ, the venter of the abdomen and a broad band on the lateral part of the dorsal aspect, broader behind, sometimes fused on the meson, whitish; the posterior femora not fuscous. Length 3 to 4 mm.

Habitat—Massachusetts and New York.

This insect was first received May 10th, 1909, from Mr. Ralph W. Curtis, Assistant Superintendent of Parks of Boston, Mass., who reported the larvæ as mining the leaves of *Cratægus*. Larvæ and adults were collected during the summer of 1911 by Mr. Andrew Rutherford in the Cascadilla ravine, Ithaca, N. Y., on *Cratægus*. It was also received during 1911 from Mr. P. J. Parrott, who reported it from Geneva, N. Y., where the larvæ were serious pests, mining the leaves of cherry.

Fenusa.—It has been shown by Mr. S. A. Rohwer that the type of this genus is *Tenthredo* (*Emphytus*) *pumila* Klg., which is congeneric with *Kaliosysphinga dohrnii* Tischbein, the type of *Kaliosysphinga*. *Fenusa* will therefore replace *Kaliosysphinga*, and another name must be used for the group of species hitherto included under *Fenusa*.

Messa.—It has also been shown by Mr. S. A. Rohwer that the type of the genus *Messa* Leach, a name hitherto erroneously associated with certain species of Nematinae, is *Tenthredo* (*Emphytus*) *hortulana* Klg., which is one of the species formerly associated with the generic name *Fenusa*. This name should, therefore, be used for those species and includes the American *Fenusa ambigua* Nort.

Euura maculata, n. sp.

Body black, with the head except a quadrangular spot about the ocelli and extending to the eyes, prothorax, margin of the lobes of the mesonotum narrowly, upper half of the pleuræ, tegulæ, legs, abdomen, except above at base, and saw-guides, except at apex, resinous; frontal crest indefinite and apparently wanting; median fovea a minute pit; saw-guides large, upper and lower margins slightly converging, and broadly rounded at apex. Length 7 mm.

Habitat—Collected by Professor J. S. Hine at Columbus, Ohio, and bears the number 169.

The form of the frontal crest distinguishes this species from all of the described eastern species.

Euura minuta, n. sp.

Body black, with head except a spot around the ocelli and occiput, pronotum, tegulæ, legs, and venter of abdomen, luteous; saw-guides straight above and broadly convexly rounded below, truncated at apex; frontal crest distinct and broken at middle; median fovea indefinite, represented only by a shallow depression in the frontal crest. Length 4 mm.

Habitat—Ames, Iowa. Professor E. D. Ball, collector.

This species is related to *nigra* Prov., from which it is separated by the colour of orbits and to *nodus* Walsh, from which it is separated by the indefinite median fovea.

Metallus bethunei, n. sp.

Female—Body black, with the two basal segments of the antennæ more or less, the trochanters, and the legs beyond the knees, white; the distal half of the posterior tibiæ sometimes more or less infuscated; the ocellar furrow adjacent to the median ocellus; the interocellar furrow wanting; depressed area behind the median ocellus broad; median fovea a broad, deep pit; lateral fovea distinct from lateral fovea; body polished with sparse setigerous punctures; the front not punctate around the base of the antennæ; the stigma twice as long as broad; front wings with the free part of M_4+Cu_1 joining the cell M_4 at middle; the saw-guides straight above, somewhat oblique below, broadly obliquely rounded point at apex above. The antennæ of the male is longer and the segments broader and compressed. Length, 4 mm.

Habitat—Jordan Harbour and Saint Kits, Ontario, Canada.

Received from Mr. Lawson Caesar, who bred it from a leaf-mining larva on blackberry. The species is named for the Rev. C. J. S. Bethune. It is closely related to *rubi*, but readily separated from that species by the more oblique and blunter saw-guides.

BOOK REVIEW.

THE NATURAL HISTORY OF THE FARM. A Guide to the Practical Study of the Sources of our Living in Wild Nature. By James G. Needham, Professor of Limnology, General Biology and Nature Study in Cornell University, Ithaca, N. Y. The Comstock Publishing Company, 1913. \$1.50.

Like Professor Needham's other writings this little book is marked by a freshness of viewpoint and a vigour of style entirely his own. Its aim is to give to the student something of that practical knowledge of nature possessed by the Indian and the pioneer, that personal acquaintance with common wild things, which was indispensable in the days when men were dependent upon their own hands for obtaining a living from the wilderness.

But it tells not only of the plants and animals from which we get our food, clothing and shelter, their relations to Mother Earth and to one another, but throughout the book the value of the beautiful in nature as an educational factor is never forgotten. It is this feature, that in our opinion gives the book its chief charm. The author's intimate first-hand knowledge of out-door nature and his keen sympathy with all her moods, are reflected throughout the book in such a way that the reader can scarcely fail to feel some of the charm of the wildwood, if he is at all responsive to its influence. Nor is there the slightest touch of that sentimentality which is apt to result from an attempt to record the charm of Nature in words.

The course of studies outlined is divided into three parts, adapted respectively for the fall, spring and summer terms of the college-year; each part including 16 exercises. The studies cover a wide range of subjects and are all designed to bring the student into close contact with nature in all seasons and all

kinds of weather. They are not intended to give all the information demanded of the student. This is to be acquired at first hand. They are merely suggestive, serving to direct the student's powers of observation and to give coherence to the knowledge he obtains in the field. At the close of each chapter a definite programme of work is given, including suggestions for recording observations by means of notes, diagrams, etc. There is also included a number of optional exercises for the individual student, to be pursued independently.

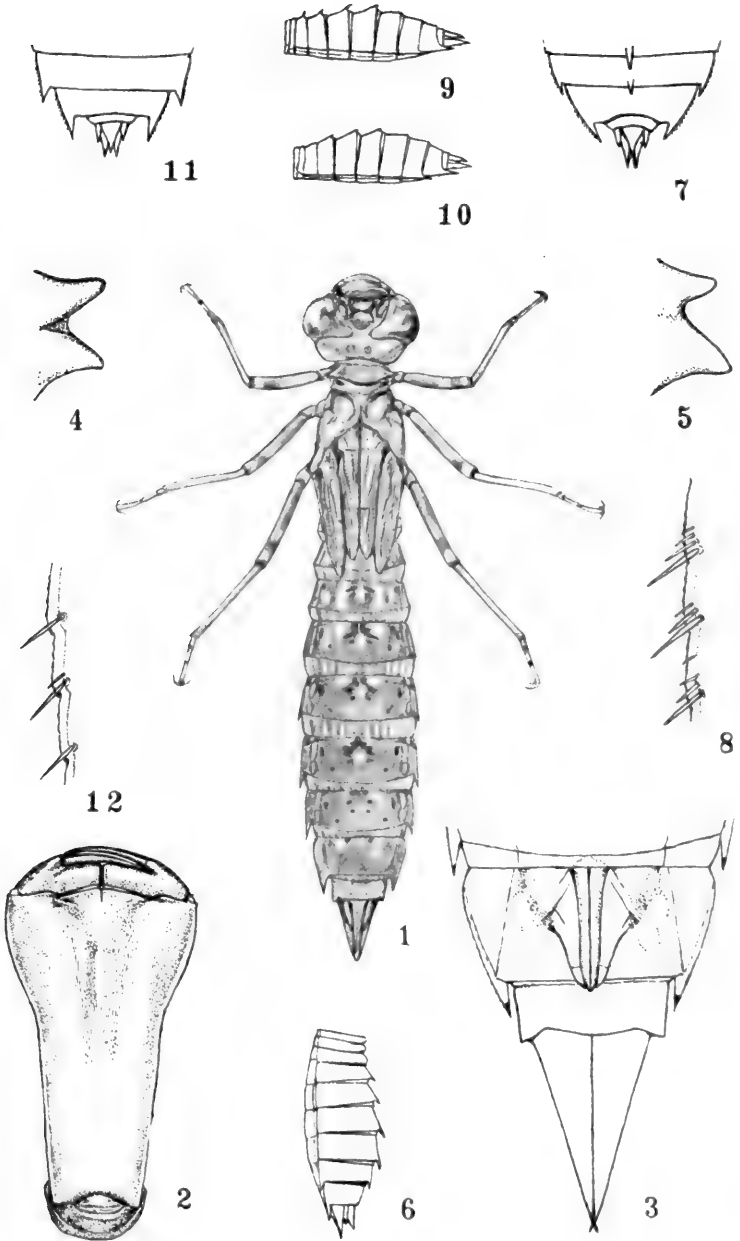
An idea of the character of the studies may be obtained by glancing at the table of contents. In Part I we find such titles as "The wild fruits of the farm," "The farm stream," "The November seed crop," "The wild mammals of the farm," etc.; in Part II, "The lay of the land," "Winter activities of wild animals," "Fiber products of the farm," "The fence-row"; and in Part III, "The progress of the seasons," "The clovers," "Some insects at work on farm crops," "Insects molesting farm animals," "Out in the rain," "The population of an old apple-tree," etc.

As several of these titles suggest, there are many references to insects and their ways. These are, for the most part, necessarily of a very general character, but mention may be made of a useful table for the recognition of aquatic insects in the immature stages, given in connection with the study of "The farm stream".

The book is illustrated by numerous well-chosen cuts, which with a few exceptions, are accurate and effective. It should be in the hands of every teacher of Nature Study.

THE types of the following species of Orthoptera, described by the writer, the custody of which was not indicated in the original descriptions, have been deposited in the Royal Ontario Museum, Toronto: *Centhophilus pallidipes*, *Orchelimum manitobense*, *Nemobius griseus*, *Nomotettix borealis*, *Trimerotropis huroniana*, *T. sordida*, *T. longicornis*, *Podisma nuda* (= *Asemoplus nudus*) and *P. glacialis canadensis*.





NYMPHS OF CANADIAN ODONATA.

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No. 11

NEW AND LITTLE KNOWN NYMPHS OF CANADIAN ODONATA.

BY E. M. WALKER, TORONTO.

(Continued from p. 357.)

Æshna tuberculifera Walk.

This rare species was quite common at Lonely Lake, Vancouver Island, a forest pond about two miles from the Dominion Biological Station, Departure Bay. I obtained two mature nymphs, both of which were successfully reared, yielding a specimen of both sexes. Numerous exuviae were also obtained. They were found in marshy coves, thickly grown up with reeds in water 12-20 inches deep, the conditions of environment being of the usual type that is characteristic of this genus. Six other species of *Æshna* were taken at the same spot.

Nymph (pl. XXV, figs. 1-3).—The nymph is long and slender and is remarkable for the length of the labium, which closely resembles that of *Anax junius* in both form and size. When closely applied to the ventral surface of the thorax, the hinge reaches the level of the hind coxæ, and this feature alone will serve to distinguish it from all other North American species of *Æshna*, in none of which the labium reaches back more than half way between the middle and hind coxæ. The length of the mentum slightly exceeds that of the hind femora, while in all other species the reverse is the case.

Eyes slightly less prominent antero-laterally than in other species of the *clepsydra* groups, with a rather long antero-posterior diameter. Lateral margins of head nearly straight, passing into the straight or slightly concave posterior margin by well rounded postero-lateral angles. Mentum of labium very long, the breadth at the base about half that at apex, which is slightly more than half the length; sides in proximal half straight and very slightly divergent, thence gradually curving outwards, the distal third moderately arcuate. Median lobe very broadly obtusangulate; lateral lobes with mar-

gins parallel, apices squarely truncate, the outer apical angle scarcely rounded, the inner with a small dark-brown tooth.

Supra-coxal processes rather small, acute, equal or the posterior sometimes slightly the broader, the apices not, or scarcely, divergent, the interval usually less than a right angle.

Wing-pads narrower than in most species, the outer pair reaching back to about the middle and sometimes the apical margin of segment 4.

Abdomen long and slender, broadest at segment 6 or 7, lateral spines on segments 6 to 9, not at all divergent, extending back on segment 6 one-third to one-half the distance to the hind margin of the segment; on segment 7 to the margin or nearly; on 8 slightly beyond the margin; on 9 to the middle or posterior fourth of segment 10. Lateral appendages three-fifths (male), three-fifths to four-sevenths (female) as long as the inferior appendages. Basal part of superior appendage of male about one-fourth or one-third shorter than the lateral appendages, its basal breadth almost or quite equal to its length, sides slightly concave, apex rather bluntly pointed.

Female genitalia reaching slightly beyond the posterior margin of segment 10; styli reaching end of ovipositor, their apices somewhat incurved.

Colour in life rather light brownish green or olivaceous; pattern as seen in the exuvia as follows: Dorsum of head behind the eyes with a pair of submedian brownish scars and a more or less indistinct oblique brownish streak or line on each side. Sometimes a pale lateral marginal band is present. Pronotum with a pale lateral margin, thorax nearly uniform brownish, with a few pale streaks on the pleura just above the middle and hind coxae. Femora in proximal half uniform brownish, distal half with a dark annulus between two pale annuli, of which the proximal is ill-defined. Tibiæ and tarsi concolorous. Abdomen with pale markings as follows: A median series of spindle-shaped spots, beginning on segment 1 as a narrow streak and ending on segment 7; a pair of ill-defined wavy dorso-lateral streaks, which break up into faint spots on segment 5 or 6, generally disappearing on the last 2-4 segments; a series of faint subcrescentic spots between the dorso-lateral punctae on the basal 3 or 4 segments only; and indications

of pale irregular blotches around the lateral scars. The dorsal and lateral punctae are darker than the ground colour and there are also diffuse darkened areas surrounding the mid-dorsal pale spots on most of the segments.

Length of body 41-45; mentum of labium 8.3-8.7; outer wing-pad, 9.5-9.9; hind femur 7.7-8.3; ovipositor, 3.2-3.5; width of head, 8.1-9; width of abdomen, 7.5-8.8.

In addition to the mature nymphs and exuviae, we also found a nymph of the penultimate stage, which was successfully brought alive to Toronto and carried through the winter and spring until the time of emergence. During the winter (December to April), when it was kept in the cellar, upon a window-sill, it took no food, but at other times it was very voracious, on one occasion, soon after the long winter fast, feeding on a earthworm continuously for four hours. It underwent the last larval month on June 8 and began to transform into the adult on July 27. Unfortunately I was away from the city at this time and an accident prevented the successful emergence of the imago.

Aeshna interrupta Walker.

The nymph described in my monograph as that of *A. interrupta* was correctly referred to this species. A nymph of the same kind, which I obtained at Banff, Alta., and kept for six weeks at the Biological Station, Vancouver Island, commenced to emerge during my homeward journey. The unfavourable conditions of travelling by rail were such that it failed to complete its transformation, but remained alive within the exuvia long enough to develop the colour-pattern quite distinctly. This is easily recognizable as belonging to *interrupta*. The race found at Banff is *lineata* varying towards *interna*. Mr. C. H. Kennedy has also taken a similar form of this species in transformation in Nevada and California, and I have found numerous exuviae on Vancouver Island under circumstances in which all other species were excluded. These exuviae are all identical, and it is quite evident that the various races of this species do not differ from one another in the early stages. It seem therefore certain that the two nymphs in the Cabot collection, which I referred with considerable doubt to *A. interrupta lineata*, do not belong to this species. It is probable that they are somewhat atypical examples of *A. eremita*.

Aeshna palmata Hagen.

During the summer of 1913 I reared a number of specimens of this species and obtained a large number of exuviae. A study of this material shows that the two exuviae referred to this species in my "North American Dragonflies of the Genus *Aeshna*" were correctly placed, but that some of the characters used to separate it from *A. umbrosa* are not valid.

I now possess a large series of exuviae of both species, including several of *umbrosa* from Vancouver Island, where most of my nymphs of *palmata* were taken. I find that the two species at this stage are so much alike that in many cases it is a difficult matter to separate them with certainty. The form of the living nymph is probably invariably stouter in *palmata*, but this difference is often difficult to detect in preserved material, though usually evident enough, to the trained eye, in the exuviae. The difference in the form of the labium is often but slight, but it seems to be always slightly broader at base in *palmata*. The absence of an internal apical tooth on the lateral lobes, employed by me as a differential character for this species (*N. Am. Aeshna*, pp. 68, 162), is a mere individual variation. The tooth is normally present as in *umbrosa*. The differential based upon the supra-coxal processes seems to be constant and is certainly a useful character. The posterior process is always the stouter and often the longer in *umbrosa*, while in *palmata* they are equal or very nearly so, the anterior being sometimes the larger (pl. XXV, figs. 4-5).

The ovipositor is slightly larger in *palmata* and extends slightly beyond the hind margin of segment 9, but seldom covers as much as one-third of segment 10 as given in the key. In *umbrosa* it just reaches the margin.

These differences in width of labium and abdominal segments and in length of ovipositor will be best appreciated by referring to the following table, which is based upon three males and three females of each species, taken at random. The first three of each species are males. The length of these specimens is nearly the same throughout the series. The relative size is roughly indicated by the lengths of the hind femora.

Aeshna palmata.

LOCALITY	Hind. Fem. Length	MENTUM OF LABIUM				Seg. 3 Width	Seg. 7 Width	Seg. 9 Width	Ovipos. Width
		Length	Bas. Width	Mid. Width	Ap. Width				
Banff (reared)	6.7	6.0	2.5	3.2	4.75	5.0	7.5	5.8	...
Vanc. I. (reared)	7.0	6.4	2.5	3.2	4.7	4.8	7.0	5.6	...
Vanc. I.	7.5	6.6	2.7	3.3	4.9	5.0	7.8	6.2	...
Vanc. I. (reared)	7.3	6.8	2.6	3.5	4.8	4.6	7.3	6.0	3.3
Vanc. I.	7.0	6.5	2.6	3.5	4.9	4.8	7.5	6.1	3.2
Vanc. I.	7.5	6.8	2.6	3.5	5.0	4.9	7.3	6.0	3.5
Average	7.16	6.51	2.59	3.36	4.84	4.85	7.40	5.95	3.33

Aeshna umbrosa.

Georg. Bay (reared)	6.7	6.6	2.3	3.0	4.4	4.5	7.0	5.0	...
Toronto	7.0	7.0	2.3	3.2	4.75	3.7	6.7	5.1	...
Toronto	7.3	7.0	2.3	3.2	4.9	4.4	6.3	5.25	...
Toronto	6.6	6.8	2.3	3.0	4.6	4.6	7.0	5.0	2.8
Georg. Bay (reared)	6.5	6.9	2.2	3.0	4.3	4.75	6.5	5.0	2.8
Vanc. I. (reared)	7.0	6.6	2.25	2.9	4.5	4.2	6.0	5.1	2.6
Average	6.85	6.81	2.27	3.05	4.57	4.36	6.58	5.07	2.73

It will be seen that the length of the hind femora and of the mentum of the labium is about the same in the two species, but that in the other measurements, particularly the length of the ovipositor, *palmata* has somewhat the advantage. The measurements of segment 3 are less reliable than those of segments 7 and 9, as the form of this segment varies considerably in the exuviae.

Ecologically there is quite a marked difference between these species. *Umbrosa* is everywhere an inhabitant of small streams, while *palmata* lives in pools and small ponds. I found nymphs of *umbrosa* associated with those of *Cordulegaster dorsalis* in a small forest brook near the Biological Station on Vancouver Island, *palmata* being entirely absent from this stream. About two miles from this spot was a small pool in the woods, grown up with western Skunk Cabbage. This pool contained numerous nymphs of *palmata*, but no other *Aeshna*.

Sympetrum pallipes Hagen.

We found this species in abundance on Vancouver Island

during the second half of July, and in August, 1913, and obtained plenty of the nymphs from two or three small ponds at Rock City, a village near the Biological Station. From these a number of adults emerged on July 20 and 21.

Most of the adults taken have the legs entirely or almost entirely black and agree with Ris's description of *S. obtrusum morrisoni*. They intergrade, however, with pale-legged specimens and are undoubtedly conspecific with *S. pallipes*, as Ris himself suspected. But I cannot consider them as a variety of *obtrusum*, for, in the first place, I found both *pallipes* and typical *obtrusum*, in every respect like eastern specimens, at Okanagan Landing, B. C., on the Pacific Slope, while *pallipes* ranges eastward to Water-
ton, Alta., In the second place, the nymphs of *pallipes* are quite distinct from those of *obtrusum*, but are so extremely like those of *costiferum* as to be practically indistinguishable from that species. I have neglected to rear *S. obtrusum* and have no nymphs that I can refer to it with certainty, but I have a number of *S. rubicundulum*, which Professor Needham was unable to distinguish from *obtrusum*, and they are very easily separated from *pallipes*.

The nymphs of *pallipes* like those of *rubicundulum* frequent small stagnant pools or ditches, while *costiferum* seems to prefer shallow reed-grown parts of ponds or lakes.

Nymph (pl. XXV, figs. 6-8).—Eyes moderately prominent, lateral margins of head very oblique, passing into the posterior margins without any semblance of an angle. Mentum of labium narrow at base, the basal breadth being somewhat less than one-fourth the greatest breadth, which is almost equal to the length; sides moderately concavely curved, diverging in the distal fourth at an angle of about 90°, median lobe depressed at an angle of about 30° with the general surface of the mentum. Mental setæ 13-14, the 4th or 5th from the side longest. Lateral setæ 10-11. Movable hook slender, one-fourth to nearly one-third as long as the distal margin of the lateral lobe, the latter with very low crenulations, at the intervals between which are groups of 3 (sometimes a rudimentary fourth in some of the groups) successively longer setæ, the third much longer than the other two (see fig. 8).

Abdomen widening gradually from base to segment 6, narrowing more rapidly caudad, especially on segments 9 and 10. Dorsal

hooks on segments 4-8, straight, or but slightly curved, rudimentary on 4, increasing to 7, on which the hook is almost as long as the segment; lateral spines on 8 and 9, on 8 about one-fourth (measured on the inner margin) as long as the lateral margin of the segment (without spine); on 9 about one-third to one-half as long as the lateral margin, not quite reaching the level of the ends of the lateral appendages, which are about two-thirds as long as the superior appendage, and slightly more than one-third as long as the inferior appendages. Superior appendage slightly longer than broad; both superior and inferior appendages acuminate, terminating in very slender apices.

Colour greenish brown, with rather obscure dark markings. Thorax with a dark longitudinal band on the pleura; femora dark, with two pale annuli, a median and an anteapical; tibiae also with two pale annuli separated by a median dark annulus.

Length of body 16-18; outer wing-pad 5-6; hind femur 4.6-5; width of head 4.5-4.9; width of abdomen 5.5-6.

As already stated, the nymphs of *pallipes* and *costiferum* are practically indistinguishable. The only differences I could find are the slightly greater basal width of the mentum of the labium in *costiferum* and in the spines on the distal margin of the lateral lobes of the labium, which in *costiferum* are usually single or with only one additional rudimentary spinule.

Leucorrhinia hudsonica Selys.

On June 18-20 adults of this species were found in considerable numbers at Nipigon, Ont., where they were associated with *L. glacialis*, although much more numerous. No other Libellulines were as yet abroad, the only other Anisopteroous dragonfly being *Cordulia shurtleffi*. Both *L. glacialis* and *C. shurtleffi* were transforming in the marshy borders of the Nipigon River, but careful search failed to result in the finding of a single nymph or transforming imago of *L. hudsonica*. Two exuviae were found, however, which can belong to no other species.

Nymph (pl. XXV, figs. 9-12).—Similar in form and size to *L. frigida*; head similar, but the eyes somewhat less prominent, more as in *intacta* (see Canadian Entomologist, 45, 1913, pl. 2, figs. 20, 23); rear of head with numerous

long hairs. Mentum of labium almost as broad distally as long; sides nearly straight on the proximal two-thirds, thence bending outwards so as to be rectangularly divergent. Ventral surface in the proximal two-thirds somewhat longitudinally convex; median lobe depressed at an angle of about 30° ; apex but little rounded. Mental setæ 12-14; the third to the fifth from the outside longest. Lateral setæ 9 or 10; movable hook slender, nearly half as long as distal margin of lateral lobes, the latter slightly undulate, the spines single or, here and there, a pair, of which the upper is much shorter than the lower; there may be also a third very rudimentary spinule on the opposite side of the long spine (fig. 12).

Abdomen, as in other species of the genus, broad-ovate, widest at segment 6, narrowed almost equally toward apex and base. Dorsal hooks on segments 3 or 4 to 6, vestigial, longest on 5. In one specimen they are considerably better developed than in the other, there being quite a distinct hook on segment 3, while in the other there is no trace of a hook on this segment. In the former the hook on 5 reaches the hind margin of the segment, in the latter it does not nearly reach the margin. Lateral spines on 8 about two-fifths the length of the segment, slightly divergent; spines on 9 about three-fifths the length of the segment, reaching to the level of the apex of the lateral appendages, their inner margins parallel; superior appendage about three-fourths as broad at base as long, sides nearly straight, apex acuminate, slender, somewhat decurved; lateral appendages rather stout, but tapering rather abruptly to fine-pointed apices, about three-fifths as long as the superior appendage and half as long as the inferior appendages, which project a little beyond the former. The setæ on their inner surfaces are longer and coarser than in *L. frigida*.

Colour dull brownish above with faint indications of mottling, but no distinct pattern. Legs apparently without distinct annuli. Under surface of abdomen with three conspicuous, dark brown, longitudinal bands.

Length of body 17-17.5; outer wing-pad 5.3-5.5; hind femur 4.3-4.4; width of head 5-5.2; width of abdomen 6-6.2.

These nymphs differ from the form described by Needham as belonging to *L. frigida* only in the presence of vestigial dorsal hooks, which in Needham's specimens are wholly lacking. I have a

number of specimens identical with Needham's form from Go Home Bay, Georgian Bay, Ont. (date and collector unknown) and two exuviae, received from Mr. C. H. Kennedy, form Lake McKinney Tahoe, California. I feel confident that they all belong to *hudsonica*, in spite of these differences in the development of the dorsal hooks. There is no other species in the Georgian Bay region which this nymph could fit. *Leucorrhinia proxima* is the only species which could be considered, but it is much larger than *hudsonica*, whereas these nymphs are all of about the same size.

EXPLANATION OF PLATE XXV.

Figs. 1-3.—*Aeshna tuberculifera*; 1, female nymph (x2); 2, labium; 3, terminal segments and genitalia of female nymph.

Fig. 4.—*Aeshna palmata*, right supra-coxal processes.

Fig. 5.—*Aeshna umbrosa*, right supra-coxal processes.

Figs. 6-8.—*Sympetrum pallipes*; 6, lateral view of abdomen; 7, dorsal view of terminal segments; 8, portion of distal margin of lateral lobe of labium.

Figs. 9-12.—*Leucorrhinia hudsonica*; 9, lateral view of abdomen of exuvia from Nipigon, Ont.; 10, same, from another Nipigon specimen; 11, dorsal view of terminal segments; 12, portion of distal margin of lateral lobe of labium.

NOMENCLATURAL AND CRITICAL NOTES ON HEMIPTERA.

BY E. P. VAN DUZEE, LA JOLLA, CALIF.

For the past two years, as many of my correspondents know, I have devoted all my spare moments, which have been all too few, to the preparation of a catalogue of the North American Hemiptera. This is now practically completed, but as it is not certain just when it will be in print, it seems best to call attention in advance to certain features of the nomenclature used, partly in the hope that criticism may show oversights and errors in time for correction in the manuscript.

The following synonymy calls for special mention:

Genus **Cydnus**.—When founding this genus, Fabricius designated *tristis* (= *aterrimus* Forst.) as type. *Cydnus* must therefore

replace *Brachypelta* Am. & Serv., which has the same type and the *Cydnus* of Fieber, Signoret, and Lethierry and Sevrin becomes *Aethus* Dall. with *indicus* Westw. as type.

Subfamily **Asopinæ**.—The synonymy of genus *Asopus* Burm. is complicated by an uncertainty as to where it was first published. Kirkaldy claims that it first appeared in Silbermann's Revue, and therefore names *gibbus* Burm. (= *cayemensis* Lap.) as type, thus making it synonymous with *Discocera* Lap., but Dr. Bergroth in 1911 (Wien. Ent. Zeit., XXX, p. 122) gives us a careful study of the question, and concludes that we should accept *argus* Fabr. (= *malabaricus* Fabr.) as the type of *Asopus*, and I do not see that we can do better than to follow him. Where we cannot be certain which of two names appeared first, it would seem best to accept the one which least disturbs a long accepted synonymy and gives us the most rational interpretation of the author's meaning. By adopting the above synonymy we are able to retain the well-known subfamily name *Asopinæ*.

Genus **Perillus** Stal.—This genus was founded in 1862 as a subgenus of *Oplomus* with the species *confluens* H. Sch., *virgatus* Stal, and *circumcinctus* Stal, of which *confluens* has properly been selected as type. I can see no justification for Schouteden's new genus *Perilloides*, as it possesses no workable character except the greater convexity of the pronotum, and I have not recognized it in my catalogue. The sulcation of the tibiæ differs inappreciably, if at all, in the two genera.

Genus **Acanthocephala** Lap.—The names *Diactor* Burm. and *Metapodius* Westw. were both given as substitutes for *Acanthocephala* Lap., a name supposed at that time to be preoccupied by a family of that name in the Vermes. By the International Rules a family name cannot preoccupy a generic name and *Acanthocephala* is therefore valid. *Metapodius* has the same type as *Acanthocephala*, and cannot therefore be used as a distinct subgenus as was done by Stal, and we must fall back on *Metapodiessa*, substituted by Kirkaldy for this well-known North American subgenus.

Genus **Leptocoris** Latr.—So many changes have been made in this genus that a word of explanation seems necessary. Latreille

founded the genus *Myodocha* in 1807 with a fair description and named three species; *tipuloides* (a *Leptocorisa*), *trispinosa* (a *Cydamus*), and *fulvipes* (an *Ischnodemus*), but as his generic diagnosis in no way fits any one of these species, it becomes evident that his manuscript must have been mixed and the genus becomes invalid here. In 1810 he corrects this error and names *serripes* as type of *Myodocha*, but as this species was then undescribed, the genus is still invalid, but becomes of force the following year, when Oliver describes it as *Myodochus* and gives a recognizable description of *serripes*. Leach, in 1815, names *tipuloides* as type of *Myodocha*, and is followed in this by Burmeister and Kirkaldy, but this is obviously invalid. The name *Leptocorisa* first appears as *Leptocorise* in 1825 (Latreille, Fam. Nat. Reg. Anim., p. 421) as a nomen nudum and not in a Latin form. In 1827 Berthold, in his German translation of Latreille's work, changes the French form to *Leptocorixa*, but does not describe the genus nor mention a species, so it is still a nomen nudum. In the 1829 edition of Cuvier's *Regnum Animalia* Latreille first characterizes the genus making it equivalent to *Gerris* Fabr. (of the Syst. Rhyng.), except *vagabundus*, but does not state that it is a substitute for that name so it need not have the same type. Laporte in 1832 names his *linearis* (= *filiformis* Fabr.) as type, which, being an original species, is valid and must stand.

Genus **Corizus** Fall.—Brullé, 1835, first fixes the type of *Corizus* as *hyoscyami* Linn., and Westwood in 1840 fixes that of *Rhopalus* Schill. as *capitatus* Wolff (= *subrufus* Gmel.). The former is equivalent to *Therapha* Am. & Serv. and the latter is the *Rhopalus* of Stal and the *Corizus* of the Oshanin Katalog. As subgenera, neither are found in our fauna.

Genus **Leptocoris** Hahn.—On account of the close resemblance of this name to *Leptocorisa* Latr. it has been renamed three times, and in each case the name was given as a straight substitute for the supposedly preoccupied *Leptocorisa*, and must take the same type. These names are *Serinetha* Spin., *Lygæomorphus* Blanch., and *Pyrrhotes* Westw. *Leptocoris* is valid and must stand for this genus, and the tribe becomes *Leptocorini*, not *Serithini*. Kirkaldy, in Proc. Hawaiian Ent. Soc., vol. II, p. 123, 1910, has established a new subgenus of *Leptocoris* as *Boisea*. He finds it in but few

words on colour characters and a "slight margination of the pronotum, etc.," for "*vittata*." The only *vittata* in this genus is already the type of the synonymic genus *Tynotoma* Am. & Serv. Both his new subgenus and his species "*vittata*" are absolutely unrecognizable, except as we may assume that his disconnected remark concerning an American species of *Leptocoris* may refer to this, and thus identify his "*vittata*" with *trivittata* Say. Kirkaldy was very severe in his criticisms of others for the use of colour characters and incomplete descriptions, but no one used colour characters more or gave us more fragmentary and unrecognizable descriptions. It is greatly to be hoped that some competent Hemipterist will work out Kirkaldy's oriental genera and species while the types are still available and thus locate, and I might say validate them, for us.

Genus **Neides** Latr.—Latreille founded *Neides* in 1802 with two species, *tipularius* and *clavipes*, and in 1810 named *tipularius* as its type. Fabricius founded *Berytus* in 1803, and then named *tipularius* as its type. I can see no reason why these genera should not be considered strictly identical and every writer so far as I can learn so considered them until 1860, when Flor divided the genus, placing *clavipes* in *Neides*, founding *Sphalerocoris* for *tipuloides* and restricting *Berytus* to *rufescens*. Fieber the next year retains *Neides* for *tipularius* and its allies, and *Berytus* for *clavipes* and its allies, in which he is followed by Puton (1886), Lethierry and Sevrin (1894), and Oshanin (1906 and 1912). Reuter (1888), on the contrary, places *tipularius* as the type of *Berytus* and *clavipes* as the type of *Neides*, and in this is followed by Bergroth in 1906. I believe Kirkaldy was entirely right in considering these genera as homotypical and that he was justified in renaming *Berytus* Fieb. as *Berytinus*. The family thus becomes *Neididæ*, not *Berytidæ*. Most European Hemipterists seem to have overlooked genus *Podicerus* Dumeril founded in 1824 with *tipularius* as type. In the Journal of the New York Entomological Society for 1911 (Vol. XIX, p. 24), Mr. H. G. Barber places my *Jalysus perclavatus* as a synonym of *Hoplinus multispinus* Ashmead, and suggests that my redescription of the species was owing to the poor characterization of Ashmead's species. This, however, does not fully state the case. The difficulty here is that Ashmead's description does

not at all correspond with his supposed type now in the National Museum. I did in this case as I have always done, followed the description rather than the supposed type. It is inconceivable that any one who pretends to know anything about the Hemiptera would describe a *Jalysus* with unarmed connexivum and pronotum and membranous elytra in a genus belonging to a distinct sub-family and having the connexivum and pronotum long-spinose and the corium coriaceous and punctate. Ashmead also distinctly describes the head as trispinose. Characters omitted may be charged to an oversight, but non-existent structural characters cannot be added. His name *multispinus* could hardly apply to any *Jalysus*. I fail to see how the ends of science can be advanced by trying to connect Ashmead's description with his supposed type, and in my catalogue I have retained my species, leaving Ashmead's as a still unknown species of *Hoplinus*. Mr. Barber also sinks my *Jalysus wickhami* as a straight synonym of *spinus*. It, however, readily separates out as the western form of *spinus*. The typical form of this species I have not seen from west of the Rocky Mts., although in Texas the two seem to intergrade and may do so wherever their habitats overlap.

Genus **Lygaeus** Fabr.—This genus was founded by Fabricius in 1794 to include a heterogeneous assemblage of species that he could not satisfactorily locate in his other genera, or so it looks to us. Lamarck in 1801 named *equestris* as its type, and in 1803 Fabricius indicates *tenebrosus* as the typical species. Kirkaldy and others claim that his repeating the generic characters in his description of *valgus* in 1794, but without italics, was a valid naming of the type. An argument in favour of this is found in the fact that he did not repeat these type indications in the case of two of the five genera so distinguished in his *Systema Rhyngotorum*, but in *Lygaeus* and one other genus he has indicated a different species as type in his later work, which in a measure will offset Kirkaldy's contention. In these two cases of double type-fixation, if such they be called, I think we should ignore both and take the next valid fixation, which in the case of *Lygaeus* is *equestris*, and in the case of *Gerris*, the other genus referred to, is *lacustris*. This procedure, which I believe is perfectly justifiable and logical, conserves these names for the genera as almost universally used

since the time of Latreille, and in the case of *Lygæus* makes that genus synonymous with *Graptolomus* Stal and *Eulygæus* Reuter. Most European entomologists accept Laporte's indication of *familiaris* Fabr. as type of *Lygæus* or follow Kirkaldy in considering *Lygæus* a Coreid genus with *valgus* as type, but I think the solution here given much more reasonable and better in every way.

Genus **Artheneis** Spin.—Dr. Horvath (Ann. Mus. Nat. Hung., VIII, p. 11, 1910) has shown conclusively that the type of this genus should be *foveolata* Spin. Kirkaldy had no reason to name *cymoides* as type and thus to make this genus supercede *Nysius* of Dallas.

Genus **Perigenes** Dist.—I have examined a long series of *Perigenes constrictus* Say from the Northern and Middle States, and have been unable to detect a distinct lunate vitta on the venter of any, although there is a structural fullness at that point which in rubbed specimens has somewhat the aspect of a vitta. The southern specimens sent to me as *Ligyrocoris constrictus* Say have proved to be *abdominalis* Guer. Say's species as represented in the collection of the Boston Society of Natural History is an undoubted *Perigenes*. It is questionable whether this lunate vitta should be considered as a generic character, as genus *Ligyrocoris* as now constituted contains species of at least four genera: *Sphaerobius*, *Heræus*, *Orthæa*, and *Perigenes*, and separable therefrom only by this lunate vitta. In my catalogue I have been unable to quote a number of the locality records on account of the mixing of the species.

Genus **Orthæa** Dall.—Say's name *Pamera*, used by Stal for this genus, published in 1832 as a straight substitute for the preoccupied *Pachymerus* Lep. & Serv., a palæarctic genus. The same year Laporte published the name *Arphanus* as a substitute for this same preoccupied name. I know no way to determine for certain which of these works appeared first and personally prefer to use the name *Aphanus* for two reasons: Laporte's paper was a systematic work in which the author undertook to name a type for each of the Heteropterous genera known to him and for this genus he names *rolandi* Linn., which was one of the original species and a perfectly valid type fixation. Say's work was a

faunal paper, and as he names no type nor original species, his name must follow the first valid type fixation for genus *Pachymerus*, which was that of Laporte mentioned above. A further and strong reason for accepting Laporte's name is that Say's name *Pamera* has long been used for a quite distinct assemblage of species, and the transfer of the name would cause serious confusion. It may be well to add here that while Say's paper on the Heteropterous Hemiptera was dated 1831, only the first eight pages were published that year as we are informed by Fitch (2d Annual Rept. N. Y. St. Entomologist, in Trans. N. Y. St. Agricul. Soc., Vol. XV, for 1855, p. 523). The next name quoted by Stal for *Pachymerus* is *Stenocorius* Ramb., which is equivalent to *Paromius* Fieb. It was established in 1842, not 1838 as cited by Stal, and is preoccupied by *Stenocoris* Burm. published in the supplement to the Handbuch, Vol. II, part 2, p. 1010, 1838. This leaves *Orithæa* Dall. the first valid name for the genus with *consuta* Dall. as type. It may be noted in this connection that the genera *Calyptonotus* and *Aphanus* in the Oshanin Katalog must be reversed. The name *Calyptonotus* Dougl. and Scott was published as a substitute for *Rhyparochromus* Fieb. (and Am. & Serv.) and therefore takes as type *alboacuminatus* Goeze. I cannot find that this genus is represented in our fauna.

Genus **Astemma** Lep. and Serv.—This genus was founded simultaneously by Latreille and Lepeletier and Serville in 1825. Latreille's genus was without description or species and consequently was a nomen nudum until 1829, when in the edition of Cuvier's Regnum Animalia of that year he gives it a short diagnosis and names two species: *Salda pallicornis* and *flavipes* of Fabricius, the latter a *Geocoris* not answering to Latreille's diagnosis of his genus, so the former must be taken as the type making it equivalent to *Halticus* Hahn, 1831. Lepeletier and Serville founded their genus *Astemma* in the tenth volume of the Encyclopaedia Methodique, naming several species and describing *cornuta* as new. In 1832 Laporte designates *königi* Fabr. as the type of *Astemma*, but not being an original species, this type fixation is invalid. Kirkaldy in 1909 names *apterus* Linn. as type of the *Astemma* of Lep. & Serv., but this certainly is invalid, as Stal had in 1870 restricted the genus to *cornuta* and its allies, as he

had a perfect right to do, and thus making it a valid genus related to *Largus*, with *cornuta* as type.

Genus **Phymata** Latr.—I wish to call attention here to the fact that Handlirsch in his monograph on this genus has, perhaps inadvertently, renamed the typical subspecies of *Phymata erosa* as *linnei* Handl. Under the International Code it must be known as *Phymata erosa erosa* Linn. with *linnei* as a synonym. It also seems to me unquestionable that Stal was right in assigning Wolff's description and figure of *erosa* to our northern form which he re-names *wolffi* and of which subspecies *pennsylvanica* Handl. is a straight synonym. Subspecies *fasciata* Gray is undoubtedly the southern form included doubtfully by Stal under *wolffi*. Subspecies *fasciata* Stal has been rightfully renamed by Handlirsch, who calls it *communis*, assuming that he has correctly located it. I am unable to understand why subspecies *chilensis* Handl. should not be known as *carinata* Fabr., but as this form is from outside our territory, I will leave this for others to work out.

Genus **Reduvius** Fabr.—This genus was founded by Fabricius in 1775 without designation of type. In 1801 Lamarck names *personatus* Linn. as such type, a valid type-fixation having priority over Fabricius' designation of *fuscipes* in 1803. While Stal was wrong in accepting *fuscipes* as type of *Reduvius*, he was certainly right in using *angulosus* Lep. & Serv. as the type of *Harpactor* Lap., who distinctly names that species as type when founding the genus. For the large genus *Reduvius* of Stal and Lethierry and Servin (= *Harpactor* of Am. & Serv.) we must use the name *Rhynocoris* Hahn, 1834, with *cruentus* Fabr. (= *iracundus* Poda) as the type. Our American species belong to this last genus. Of the numerous subgenera used by Stal in this genus, I would recognize but four or five, reducing the others to synonymy. The subfamily *Reduviina* of Stal, 1872, must take the name *Harpactorina*, as that was the first name given to the group. It has been so used by Amyot & Serville, Spinola, Dohrn, Puton, Lethierry and Servin, Champion and Oshanin. There are two fairly well marked tribes in this subfamily, the *Harpactororini* with the mesopleura tuberculate and the *Zelini* without the mesopleural tubercle. The former was named *Hezeda* by Stal in 1859, but as I understand the International Code the typical subfamily

or tribe must bear the name of the typical genus the same as a subgenus, including the typical species of the genus must bear the name of the genus. The second tribe was called *Reduviida* by Stal, but has been properly designated as *Zelini* by Bergroth and others.

Genus **Ectrichodia** Lep. & Serv.—Kirkaldy (Entomologist, XXXIII, p. 239, 1900) goes into an elaborate explanation of why he names *Reduvius cruciatus* Lep. & Serv. as type of *Ectrichodia*, all of which was quite unnecessary as Laporte had already named this species as its type (Essai, p. 7, 1832) and Brullé did the same in 1835 (p. 320). This generic name must therefore replace the old-world genus *Physorhynchus* Am. & Serv. and *Ectrichodia* of Stal must be known as *Rhiginia* Stal with *lateralis* Lep. & Serv. as type. The name of our northern *cruciata* Say, described as a *Petalochairus*, is not preoccupied by *Ectrichodia cruciata* Lep. & Serv. and will stand as *Rhiginia cruciata* Say.

Genus **Nabis** Latr.—This genus was founded by Latreille in 1802 with two species mentioned, *guttula* and *vagans* Fabr., the latter a synonym of *ferus* Linn. I cannot find that the former was named as type until Kirkaldy did so in 1900. *Vagans* was named as type of *Nabis* by Westwood in 1840, and I cannot see why this type fixation is not valid. *Reduvius apterus* Fabr. was named as type by Latreille in 1810, Laporte in 1832, and Spinola in 1837, but is invalid as *apterus* is not an original species. Latreille in 1804 and 1807 named *apetrus* (= *subapterus*) and *guttula* as examples, but this cannot be considered as a proper type fixation for *guttula*. *Nabis* then = *Coriscus* Auct., = *Reduviolus* Kirby, with type *vagans* = *ferus* Linn. Prostemma Lap. = *Nabis* Stal, 1873, and Reuter, 1908, and 1909, type *guttula* Fabr.

Genus **Cimex** Linn.—This generic name is now so universally used for the "bed-bug" that it seems unnecessary to notice it here further than to draw attention to the fact that Kirkaldy's very positive statements that *Cimex* was not and could never be available for *lectularius* were founded on a careless and imperfect knowledge of the bibliography of this genus and species. Brünnich restricted genus *Cimex* to *lectularius* eleven years before Fabricius founded genus *Acanthia* and restricted *Cimex* to the *Pentatomidæ*,

and furthermore Lamarck named *lectularius* as type two years before Fabricius indicated *rufipes* as type of *Cimex*, so I cannot see that there is any case for discussion. My copy of both Brünich and Lamarck are from the Kirkaldy library, and are annotated by him, and he could soon have learned these facts had he tried.

Family **Capsidæ**.—It seems to be quite the vogue now to follow Kirkaldy and call this family after the oldest genus, *Miridæ*. This Kirkaldy system is illogical to me as I have stated above, and I would not revert to it did it not seem best to refute Reuter's statement of 1910 that the name *Miridæ* Brullé, 1835, has priority over *Capsidæ* Burm., 1835. In the first place every indication I can discover of the date of these two works show that Burmeister's appeared first, but that would not effect the present case as Brullé's name was in the French form and was not latinized at all. If we accept vulgar names, we must go back to Hahn's *Wanzenartigen Insecten*, Vol. I, 1831, where we find the family called *Mirides*. However, I think Dr. Horvath was perfectly right in discarding all names not given in the Latin form. By this system the name *Capsidæ* has clear priority and practically universal usage until Kirkaldy devised his system for unstabilizing family nomenclature.

Genus **Salda** Fabr.—This genus cannot be considered without first locating *Acanthia*. Fabricius founded *Acanthia* in 1775 for *lectularius* and its allies without indication of type. Latreille in the "Precis," 1796, restricts *Acanthia* to those of Fabricius' species which inhabit the borders of ponds and streams, but names no species nor type. As it is impossible to name a type from such a statement, his restriction has no value. In 1801 Lamarck identifies *Acanthia* with *Cimex* and names *lectularius* as type. The next year Latreille still clings to his delusion and describes genus *Acanthia* for *littoralis* and *zosteræ* Fabr. One year later Fabricius, perhaps as a protest against Latreille's misuse of his genus, restricts *Acanthia* to *lectularius* and *hemipterus* and indicates the former as its type. At the same time he founds his genus *Salda* for the littoral forms with *zosteræ* as type. This disposition of these species by Fabricius was perfectly valid, and I have so used them in my catalogue. Recently Dr. Reuter has broken up genus *Salda*, very properly restricting *Salda* to *zosteræ* and its allies, but still retains *Acanthia* for the littoral species with *saltatoria* Linn. as type. In accepting

Acanthia in the Fabrician sense as indicated above we find the largest genus in the family without a name and I therefore propose to call it **Saldula**. As a substitute for *Acanthia* of Reuter (Of. Finska Vet. Soc. Forh., Afd. A, No. 12, p. 14, 1912) it takes the same type, *saltatoria* Linn. Nineteen North American species belong to this genus.

Genus **Dictyophara** Germ.—Melichar in his recent monograph on this subfamily places our American species in Stal's genus *Nersia*, which he considers as distinct. Our species are, however, entirely congeneric with *Dictyophara europæa* Linn. and must be retained in this genus.

Genus **Ticida** Uhler.—I now find that my *Loxophora transversa* is a synonym of *Ticida cingulata* Uhler and my genus therefore becomes a synonym of *Ticida*. I was misled by Uhler's placing his genus in the *Issidæ*.

Genus **Otiocerus** Kirby.—I do not accept Kirkaldy's statement that Vol. XIII of the Trans. of the Linnean Society was published in 1822. The first pages containing Kirby's paper undoubtedly appeared in 1819 or very early in 1820. Germar accepted Kirby's name as the earlier and we must do the same.

Genus **Cicada** Linn.—When publishing my note on this genus in 1912 I did not realize that it was Lamarck's intention to name types in this work of 1801, and finding *Cicada* without a valid type, named *tibicen* as such type. There is no doubt, however, but we must accept *orni* Linn as type of *Cicada* as named by Lamarck, thus making the genus equivalent to *Tettigia* of Kolenati. There is an additional reason for our doing this in the fact that Linneus named this section of his genus *Manniferæ* from the "manna" produced by this insect, which is perhaps the most common European *Cicada*. This is in accord with the Linnean method of restricting his genera to the best known or officinal species. What then shall we do with genus *Cicada* of Stal and other writers? Latreille in 1825 establishes genus *Tibicen* for *plebeja* Scop., but without description. The question is: Was *Tibicen* properly established by the simple naming of a well-known species in 1825, or must it be held over until 1829, when one distinguishing character (of no value) was given and four species (belonging to three genera)

are named? Amyot and Serville take the latter view and name *hæmatodes* as its type. The genus can, however, be much more accurately recognized by the naming of *plebeja* in 1825 than by the characters and species mentioned in 1829, and I think we should accept *plebeja* as its type. Many recent writers ignore *Tibicen* entirely, but this cannot be done. Either it is equivalent to the *Cicada* of Stal with *plebeja* as type or *Tibicina* Kolen. with *hæmatodes* as type. Another question arises in studying this case. Fabricius, who uses *Tettigonia* Geoff. in place of *Cicada* Linn. indicates *tibicen* as its type, and I am not certain but we should consider this a valid naming of a type for genus *Cicada* of Linn. This, of course, would antedate Latreille's genus *Tibicen* and leave genus *Cicada* as it was understood before Distant founded his genus *Rihana*. I can find no ruling on this in the International Code, and therefore for the present use *Cicada* for *orni*, largely on the assumption that Linneus intended that for the type of his section *Manniferae*, and *Tibicen* for *plebeja*. Latreille in 1810 names *plebeja* as type of genus *Cicada* Linn., but as it was not an original species, this is of course invalid.

Genus **Philænus** Stal.—As I understand the International Rules, a variety name is preoccupied by an earlier species name in the same genus. This necessitates our changing the name of *Philænus leucophthalmus* var. *lineatus* Linn. for which I now propose the name *fabricii*; and we must also change the name of what was formerly the typical *spumarius* of Fallen, which I propose to call *falleni*. Both of these colour varieties occur in our fauna.

Genus **Ceresa** Am. & Serv.—The name *aculeata* was used in this genus by Fairmaire in 1846, so I now propose the name **stimulea** for the *Ceresa aculeata* published by me in 1909.

Genus **Stictocephala** Stal.—I cannot find that a type has been named for this genus, so I now name *lutea* Walk as such type, as it is the best known species mentioned by Stal when founding the genus.

Genus **Campylenchia** Stal.—I do not feel at all convinced that our North American *latipes* Say is identical with the South American *curvata* Fabr. and have retained it as distinct in my catalogue.

Genus **Bolbonota** Am. & Serv.—Fowler's name *aureosericea* preoccupied in this genus by *aureosericea* Stal, and for the former I propose the name **dubiosa**.

Genus **Gypona** Germ.—*Gypona bimaculata* Woodworth, 1887, is preoccupied by *Gypona bimaculata* Spangberg, 1878, for the former I propose the name **woodworthi**.

Genus **Euscelis** Brullé.—Genus *Athysanus* Burm., 1838, type *argentatus* Fabr., is scarcely separable from *Phrynomorphus* Curtis, 1833, type *lineolatus* Brullé. It seems, however, that both must fall before *Euscelis* Brullé, 1832, type *lineolatus* Brullé. I have not been able personally to examine Brullé's work, nor can I learn that there is a copy in this country, but he seems to have established his genus for *lineolatus*, and as his genus has recently been recognized by Dr. Horvath, it is evidently a valid genus, I recognize the following subgenera: *Athysanus* Burm., type *argentatus* Fabr., *Euscelis* Brullé, type *lineolatus* (= *Conosanus* Osb. and Ball), *Conomellus* Osb. and Ball, type *comma* Van D. and *Stirellus* Osb., and Ball, types *bicolor* Van D.

NOTES ON SCIAPUS, WITH DESCRIPTIONS OF THREE NEW SPECIES.

BY M. C. VAN DUZEE, BUFFALO, N. Y.

Sciapus forcipatus Ald.

Three males from Guatemala differ from Prof. Aldrich's description in having the knob of the halters, lamellæ of the hypopygium, and hind tibiæ yellow; and in having the wings marked with the usual two cross bands, although these bands are not very dark or well defined. The two long bristles at the tip of the abdomen seem to be composed of two or more fine hairs so closely twisted together as to appear as one, in one specimen these hairs are partly separated; the middle tibiæ have two long bristles, one at the middle and one at apical fourth; the middle tarsi in one specimen have two rather long bristles, and several smaller ones on the first joint; all the femora have long white hairs below, the middle pair have also the black bristles mentioned by Aldrich.

I feel quite certain that these differences are not of specific value; in fact, hardly sufficient to warrant separating it as a variety.

Two other males in the same lot have the hind tibiae yellowish brown and the wings hardly tinged with brown, even in front of the third vein. They come nearer the typical form.

Sciapus tonsus Ald.

I have seen two specimens, one from Bradentown, Fla., and the other from Beaufort, N. C., which answer the description of this species. In one the appendages of the hypopygium are closely drawn up as in the type; in the other they are somewhat extended. They are black and rather long, extending forward to the tip of the fourth ventral segment. The fore metatarsi are about as long as the four remaining joints together, and with rather long hair below.

Sciapus crinitus Ald.

I took this at Bradentown, Fla., and have seen specimens from Georgia.

Sciapus flavipes Ald.

I took a number of these at Bradentown, Fla., in March. I have also seen specimens from Georgia and Erie Co., N. Y.

Sciapus chalybeus, n. sp.

Male—Length 5.5 mm. Face bare, green with blue reflections and coarse gray pollen on the lower part. Front blue-green, pure green on the upper lateral corners; antennae black, with a few rather long bristles on the second joint, one of which is three-fourths as long as the face; arista more than half as long as the body and with the tip white. Thorax steel-blue or purplish; pleurae more green; meta-scutellum green; bristles of the thorax and abdomen long. Abdomen concolorous with the thorax, the last two segments green. Hypopygium with a peduncle which is as long as the sixth segment, blue, and bears many long, wavy hairs, which are as long as the fifth and sixth segments together; hypopygium black with pale yellow, curved, somewhat forcipate appendages. Coxae, trochanters and femora black; extreme tips of fore and middle femora, all tibiae and fore and middle tarsi yellow; last joint of fore and middle tarsi, extreme tips of hind tibiae and hind tarsi black; all femora with long white hairs below; fore tibiae with a row of bristles on the upper surface, two of which are long, the last one about three-fourths as long as the tibiae; fore tarsi a little more than twice the length of their tibiae, the

first joint being longer than the remaining four together, and ciliate with long bristles above; the second joint with a long and the third joint with a short bristle at tip; middle tibiae with three long bristles of increasing length above, and a long bristle-like spur at tip, also several small bristles; middle tarsi about one-and-one-fourth times as long as their tibiae and ciliate above with close-set bristle-like hairs, which decrease in length but extend to the extreme tip of the fourth joint; fifth joint with minute white hairs above; hind tibiae without bristles, but with a row of short hairs along the lower inner edge. Tegulae and their cilia black; halteres black, with a pale yellow knob. Wings grayish hyaline, with a brown cloud near the tip in front of the third vein.

Described from one male taken at Philadelphia, Pa. Type in the Cornell University collection.

The formation of the hypopygium and its appendages is much like that of *S. forcipatus* Ald., but the arrangement of the bristles of the legs is quite different and easily separate the species.

***Sciapus digitatus*, n. sp.**

Male—Length 5 mm. Face and front green, the former with rather thick white pollen when viewed from in front, this pollen extending a little on to the lower part of the front; antennae small, black, the longest bristles on the second joint a little longer than the antennae; arista about as long as the width of the head; palpi and proboscis brown. Thorax green with very little pollen. Abdomen green, with black bands at the base of the segments, those on the last two segments occupying nearly the whole of the segments; hypopygium small with two small, slender, nearly straight appendages, which are black and about as long as the width of the hypopygium. Coxae and femora black, the tips of the latter yellow; fore and middle tibiae yellow; hind tibiae yellowish brown with black tips; fore tarsi brownish almost from the base; middle and hind tarsi black; fore femora with delicate white hairs and a few black bristles below; fore tibiae with about four long black bristles on the lower hind edge; fore tarsi about twice the length of their tibiae, the metatarsi slightly longer than the tibiae and with two bristles below; middle and hind femora with white hairs below; middle tibiae with several small scattered bristles; hind tibiae with only very short bristles, which are hardly distinguishable from the

hairs. Halteres yellow, the stem infuscated; tegulae and their cilia black. Wings hyaline, with the usual cross bands, which are united on the front as far back as the third vein; the last bend in the fourth vein nearly a right angle and little rounded.

Females with yellow femora.

Described from two males and two females from Cuba.

This is very close to *S. breviseta* Coq., differing in having longer bristles on the second joint of the antennae, smaller lamellae to the hypopygium and having the middle tarsi entirely black.

Sciapus nigrimanus, n. sp.

Male—Length 7 mm. Face green, more bluish on the upper part, white pollinose when viewed from above; front violet with the orbits narrowly green near the vertex. Antennae small, black with short bristles on the second joint; arista about as long as the width of the head. Thorax green, white pollinose along the front and sides of the dorsum when viewed from above; pleurae more blackish, with white pollen; scutellum blue-green. Abdomen green, with black bands at the incisures, that on the second segment extending forward on the centre of the dorsum to the base of the abdomen; hypopygium large with large, somewhat forked, black lamellae. Coxae black with white pollen; tips of the fore coxae yellow; fore and middle coxae with rather long, delicate white hairs on the front surface; hind coxae with several pale hairs and the usual black bristle on the outer surface; femora green, fore and middle pairs broadly, and the hind pair narrowly yellow at the tips, all with delicate pale hairs below, those on the hind pair longest; tibiae yellow, tips of the hind pair black; fore tibiae with about six slender bristles below and one above near the apex; middle tibiae with a row of about twelve stouter bristles on the lower front edge, three on the upper side, and three or four small ones on the posterior surface; hind tibiae with one bristle at basal fourth; front tarsi black from the tip of the first joint, about one-and-two-thirds times as long as their tibiae; the metatarsi nearly as long as the tibiae, and with a row of bristles below extending the entire length; second joint short, about twice as long as wide with delicate hairs below, a little widened downward; third joint slightly shorter than the second; fourth joint nearly as long as the two preceding together; fifth joint about as long as the third; middle-

tarsi black, the metatarsi a little shorter than their tibiæ and with a close row of erect hair-like bristles below; the remaining four joints together about two-fifths as long as the first; hind tarsi black, shining with rather long hairs, shorter than their tibiæ; the metatarsi longer than the remaining four joints together. Tegulæ yellowish brown, with black tips and cilia; halteres yellow. Wings grayish hyaline, with the usual cross-bands, which are united in front as far back as the third vein; a brown cloud fills in the apex of the cell in front of the tip of the first vein; the cells between the first and third veins are tinged with yellow as far as the cross-bands; costa with erect cilia, which is longest at the tip of the first vein; the last section of the fourth vein beyond the fork bent backward so as to be somewhat U-shaped.

Female—Agrees with the male in the colour of the front, body and wings, but differs in having no rows of bristles on the tibiæ and tarsi and no erect cilia on the costa; the front coxæ and all femora are yellow, all the tarsi black, and the face is so thickly covered with white pollen as to conceal the ground colour. Length 6 mm.

Described from two males and three females taken at Los Amates and Marales, Guatemala, in February and March.

This species agrees in most points with the description of *S. genualis* Ald., but differs in the structure of the front tarsi, the first joint of which has a row of stout bristles below for its entire length, the second joint has no bristles, but only short, delicate hairs below, while Prof. Aldrich, in his description of *genualis*, states that the first joint has a few small bristles near the apex and the second joint a number of smaller ones extending its whole length.

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

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

(Continued from Vol. XLV., p. 302.)

531. *Diastictis denticulodes* Hulst.—A third specimen from Head of Pine Creek on Aug. 3rd, 1907.

534. *D. loricaria* Eversman.—Messrs. Barnes and McDunnough, in their "Contributions," Vol. I, No. IV, p. 33, and plate XV, figs. 5, 12, figure a winged female type of *Sympherta julia*

November, 1914

Hulst, from Hall Valley, Colo., and a Colorado male compared with a male type in their possession. The male there figured (fig. 12) is the species which was referred by Taylor to *loricaria* Eversman, and listed by me as such. The female type is, as Messrs. Barnes and McDunnough point out, a distinct species, and is very close to my No. 532, for which I have not yet received a name. No mention is made of sexes in Hulst's description.

541. *Apocheima rachelæ* Hulst. I have a wingless female taken here, which is evidently this species, dated April 11th.

543. *Anagoga pulveraria* Linn.—During one or two years, particularly 1909, this species was not uncommon here in June, flying at dusk in the poplar woods.

547. *Xanthotype crocataria* Fabr.—I have a single specimen of this species taken at the head of Pine Creek on July 14th, 1906.

552. *Euchloena astylusaria* Walk.—A male is in my collection taken at Edmonton by Mr. F. S. Carr, May 13th, 1910. A male at the head of Pine Creek on May 31st of the same year, by Mr. E. R. Brill. The latter specimen is about like Holland's figure, but lacks the cloud opposite the cell on primaries. The Edmonton specimen is similar though rubbed. The Red Deer River specimen previously recorded almost lacks the brown irroration, and differs from the others in having a diffuse transverse fuscous shade across all wings, above and beneath, least evident on the primaries above, where it is just posterior to the t. a. line. It is possibly a distinct species.

553. *E. pectinaria* Schiff.—High River. (Baird).

556. *Metanema inatomaria* Gn.—Banff. July 1st, 1907.

557. *M. determinata* Walk.—Banff. July 1st, 1907.

560. *Brephos infans* Moschl.—Calgary, April 19th, 1913, by Mr. Norman Criddle.

563. *Cossus populi* Walk.? vel *orc* Strk.?—Messrs. Barnes and McDunnough commenced their "Contributions" by a "Revision of the Cossidæ" (Vol. I, No. 1, 1911). There on Plate VII, fig 8, is a reproduction from a coloured figure of Walker's type of *populi* in the British Museum, from St. Martin's Falls, Hudson's Bay Territory, on the borders of Ontario. It is a female, and Sir George Hampson states that the abdomen, though distorted laterally by pressure, is more elongate than in any of its allies. Compared

with others of this group, it seems to be characterized also by lack of tendency of the reticulations to form prominent transverse black lines, or in having dark clouds or blotches. The authors mention having only a single female from Calgary which approximates this, and figure the specimen on plate V, fig. 9. This specimen happens to be more like the type than any in my possession, but shows a tendency towards the development of clouds and well-marked lines possessed by all in my series of five. In my only female the abdomen is about as in that figure, but the maculation is nearer to that of fig. 7, an Arrowhead Lake specimen referred doubtfully to *orc* Strecker. The male and female types of *orc*, from the State of Washington, are figured on plate VI. The female type seems a bit more blotchy than mine, but I can match the male very closely, and believe that all my specimens are really of this species, whatever may be the true relationship to *populi* and *undosus*, the authors suggesting that "It is possible that they are merely geographical forms of the same species."

The fragmentary female type of *undosus* Lint. is also figured on Plate VII, fig. 2, and in maculation appears nearer *populi* than *orc*. The authors state that in the type of *undosus* and in all specimens seen by them the collar is distinctly ochreous. A slight ochreous or brownish tint is present in some of mine, one of which is almost exactly like their fig. 8, plate V, of a Colorado specimen called *undosus*. Holland's figure under this name has much heavier black bands than anything I have seen, and lacks the usual blotches. Barnes and McDunnough give Colorado and Wyoming as the habitat of *undosus*, though they do not denote the type locality. I have specimens of the Alberta form, whatever may be its correct name, from High River, where Mr. Baird says it visits the town lights pretty regularly.

569. *Hepialus macglashani* Hy. Edw.—In Can. Ent., XLIII, pp. 290-292, Aug., 1911, Mr. McDunnough gives us some valuable notes on the group included under *hyperboreus* in Dyar's Catalogue. He states that *macglashani* was described from a series from Truckee, Calif., and that, as described, the band is connected with the inner margin of the wing by a spur of silver. The species is said to bear a great resemblance to *ganna* of Europe. He mentions that Dr. Barnes has a female of *macglashani* from the type locality,

four pairs from Hymers, Ont., and three specimens from Calgary. He seems to imply that all of these specimens have the band connected with the inner margin by a spur. My only two Alberta specimens are those previously recorded, and one of them lacks the spur. Both are pale reddish brown, almost salmon tinted. A pair from Hymers, Ont., are similarly maculate, though both have the spur, but the colour is much darker brown, especially in the secondaries. A female from Duncans, V. I., is apparently closely allied to the Calgary form, but is of a more fuscous pale brown, without any reddish tints, and has faint, diffuse fuscous cloudings in various portions of the wing, and two small, faintly silvered discal dots in one of these clouds at the end of the cell on primaries.

Additional Heterocera.

The number of species of Heterocera which have come to hand, or been recognized, or of which authentic records have been procured too late for insertion in their order in my original list, is large, roughly, some hundred and twenty. Considering that it is about nine years since that list was commenced (Vol. XXXVI, p. 345, December, 1904), and seven since its completion (Vol. XXXVIII, p. 267, August, 1906), a much larger number of additions might have been expected, had collecting been done as assiduously of recent years as it was formerly. Mr. Arthur Hudson and the author used to collect, principally at night, on a somewhat extensive scale, for some twelve or fifteen years, though such collecting was for the most part restricted to a very small area. The cessation has been gradual, and, for a variety of reasons, the collecting done by us during the few past years has been practically nil. That the list could yet be largely augmented if researches were carried on extensively further afield, is evinced by the high percentage of fresh species found in occasional small consignments received from distant localities. For instance, Lethbridge, in Southern Alberta, the driest portion of the Province, and practically the northern limit of the desert region, has, to judge from the captures made on occasional visits by one or two collectors there, many species unknown, or of extreme rarity further north. Mr. N. B. Sanson has done considerable collecting, chiefly at light, at Banff, in the Rockies, for the past few seasons, and discovered

a large number of forms previously unrecorded from the province, and several species of extreme rarity in collections, some entirely new. Mr. Bean, who I believe left Laggan for his old home in Illinois about 1895, probably has many records which have not yet come my way, though I found a few of his captures new to me in eastern collections. In a very small collection from Edmonton, shown me by Mr. F. S. Carr, the percentage of fresh records was high, and even the city of Calgary has produced species never taken on Pine Creek. An extensive collection was made at Calgary, and some fifty miles further northwest, near Didsbury, throughout several seasons. But I never had a chance to look through them, though the results of the small portion I did examine were tantalizing. My "List" was quite correctly entitled "Preliminary."

584. *Hemaris thysbe* Fabr. var. *cimbiciformis* Steph.—A specimen taken at sallow blossoms at Edmonton on May 13th, 1910, is now in my collection. I recorded the specimen as *ruficaudis* Kirby in Mr. Gibson's "Record" for 1910. I now follow Messrs. Barnes and McDunnough's treatment of the forms in their List of Sphingidæ, Psyche, XVII, p. 200, Oct. 1910. They there make *thysbe*, *fuscicaudis* and *cimbiciformis* forms of one species, and state that the latter has olive markings on last abdominal segments, and anterior edge to outer brown borders of primaries entire, and not dentate as in *thysbe*, to which they refer *ruficaudis* Kirby—not recognisable from Kirby's description—as a synonym. I have exactly the same form from Field, B.C., dated July 6th, perfectly fresh, and from Chicago, June 28th and Aug. 4th. The form has the olivaceous thorax of Holland's Pl. II, fig. 5, of *thysbe*, and differs in that respect from his fig. 6 under *cimbiciformis*, of which it has the entire border. I have another Chicago specimen almost exactly like this fig. 6.

585. *Lepisesia juanita* Strk.—A male taken by the author, feeding on the wing at thistles, on the Red Deer River, 50 miles northeast of Gleichen, on July 6th, 1905, comparatively fresh. The secondaries are a bit paler, and the anal mark less distinct, but otherwise it is extremely like the *juanita* of Holland's figure. I have *clarkia* from Oregon, and from Duncans and Wellington, Vancouver Island. These differ in many details of shape, colour

and maculation, including the absence of the anal ocellate mark on secondaries. *Juanita* was described from Texas.

586. *Amphion nessus* Cram.—I have a single specimen from High River, from Mr. Baird, rather worn, and possibly a migrant.

587. *Sphinx luscitiosa* Clem.—A female is in my collection, taken west of Didsbury, Alta., by a Mr. C. G. Garrett.

588. *S. pinastri* Linn.—Barnes and McDunnough, in their Sphingid paper quoted above, state that Dr. Barnes has two specimens of this species, one labelled California, the other Waghorn, Alberta. Presuming the latter label to be correct, the capture was perhaps made by Mr. P. B. Gregson.

According to Smith's Monograph of Sphingidæ (Trans. Am. Ent. Soc. XV, pp. 49-241, 1888) Strecker described this species under the name *saniptri*, but subsequently referred it as synonymous with the European *pinastri*. His types were a male from "Canada," received from Mr. Reakirt, and a female taken by himself on a fence near some pine woods at Reading, Pa. Holland states that Strecker took the species at Reading on one or two occasions. It is listed by Dyar as a doubtful U. S. species. Judging from the British figures I have seen, it should not easily be confused with anything else North American.

589. *Turuptiana permaculata* Pack.—Red Deer River, north-east of Gleichen, July 1st, 1905, flying at dusk. I have four specimens, exactly like Holland's figure. It did not appear to be by any means rare, and indeed I was assured by local residents who professed to recognize it that it was sometimes very abundant, and I have been given the same report from the Lethbridge district, though, of course, such records are not authentic. I have certainly received and named the species from other points in the western provinces, but cannot at present find the references.

590. *Diachrisia virginica* Fabr.—Edmonton, June 3rd, 1910. (F. S. Carr.)

591. *Euchætiás oregonensis* Stretch.—Didsbury, June 27th, 1907. (C. G. Garrett.) A single male is in my collection, agreeing with Holland's figure, and with the description given in Hampson and in Neumœgen and Dyar's "Bombyces."

592. *Panthea virginaria* Grt.—Dr. Barnes told me several years ago that Grote's *Biston virginarius* (No. 3866, Dyar Cat.)

was a *Panthea* allied to *gigantea*. I recently examined the type in the British Museum, and that is evidently correct. It comes from Shasta Soda Springs, California (Hamps. Cat., XIII, 370, pl. CCXXXIV, fig. 10). Mr. Sanson has taken two specimens of a *Panthea* at Banff, a female on July 16th, 1906, on Sulphur Mountain, and a male on June 1st, 1910. I have examined both of these, the former in Smith's collection, and recorded them, apparently wrongly, as rather dark *portlandia* in the "Record" for 1910. I have in my collection a similar female which I took on a station light at Field, B. C., on July 16th, 1907, and this I have compared with Grote's type of *virginaria*, and consider it the same, though it has heavier cross lines. I did not feel confident as to the distinctness of the *gigantea* of the British Museum. I have not seen Grote's description of *portlandia*, but have a Wellington, V. I., specimen agreeing with Holland's figure, and with that in Smith and Dyar's "Monograph of Acronycta," where the habitat given is the northern Pacific coast, from Oregon to Vancouver Island.

593. *Acronycta dactylina* Grt.—I have four males taken here, from July 5th to 17th, in 1901, '04, and '09. Two of these were included in my original notes under *canadensis*. The female is from High River, from Mr. Baird. They are a trifle bluer grey than eastern specimens, one of which, from Lowell, Mass., I have compared with Grote's type from New York, but they appear to be the same species. *Hesperida* Smith was described from two males and six females from California; Seattle and Tacoma, Washington; Nanaimo and Vancouver. I have seen three specimens labelled "type," one of which is labelled "Victoria, B. C.," which is presumably intended by "Vancouver" in the description. I consider it a dark variation of *dactylina*, all wings, including even the secondaries in the male, being more suffused with brown than those from east of the Rockies. The dark secondaries, as I have elsewhere pointed out, are a feature common to many B. C. forms. Smith adds that "the dagger mark opposite the anal angle is entirely absent." It is present in two out of my six B. C. specimens, and, moreover, it is sometimes absent from eastern *dactylina*. Hampson figures as *hesperida* a female from Aweme, Man., but it is not typical. I have specimens from Miniota, Cartwright, and Winnipeg, and they are like the local form.

594. *A. felina* Grt.?—I have a single male taken at the head of Pine Creek on June 20th, 1895, being one of those four specimens originally treated by me under *canadensis*, which I have compared with a male type of *felina* from the Sierra Nevada in the British Museum. This type is well figured on Plate CXXVI, fig. 3, of Hampson's Catalogue, but the figure is too brown. My specimen differs in a few minor details, but appears to be the same species. There is a female type of *felina* from the same locality in the Henry Edwards collection, which did not satisfy me as being the same species as that in the British Museum, but this comparison was from memory only. It seemed to me nearer *cyanescens* Hampson, from Vancouver, but paler. At any rate the two are close allies, and *metra* Smith, from Seattle, Wash., and Colorado, is doubtfully distinct from *cyanescens*. The *felina* of the British Museum is not like that figured in Smith and Dyar's Monograph.

595. *Arsilonche henrici* Grt.—Two specimens, June 17th, 1906, and June 5th, 1910. They are much darker and more streaky than my specimens from the east and are irrorate with smoky. The species appears to have a wide range of variation. The type of *henrici* is very streaky and grey, that of *evanidum* being rather even and not grey. Both are in the British Museum and appear to be from New York. *Fumosum* Morr., of which the type is in the Tepper collection, is called "ab. 1" by Hampson, almost entirely suffused with slate-grey." Sir George Hampson keeps *henrici* distinct from the European *albovenosa* as being darker brown and having blunter apices to the primaries. My own notes say, concerning the British Museum series: "All are much more even and less powdery than a series of *albovenosa* here." Some European students, including Tutt, have claimed to have found them identical. As regards my series from each continent, the differences in wing form certainly do not hold, and the contrast between the pale veins and the ochreous or brown interspaces is greatest, as a rule, in North American specimens. My Calgary examples, which seem to be about typical *henrici*, agree very closely in colour with a Bavarian specimen sent me by Bang Haas as ab. *albida* Auriv., but have more dark interspaceal shades. I neither possess, nor have I seen, any specimens which cause me to consider *albovenosa* and *henrici* strictly synonymous, though the relationship

is certainly very close indeed. Grote's note under *henrici* in his 1895 List—"an spec. europ.?"—is apparently intended to apply to "aberr. *fumosum* Morr." only.

596. *Merolonche lupini* Grt.—Three specimens taken at Banff. Two of them dated June 6th and 12th, 1910 (Sanson).

597. *Bryophila avirida* Smith.—(Journ. N.Y. Ent. Soc., XIV, p. 10, March, 1906).—Described from four specimens. The male type is from Cartwright, Man., and the female from Ft. Collins, Colo. I took several specimens on the Red Deer River on July 6th and 7th, 1905, and have a good series from Miniota and Cartwright, Man., dated from June 14th to July 8th. Mine were beaten from bushes in the daytime. As described it is darker and more obscurely marked than *lepidula*. It is also stated to have "all the green shading eliminated." Hampson mentions no green, and yet, to my eye, an olivaceous green tinge is evident both in the types and in every one of my series of thirteen specimens, and in some from Miniota it is very pronounced. Hampson, besides specimens from Manitoba and Alberta, lists a female from New York. The type of *lepidula* is catalogued as from Missouri, and has most of the pale areas pale green. A Columbus, Ohio, female in Smith's collection, seemed to me about intermediate, as, indeed, are some of my Miniota specimens. From what I have observed I feel bound to look upon the form as a variation of *lepidula*.

598. *Senta defecta* Grt.—Two at light at head of Pine Creek on August 15th and September 3rd, 1904. A third bred in August, 1905, from larva found in stem of a reed-like grass known locally as "red-top" in a slough on the prairie near Gleichen a few weeks previously. A number of larvæ were secured, the stems being cut off above and below them and placed upright in wet sand, but all the rest died. I have compared one of the specimens with the type, catalogued as merely from "U. S. A."

599. *Luperina extensa* Smith.—(Journ. N.Y. Ent. Soc., XIII, 203, Dec., 1905).—Type a male from Regina, Sask. Syn. *Perigea flavistriga* Smith (id. p. 204). Type a female from Lethbridge, Alta. The descriptions were made from single specimens, both taken by Mr. T. N. Willing. The synonymy has been published by Smith himself. I have a female taken at treacle by myself at

the Red Deer River locality—now known by the name of an adjacent post office, Dorothy—on July 23rd, 1907, which I have compared with both types in Smith's collection. In that collection also are a pair from Bozeman, Montana, Aug., 1908, and a female from Westbourne, Man., Aug. 3rd, 1908, from Mr. J. B. Wallis. Sir George Hampson gives figures from coloured drawings sent him of both types. That of *flavistriga* is most like my specimen, but shorter winged. That of *extensa* is in accordance with my notes on that type, which is browner than any of the rest I have seen, though when I saw it it was greasy and probably discoloured.

600. *Hadena castanea* Grt.—This name stands wrongly in our lists as a synonym of *pluviosa*. The type of the latter is in the British Museum and is a very badly worn specimen from Vancouver Island. It is, as Hampson lists it, the species well known as *arctica* Bdv., which I believe was described from Labrador. A type of *castanea* is in the British Museum from California, and, according to Smith's Catalogue, there is another in the Tepper collection. That of *cymosa* from Washington Territory is in the British Museum also, and is the same as the type of *castanea* there, and distinct from *arctica*. *Castanea* is sienna brown, and *cymosa* fuscous brown, whilst the "ab. 1" of Hampson is a variegated form with pale shades in the subterminal area. *Castanea* occurs on Vancouver Island, often apparently in considerable numbers. *Arctica* occurs there also, but less commonly. Whilst I think it improbable that the two are one species, the variegated form of *castanea* sometimes resembles *arctica* so very closely as to make separation a matter of the very greatest difficulty, if not occasionally impossible.

In the Kootenai List Dr. Dyar records under *pluviosa* three specimens from Banff, Alta., July 21st, Aug. 11th and Sept. 10th, 1904, adding: "Apparently distinct from *arctica* Bdv., but very close to it." I did not see the specimens when at Washington, but must assume that he took the variegated form of *castanea*, and therefore so record it. I have not found the species amongst specimens sent me from time to time by Mr. Sanson.

601. *H. loda* Strk., syn. *albiserrata* Sm. Mr. Sanson has taken two males of this species at light at Banff, on Sept. 2nd, 1908, and

Sept. 16th, 1910. I have published a note on this species in Ent. News XXIV, 356, Oct. 1913.

602. *H. majda* Dyar.—(Can. Ent., XXXVI, 30, Feb. 1904.)—Two females at Banff, Sept. 22nd, 1910 (Sanson). Described from Kaslo.

[168a. *H. illustra* Smith.—(Ann. N. Y. Acad. Sci., XVIII, 114, 1908.)—Described from a single female taken at High River by Mr. Baird. I have an unusually black, uniform female of *commoda* taken here, which I have compared with it, and labelled as undoubtedly identical. I should have referred to the form under that heading.]

(To be continued.)

NEW SOUTH AMERICAN MEMBRACIDÆ.

BY W. D. FUNKHOUSER, ITHACA, N. Y.

(Continued from p. 363.)

7. *Ennya pulchella*, sp. nov. (Pl. XXIV, fig. 7).

A very remarkable and beautiful little species, apparently quite different from any hitherto described, although it may be somewhat near *E. rufipes* Fairm., a species which I have never seen. Superficially it much resembles a small, deeply-ridged *Telamona*. It should be easily recognized by the characteristic dorsal crest and the two bright nile-green spots on each side.

Golden brown with green spots. Pronotum extended dorsally into a thin squarish crest, slightly step-like posteriorly. Entire dorsal surface deeply ridged and punctate. Head yellowish; much broader than long, finely punctate, apex rectangular; ocelli transparent, equidistant from each other and from the eyes; eyes brown. Pronotum deeply and roughly punctate: light green in front, brown on dorsal and lateral surfaces, except for two bright green spots on each side near lateral margin; high, thin, squarish crest above and somewhat behind lateral angles, anterior margin sloping, posterior margin with angle near base of declivity, marked on each side with three perpendicular ridges, the first short, the second long and slightly curved, the third bifurcate at the tip; lateral surfaces of pronotum with four prominent ridges on each side, and two bright green spots, the first extending from the mar-

gin to the second ridge, the other extending from the margin to the third ridge; humeral angles greatly produced, triangular; posterior process gradually acute, sharply depressed at apex, extending just to the tip of the tegmina. Tegmina more than half covered by the pronotum, brown and punctate on its dorsal two-thirds, apical third hyaline, extreme tip black. Legs and under surface of body concolorous yellow brown.

Type.—Female.

Length 6 mm.; width at humeral angles 4 mm.

Locality.—Peru.

Described from one specimen.

8. ***Antonea nodosa***, sp. nov. (Fig. 8).

Clear, shining lemon-yellow throughout, with tiny black spots on head, legs and abdomen. Pronotum swollen into large globular nodules and terminating in a sharp spine. Entire pronotum more or less translucent in dried specimens. Near *A. flaccida* Fairmaire, but smaller and differing in number of nodules and in colour.

Head smooth, yellow; a deep longitudinal depression laterad of each ocellus; ocelli yellow with orange border, much closer to each other than to the eyes; eyes very large, black with orange border; small black spot just below each eye. Prothorax smooth, shining, with six globular swellings set off from each other by punctate depressions. These swellings are located as follows: One above the head on each side, very large, bearing short, sharp horn and many long bristly hairs; one in middle of dorsum just behind these two bearing a few scattered hairs; one on each side below this middle bulb, smooth; one just before posterior process very large and almost spherical. Posterior process long and sharp, extending to a point half way between internal angle and tip of tegmina. Tegmina perfectly hyaline throughout; veins yellow and prominent. Abdomen yellow; second segment with black spot on each side. Legs yellow; a black spot at tip and a black ring near the base of each tibiæ and at the base of each femur; tarsi yellow; claws flavous.

Type.—Female.

Length 7 mm.; width between extremities of horns 4 mm.

Locality.—Bolivia.

Described from three females and two males. The males are neither smaller nor darker than the females.

Subfamily *HOPLOPHORINÆ*.

9. ***Aconophoroides rectispina***, sp. nov. (Fig. 9).

This species suggests at once an *Aconophora*, but the very short hind tarsi removes it from the subfamily to which that genus belongs. It may be recognized by the erect pronotal process, black with yellow tip. The four apical cells of the hind wing are characteristic of the genus.

Yellow, deeply and coarsely punctured with black; pronotal horn straight and nearly upright, black, tip yellow. Head rough, striated, wider than long; clypeus short, inflexed, with median translucent ridge; ocelli transparent, nearer to each other than to the eyes, a black spot under each; eyes prominent and brown. Pronotum coarsely punctured, not pubescent; dorsal horn projecting upward and slightly forward, anterior and posterior margins flattened, black, except at tip, which is smooth and yellow; humeral angles obtusely prominent; posterior process long, narrow, lightly punctured, slightly pilose, extending far beyond abdomen and almost reaching tips of tegmina. Tegmina yellow, subhyaline, much wrinkled between veins; veins brownish and slightly raised. Legs and under surface of the body ferruginous. First and second pairs of tarsi very long and black; hind tarsi short and yellow.

Type.—Female.

Length 10 mm.; width 4.8 mm.

Locality.—Bolivia.

10. ***Aconophoroides projecta***, sp. nov. (Fig. 10).

Superficially recalling a large *Aconophora*, but, like the preceding species, easily distinguished by the very short posterior tarsi and the four apical areas of the hind wings.

Uniform ferruginous brown; pronotal horn short, sharp and projecting forward; thickly covered with more or less obsolete longitudinal carinæ and densely punctate. Head much wider than long, rough and sculptured; clypeus short and reflexed, sparingly pilose; ocelli brown, equidistant from each other and from the

eyes; eyes very prominent, round and black. Pronotum densely and roughly punctured and lightly ridged with faint percurrent median carina and bearing short porrect horn; this horn sharp, subconical, anterior and posterior margins flattened, three or more longitudinal ridges on each side, the middle one sharp and distinct; posterior process long and narrow, gradually acuminate, slightly depressed, extending just to tips of tegmina; humeral angles obtuse, not prominent. Tegmina brown and wrinkled, veins broad and distinct, base and costal area slightly punctate, apical border blackish. Under surface of body black-brown. Legs thick, strong, concolorous ferruginous, slightly pilose; hind tibiae broadly spatulate; hind tarsi very short.

Type.—Female.

Length 10 mm., cum corn. 13 mm., width 5 mm.

Locality.—Bartica, British Guiana.

Collected Feb. 15, 1913, by Mr. H. S. Parish.

Subfamily *TRAGOPINÆ*.

11. *Tragopa luteimaculata* sp. nov. (Fig. 11).

Near *T. humeralis* Fairm., but much smaller and differing in colour and in the markings of the prothorax. Easily recognised by the fourteen bright yellow spots which stand out in striking contrast to the beautiful shining black-brown pronotum.

Nearly twice as long as wide; black-brown with yellow spots; humeral angles rounded; posterior process acute. Head twice as wide as long; smooth, deep brown with median longitudinal yellow stripe starting between the ocelli and extending to the clypeus; ocelli white, farther from each other than from the eyes; eyes black, narrowly bordered with yellow. Pronotum black-brown; very finely punctured, not pubescent; gradually sloping above head; marked on each side with seven irregular yellow spots, each spot faintly bordered with crimson. These spots are arranged on each side as follows: one between humeral angle and eye; one behind humeral angle; two on lateral margin; two in middle of dorsum nearly touching median line; one very large spot covering entire posterior apex. Posterior process subacute, reaching beyond tips of tegmina. Tegmina black and opaque, more than

half concealed by the pronotum; apical limbus very broad and corrugated. Abdomen black; legs yellow.

Type.—Female:

Length 3.4 mm.; width between humeral angles 2.2 mm.

Locality.—Peru.

12. **Tragopa decorata** sp. nov. (Figs. 12 and 13).

About the size of the preceding. Apparently near *T. fulvovaria* Fairm., in its decorations; but smaller, not black, and without the large posterior spot of Fairmaire's species. The head shows no markings.

Decidedly longer than wide; beautiful rich chocolate brown shading to light brown on shoulders and head; decorated with numerous irregular yellow dots and bars bordered with dark brown. Head slightly wider than long; uniform light brown; front convex; ocelli yellow, farther from each other than from the eyes; eyes black bordered with yellow. Pronotum chocolate brown, shining, very finely and faintly punctured; humeral angles rounding; apex obtuse; a crescent-shaped row of yellow dots connecting the humeral angles, these dots joined together near shoulders to make a short stripe; behind this row a transverse area filled with very small dots which in the same manner join to form a stripe at the margin; apex concolorous yellow-brown. These dots and fascia are bordered by bands of dark brown and are not symmetrically arranged bilaterally. Tegmina very dark brown, opaque, more than half covered by the pronotum, border wide and wrinkled. Legs and undersurface of body yellow. Tarsi and tips of tibiae fuscous-brown.

Type.—Female.

Length 3.6 mm.; width 2.4 mm.

Locality.—Bolivia.

The fore-wings of the genus *Tragopa* are most peculiar and are entirely different from the wings of other Membracidae. The wing of *T. decorata* figured is a good example of this interesting wing structure and is remarkable not only for the venation but also for the broad, corrugated limbus.

EXPLANATION OF PLATE XXIV.

- Fig. 1. *Tropidoscyta brunneidorsata*, sp. nov.
Fig. 2. *Tropidoscyta binotata*, sp. nov.
Fig. 3. *Tropidoscyta maculata*, sp. nov.
Fig. 4. *Bolbonota lutea*, sp. nov.
Fig. 5. *Bolbonota nigrata*, sp. nov.
Fig. 6. *Metheisa sinuata*, sp. nov.
Fig. 7. *Enna pulchella*, sp. nov.
Fig. 8. *Antonea nodosa*, sp. nov.
Fig. 9. *Aconophoroides rectispina*, sp. nov.
Fig. 10. *Aconophoroides projecta*, sp. nov.
Fig. 11. *Tragopa luteimaculata*, sp. nov. Dorsal view.
Fig. 12. *Tragopa decorata*, sp. nov. Dorsal view.
Fig. 13. Fore-wing of *Tragopa decorata*.
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MR. LYMAN'S COLLECTIONS.

The late Mr. Henry H. Lyman, a former President of the Entomological Society of Ontario, of whom a portrait and obituary notice were given in the July number of this magazine, left an estate valued at \$1,268,315. By the terms of his will his entomological collections and library are left to McGill University, together with the sum of \$40,000 for their preservation and augmentation. He added: "It is my desire that so long as there may be maintained in Montreal an active Branch of the Entomological Society of Ontario, the President and Secretary of such Branch should be associated with the Professor of Zoology." It is stated that the University has accepted the legacy on these terms.

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BEES VISITING HELIANTHUS.

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

The genus *Helianthus*, consisting of the annual and perennial sunflowers, is native only in America, though widely cultivated in the Old World. The common sunflower, *H. annuus*, is wholly sterile with its own pollen; and has to be visited by insects in order to produce seed. Presumably the same is true of the other species of the genus. The insects carrying the pollen are various, but the bees are far more important than all the rest combined; their incessant activity can only be appreciated by one who has worked with sunflowers throughout the summer.

At Goodview, Colorado, August 2, 1913. I took a census of insects on flowers of cultivated *H. annuus* (var. *coronatus*) for a short time, with this result: *Andrena helianthi*, 12; *Halictoides marginatus* (perhaps some were *Halictus*), 9; *Halictus armaticeps*, 4; *Melissodes*, 2 ♂, 1 ♀; *Panurginus innuptus*, 1; *Apis mellifera ligustica*, 1; *Syrphid*, 1. These were recognized as they flew, but on July 18, I collected a series of bees from the same flowers, at the same place, and found I had *Andrena helianthi* Rob., *Halictus armaticeps* Cress., *Halictoides marginatus* (Cr.), *Panurginus innuptus* (Ckll.), both sexes, *Melissodes aurigena* Cress., ♀, *M. confusiformis* Ckll., ♀, and *Megachile agustini* Ckll., ♂.

The domesticated honey-bee, belonging to the Old World genus, is here an insignificant factor in sunflower pollination. Mr. Collins of Boulder, who has many hives of bees, informs me that they do not go to sunflowers unless the supply of other nectar runs short. When they do make honey from sunflowers, it is very yellow.

The most important sunflower bee, with us, is certainly *Andrena helianthi*. In some localities it is probable that the species of *Megachile*, which work fast and carry a lot of pollen, do more work. *M. helianthi* Ckll. was collected by Rohwer on the wild sunflower (*Helianthus annuus lenticularis*) at Boulder, Colorado.

Mrs. C. Bennett, in August 1908, took males of *M. parallela* Sm. and *M. manifesta* Cr., at flowers of *Helianthus* at Denver. *M. agustini* Ckll., ♂, was collected at Boulder, Aug. 8, on *H. annuus coronatus*. Male bees visiting sunflowers get covered with pollen, and must be almost as useful as females.

At Sterling, Colorado, far out on the plains, I collected bees from *H. annuus lenticularis* on Aug. 3, 1911. Several of the species (Canad. Entom., Nov. 1911, p. 390) were the same as those found at Boulder, but others were present, and, in particular, *Anthophorula bruneri* (Crawf.) was abundant and evidently an important factor in pollination.

The above lists happen to lack now other types of bees which are more or less important visitors of sunflowers in Colorado; *Bombus* and the Anthidiines. The Bombi on sunflowers are principally males, and the same is true in European gardens, as may be seen by the list in Knuth's "Blütenbiologie." The Anthidiines (at Boulder *Heteranthidium zebratum* (Cr.), *Dianthidium perpictum* Ckll., and *D. sayi* Ckll.) and efficient, but not abundant enough to be of great consequence.

In suitable localities, *Perdita* abounds on sunflowers. Thus, in Nebraska (Swenk and Cockerell, 1907) eight species are recorded, some of them regular visitors, others only occasional. In Nebraska and New Mexico, *P. albipennis* and its immediate allies (subgenus *Cockerellia* Ashmead) are especially found on *Helianthus*, though there are members of this group attached to other Helianthoid Compositæ, as *Ratibida* and *Ximenesia*.

Diadasia cannot be regarded as a normal or regular visitor of *Helianthus*, yet it occurs from time to time. I collected males of *D. australis* Cr. on sunflower at San Bernardino, California, many years ago; and females of *D. enavata* Cr. on *H. lenticularis* at Mesilla, New Mexico.

At Falfurrias, Texas, May 18, 1907, Mr. A. C. Morgan collected one female each of *D. australis* Cr. and *D. afflicta* Cr., at flowers of *Helianthus*. The *D. australis* had collected much yellow pollen on the hind legs, but the large smooth grains were apparently cactaceous, certainly not from *Helianthus*. However, the compound microscope showed also a small quantity of the small grains of

Helianthus, scattered about. The *D. afflicta* carried only a little pollen on the legs, but it also had both sorts, and *Helianthus* grains also on the wings.

We must probably conclude that these species of *Diadasia*, regularly visiting Cactaceæ for nectar and pollen, rested from time to time on the discs of *Helianthus*, and accidentally became dusted with pollen from these. In this way, without actually feeding on *Helianthus*, these bees might become pollinating agents.

We are almost without records of sunflower visitors in the Pacific coast region, and I have no data from Central and South America, although rather numerous species of *Helianthus* exist in the mountains from Mexico to Peru. Graenicher in Wisconsin and Robertson in Illinois have made many observations of interest on the visitors of the perennial species. Records from Canada, the Atlantic seaboard and the Southern States are much to be desired. The Entomologists of the U. S. Department of Agriculture stationed in Texas have secured enormous series of insects of all orders, including a considerable number from *Helianthus*, but the labels do not, as a rule, show what species of *Helianthus* are involved. I have been very kindly permitted to examine many of the bees, and also to use the records kept on file in Washington. I give here some illustrative data:

- (1.) Dallas; Sept. 21, 1905. At *H. maximiliani*. C. R. Jones. *Nomia nortoni* Cr., det. Crawford; *Halictus armaticeps* Cr. (*ligatus* Auctt.); *Megachile parallela* Sm.
- (2.) Clarendon; Aug. 11, 1905. At sunflower. C. R. Jones. *Perdita xanthismæ* Ckll.; *Triepeolus remigatus* (Fabr.), det. Bishopp; *Melissodes obliqua* Say.
- (3.) Victoria; October 2. At *Helianthus*. Crawford and Leister. *Nomia heteropoda* Say.; *N. apacha* Cr.
- (4.) Wichita Falls; June 10, at *Helianthus*. J. D. Mitchell. *Nomia bolliana* Ckll.
- (5.) Falfurrias; May 18, at *Helianthus*. A. C. Morgan. *Nomada garciæna* Ckll.; *N. texana* Cr.; *Osmia subfasciata* Cr., ♂; *Melissodes suffusa* Cr., ♂; *Anthophorula morgani* Ckll.; *Halictus ligatus* Auctt. (det. Crawford); and other species recorded elsewhere in this paper.

Various species of *Megachile* have been recorded elsewhere. It will be observed that in Texas the species of *Nomia* become quite conspicuous. In New Mexico *N. triangulifera* Vachal occurs on *Helianthus*.

Do the bees distinguish the annual and perennial sunflowers, or between the species of either group? Are there species of bees adapted to particular species of *Helianthus*? At present we cannot produce any satisfactory evidence on this point; differences observed may be no more significant for the discussion than those between the visitors of the same species (*H. lenticularis*) in different regions. Robertson, in Illinois, finds *Andrena helianthi* Rob., *A. pulchella* Rob., and *A. aliciae* Rob., on perennial sunflowers. At Boulder we get only one of these on the annual species, *A. helianthi*; but in New Mexico *A. pulchella* appears on *H. lenticularis*. In the vicinity of Milwaukee, Wis., Graenicher gets four species of *Andrena* on sunflowers; *A. helianthi* Rob. (the most common), *A. aliciae* Rob., *A. peckhami* Ckll., and *A. clypeonitens* Ckll. These all visit perennial species.

In view of the fact that *Helianthus* is exclusively American, and possesses in our fauna a long series of more or less adapted bee-visitors, it becomes very interesting to enquire what happens when sunflowers are grown in the Old World. Do the bees of those regions find them out, and if so, are they allied to the regular American sunflower bees?

Afken, in Bremen (Abh. Nat. Ver. Bremen, XXII, pp. 180-181) observed the bees visiting cultivated *H. annuus*. His list is as follows: *Bombus*, 8 species; *Psithyrus*, 3 species, all males; *Megachile*, 2 species, females; *Halictus leucozonius*; *Coelioxys acuminatus*; *Apis mellifera*; *Anthidium manicatum*. It will be seen at once that this closely corresponds in character with American lists, leaving out the genera peculiar to America, and also certain genera, as *Andrena*, our species of which appear to be oligotropic.

The perennial sunflowers in European gardens are visited by *Apis*, *Bombus*, *Psithyrus*, *Halictus*, *Megachile* and *Heriades*.

In Australia, Mrs. M. Anderson collected bees for me from flowers of *H. annuus*, and it was very interesting to find that

Trigona carbonaria Sm. freely visits them, collecting pollen. No species of *Trigona* occurs within the natural range of the *H. annuus* group.

At Gisborne, New Zealand, Mr. W. D. Cook kindly observed the insects on *H. annuus coronatus* in 1913-14. He did not send any specimens, but his account is sufficiently clear to permit the recognition of the bees, and I have inserted the names within brackets:—

“There seem to have been very few bees about this year; at any rate very few visited the sunflowers. I noticed a few ordinary German bees [*Apis mellifera* L.], a few bumble-bees, and a tremendous number of the common cream-coloured moth, and also a great many flies. [The bees] were nearly all a small black bumble-bee. There seem to be very few big bumble-bees about here (I mean the black one with the yellow band [*Bombus terrestris* L.]), but the one I saw most was about half the size and pure black (much larger than an ordinary bee)” [*Bombus ruderatus fidens* Harris.]

Thus in New Zealand the only bee-visitors were the introduced species of *Bombus* and *Apis*, as might be expected from the absence of native long-tongued bees. Had the sunflower reached that country before the bees, perhaps the flies would have been fairly satisfactory pollinators.

I add to this paper descriptive notes on some sunflower bees, two of which are new.

***Melissodes semiagilis* (Cockerell).**

Melissodes agilis semiagilis Cockerell, Ann. Mag. Nat. Hist., April 1906, p. 364, ♂.

♀. Length about 11 mm.; pubescence grayish-white, tinged with ochreous, vertex with black hairs, scutellum and posterior part of mesothorax with much black hair, the tegulae separated from the black patch by a band of pale hair about equal to their width; head broad; flagellum dusky reddish beneath, except at base; first abdominal segment with a narrow pallid hind margin, the others with hind margin dark; second segment with pale hair at extreme base, and a rather broad median hair band; third segment with median band twice as broad as that on second; tibia of hind

legs with scopa strongly plumose, long and loose, wholly pale; hair on inner side of hind tibiæ fusco-ferruginous.

In my table in Trans. Amer. Ent. Soc., XXXII, the female runs to the vicinity of *M. gilensis communis* and *hortivagans*. It is smaller than *gilensis*, with much clearer wings, and hair on outer side of middle tibiæ all pale (largely dark gray in *gilensis*). The same characters at once separate it from *hortivagans*. The wings are much paler and shorter than in *communis*, and the band on middle of second abdominal segment is much broader. The hind margin of fourth abdominal segment has dark hair only in middle, not right accross as in *M. wheeleri*. Among Robertson's species *M. semiagilis* female resembles *M. vernoniæ*, which has short, still clearer wings; but *vernoniæ* has a patch of black hair on outer side of middle tibiæ apically, the hair on abdomen whiter, and the hair on inner side of hind basitarsi black.

Hab.—Quanah, Indian Territory, at flowers of *Helianthus*, June 10, 1906 (*J. D. Mitchell*), U.S. Nat. Museum, 9♂, 4♀. A female from Dallas, Texas, at *Helianthus*, Sept. 22, 1905 (*F. C. Bishop*) has a little dusky hair at apex of middle tibiæ, and the hair on inner side of hind basitarsi is fuscous; but the general appearance and colour of the hair agrees exactly with *semiagilis*, not with *vernoniæ*. Thus it rather approaches *M. simillima* Rob.

Melissodes suffusa Cresson, variety.

♂. Differs from a cotype in having the flagellum only obscurely reddened (instead of bright clear ferruginous) beneath; otherwise normal.

Hab.—Falfurrias, Texas, on *Helianthus*, May 18, 1907, (*A. C. Morgan*).

Melissodes bishoppi sp. n.

♂. Runs in my table in Trans. Amer. Ent. Soc., XXXII, to the vicinity of *M. aurigenia* Cresson, which it closely resembles differing as follows: Third antennal joint (view from front) 192 μ long, fourth 752 (the same measurements for *aurigenia* are 128 and 1040); the third joint very much longer than second; flagellum about 5½ mm. long (about 7½ in *aurigenia*); nervures darker; second s. m. narrower; third t. c. angular in middle;

hind knee-plate larger; hair of hind tibiae whiter and less spreading; first two abdominal segments very distinctly punctured; subhyaline margins of segments less than half as wide. Clypeus, labrum and large spot on mandibles yellow; hair of thorax above wholly pale ochraceous; flagellum entirely red, bright beneath, a little dusky above; small joints of tarsi red; hair on fifth and sixth abdominal segments light; wings as clear as in *aurigenia*. The abdomen is without hair-bands. Tegulae light fulvous. Eyes dark brown.

Hab.—Paris, Texas, at *Helianthus*, Aug. 27, 1905 (F. C. Bishopp), U. S. National Museum. The *M. aurigenia* compared is a cotype from New York.

***Xenoglossodes helianthorum* sp. n.**

♂. Length about 10 mm.; black, with abundant pure white hair, light orange on inner side of basitarsi; head broad; eyes greyish-brown; clypeus (except upper third), labrum and basal half of mandibles cream-colour; apical half of mandibles ferruginous; head and thorax with dense long hair; antennae reaching the second abdominal segment; third and fourth joints (from front) measuring respectively about 160 and 1120 μ ; flagellum dark rufous, redder beneath, but not brightly coloured; mesothorax shining, well punctured; tegulae almost wholly hidden by hair, their margins pallid; wings short, hyaline, with ferruginous nervures and stigma; second s. m. very large and broad; small joints of tarsi ferruginous; abdomen entirely covered with white hair, long at base, otherwise short, denser on apical margins of segments, producing obscure bands; subapical lateral spines very small; short fuscous hair on each side of apical part of apical plate; last ventral segment with two large oval depressions.

Hab.—Falfurrias, Texas, at *Helianthus*, May 18, 1907 (A. C. Morgan). U. S. National Museum. I have not ventured to extract the mouth-parts of the unique type, but refer the insect with confidence to *Xenoglossodes*, where it falls near *X. albata* (Cress.), differing by being larger and more robust, with upper part of clypeus black.

LUCILIA SERICATA MEIGEN ATTACKING A LIVE CALF.*

BY H. F. HUDSON, B.S.A., ENTOMOLOGICAL BRANCH, OTTAWA.

While walking through a pasture field at Strathroy, Ont., on July 1st, my attention was directed to a well-bred herd of young Holstein cattle. There were among them twelve calves from five to six weeks old. On looking them over, I noticed that one of the calves had a sickly appearance and was extremely thin. This calf appeared to be suffering from an acute attack of white scours, and all known remedies seemed to be useless. It was becoming weaker although still able to run around, and was very keen for its milk. On July 4th, when I saw the calf again, I was surprised to find the hind extremities, especially around the base of the tail, a mass of maggots. A closer examination showed that the maggots were most abundant around the anus and base of the tail where some of them had eaten into the flesh to the depth of about a quarter of an inch. No adult flies were observed though a watch was kept for some time. Learning the calf's condition, the owner killed it immediately and a piece of the infested flesh was brought to the laboratory. On July 12th the larvæ appeared to be thriving, but as other work compelled an absence of about a fortnight from the laboratory at Strathroy, most of the larvæ died through want of food during this absence. Two larvæ pupated on August 5th, and on August 19th two adults of *Lucilia sericata* Meigen emerged. The specimens were dwarfed owing to the larvæ having suffered from lack of nutrition.

The adult flies had no doubt been attracted by the filthy hind quarters of the sickly calf and had oviposited there. Dr. C. Gordon Hewitt, to whom the specimens were submitted, states that *L. sericata* is the chief fly which produces the maggots on the backs and hind quarters of sheep in Great Britain, as MacDougall has shown. Such a case of myiasis occurring in cattle, however, is very unusual.

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

A NEW SARCOPHAGID SCAVENGER FROM MONTANA.*

BY RALPH R. PARKER, M.S., AMHERST, MASS.

***Sarcophaga cooleyi*, n. sp.**

Plate XXVI; figures 1, 2, 3 and 4.

Type, ♂ and ♀: Massachusetts Agricultural College.

Paratypes, ♂ and ♀: Massachusetts Agricultural College, four; United States National Museum, four; Montana Agricultural Experiment Station, six; collection of Dr. J. M. Aldrich, two; collection of writer, eight.

This species is rendered especially easy to separate from other North America members of the genus by the lack of marginal bristles on the third abdominal segment. *S. kellyi*, a much smaller species recently described by Prof. J. M. Aldrich (Journal of Agricultural Research, vol. 2, No. 6, Sept. 1914, pp. 443-445) is the only other native species with which the writer is acquainted that also lacks these bristles. The two species are at once differentiated by the presence of presutural acrostichal bristles and three rows of black cilia behind the eyes in *S. kellyi* Ald., while *S. cooleyi* lacks these bristles and has but two rows of cilia. Of the males *S. kellyi* has a grayish pollinose first genital segment, tinged with the reflecting colours of the abdomen, but the corresponding segment of *S. cooleyi* is dull orange, at most slightly grayish pollinose anteriorly. The female of *kellyi* has three sternopleurals, that of *cooleyi* four.

Length: 7 to 13 mm.; average 10 to 12 mm.

Male Head:—Viewed from side parafrontals and genæ with dark reflections. Breadth of front at narrowest part about three-fifths eye width; cheek height approximately one-half that of eyes. Front prominent, upper inner orbits of eyes converging downward; sides of frontal vitta not drawn in at base and usually converging backward by slight curves. Second antennal segment dark, its tip sometimes slightly brownish; third segment two and one-half times length of second; arista plumose on basal one-half to two-thirds. Back of head somewhat convex, with two rows of black cilia behind eyes, otherwise clothed with whitish, silvery white, or sometimes faintly yellowish hair. Cheeks clothed with black

*Contribution from the Entomological Laboratory of the Massachusetts Agricultural College.
December, 1914

hair. That half of genæ nearest eye-orbits with scattered hairs arranged in two or three irregular rows, a few stouter ones just above transverse impression. Palpi dark.

Chatotaxy.—Lateral verticals absent; vibrissæ inserted just above line of oral margin.

Thorax.—Vestiture of metanotum consisting of short, slightly reclinate, bristly hairs. Sutural ridge with a few scattered hairs behind last notopleural bristle. Hairs covering anterior spiracle mostly yellowish gray, but their bases dark forming an irregular band; those on anterior margin of posterior spiracle dark brown; spiracular cover pale yellowish. Epaulets dark.

Wings.—Bend of fourth vein normally a little less than a right angle; anterior cross-vein much more basal than end of first longitudinal; third vein bristly; costal spine vestigial; section V of costa about one half length of section 3; alulae fringed with hair; calyptre whitish, outwardly fringed with white hair.

Legs.—Dark. Posterior trochanter hairy, without a distinct "brush"; in profile a slender spine can often be seen distally on the ventral surface but is usually obscured by hair and may be absent; femur sub-spindle shaped, sometimes very slightly arched, clothed beneath with long, fine hairs that both anteriorly and posteriorly form a sort of beard, anterior face with three rows of bristles, those of the intermediate row short and stout, not present distally; tibia usually slightly curved, anterior and posterior faces each with a beard of equally dense, long, coarse, black hairs on distal four-fifths; tarsus shorter than tibia, the fourth segment longer than one-half-fifth. Middle coxa with a single row of bristles; femur clothed beneath on proximal one-half to two-thirds with a beard-like growth of long, fine hairs, anterior ventral row of short, scattered bristles complete, posterior row represented only by a distal comb extending proximally to the long hair. Anterior coxa with two rows of bristles.

Chatotaxy.—Anterior dorsocentrals strongly reclinate, but projecting well above short vestiture of prescutum; acrostichals absent, though most posterior pair is rarely weakly developed; inner presuturals absent, or if present inconspicuous; four or five pairs of postsutural dorsocentrals, two posterior pairs that are long

and two or three anterior that are short and weak; prescutellar acrostichals present; scutellar apicals present; three sternopleurals: lower sternopleurals consisting of a single row of strong bristles and numerous other irregularly placed bristles anterior to it.

Abdomen.—Somewhat conical, clothed above with short decumbent bristles, beneath with short almost erect hair. Ventral plates, as a whole, with their sides converging posteriorly, the first bearing long erect hairs, vestiture of second and third short and decumbent except at sides and posterior margin, first usually trapezoidal, its sides slightly converging posteriorly. Fourth plate prominent, in profile its base with a large somewhat conical elevation posteriorly, posterior inner edges of lamellæ bent inward and each with a “brush” of very densely set, short, stout, blunt spines on proximal half.

Chaetotaxy.—Second and third segments without marginal bristles, fourth with a complete row ending ventrally at forward turn of margin.

Genital Segments.—Prominent, dull orange. First, usually concealed to just beyond “humps”; in profile slightly convex; faintly yellowish pollinose dorsally, anterior portion including “humps” sometimes slightly darkened, rarely the entire segment; clothed with short hair, “humps” bare; marginal bristles present, three to five on each side of centre; second, rotund, not flattened; vestiture longer than that of first; anal area of medium size, extending upward at least to centre of posterior surface. Forceps darkened, inner edges of prongs approximated to about the middle then slightly separated; tips blackish, bent forward and slightly spread apart; clothed with short hair nearly to prong tips, longest at sides; base with upward flap-like extensions.

Genitalia.—Head of penis large, distinctly marked off from base on posterior surface by a narrow band of membrane. Accessory plates hairy.

(♀) Females differ from males in the following important points:

Head.—Breadth of front at narrowest part slightly greater than eye width. Inner orbits of eye on upper part of front diverging downward.

Chaetotaxy.—Lateral verticals and two orbital bristles present.

Thorax.—Sutural ridge bare.

Wings.—Angle formed by bend of fourth vein slightly more acute than in male.

Legs.—Vestiture throughout of short hair. Spine of posterior trochanter distinct, anterior face of femur with but two rows of bristles, an upper and lower, a few bristles proximally and posteriorly on ventral face. Middle femur with "comb".

Chaetotaxy.—Scutellar apicals absent; four sternopleurals; lower sternopleurals fewer and anterior ones more distinctly bristly.

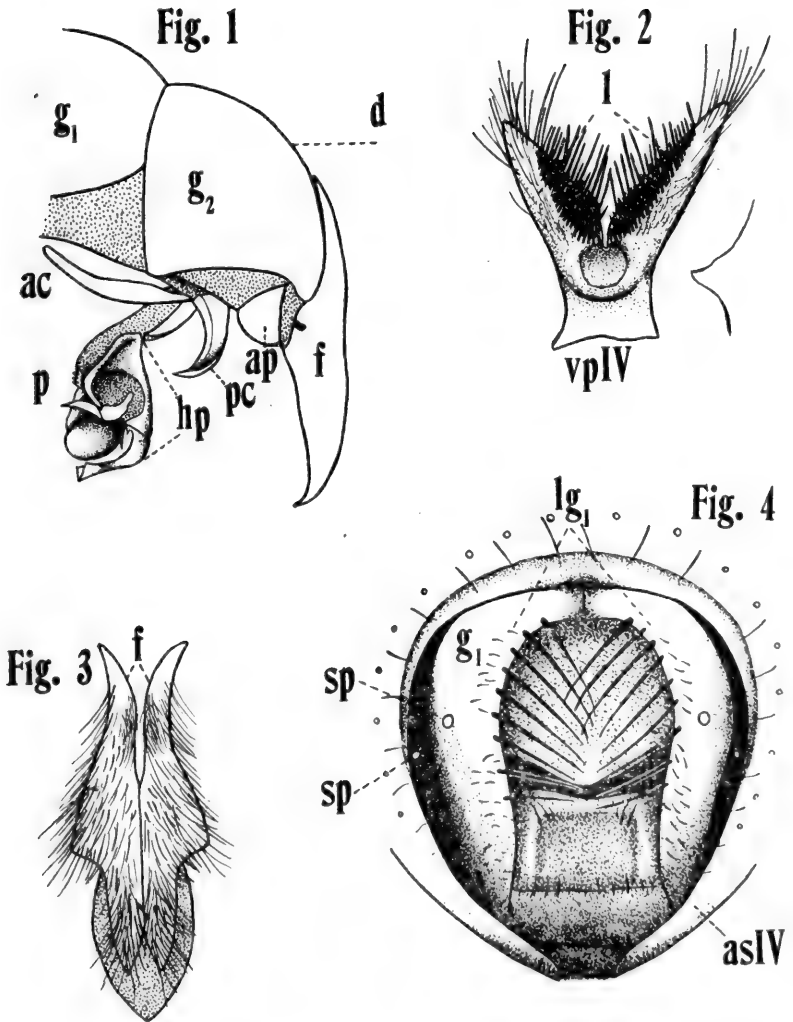
Abdomen.—Oval; vestiture throughout of short reclinate bristles. Posterior margins of ventral plates each with a row of bristles.

Genital Segments.—Protuberant. First segment consisting of two lateral lips that converge dorsally meeting in a slight depression and ventrally are separated by fifth ventral plate which they sometimes overlap, on dorsal half their edges with a row of close set, strong bristles that converge backward and downward, tips of uppermost usually crossing, each bears short hairs just in front of posterior edge, spiracles slightly above centre. Spiracles of fifth segment plainly visible.

Described from 13 ♂ and 13 ♀ specimens. About 500 examined.

Range.—Collected at Laurel and in the Bridger Mountains, Montana.

The colour of the parafrontals and genæ is usually faintly aurichalceous, sometimes silvery gray, the deeper reflections when viewed from the side vary from brown to deep gray. In a single male specimen the lateral vertical bristles were weakly developed. The abdomen of ♂ often appears more oval than conical, but the latter is more typical. Ordinarily the vestiture of the second ventral plate is decumbent like that of the third, but occasionally may be a little more erect. As seen when the abdominal segments are in their normal position the sides of the second and third ventral plates appear almost straight, but when the segments are separated, as so often happens when the genital segments are being pulled forth and fixed in position, these two plates are fully exposed; they then appear subcircular. The membranous area at



SARCOPHAGA COOLEYI, N. SP.

the base of the lamellæ of the fourth ventral plate is very prominent forming the posterior face of the somewhat conically raised extremity of the base. The "brushes" of the lamellæ are prominent even when the genital segments are in their normal position, and may be seen filling in the space between the forceps and the ventral portion of the fourth notum. The marginal bristles of the third abdominal segment which are present in most species of *Sarcophaga*, are lacking, though sometimes a few, short, decumbent bristles may be discerned. If the penis is examined a weakly chitinized projecting process is seen extending upwards from the dorsal, distal portion. This bends abruptly forward and divides in to a Y. When specimens are fresh, a profile view shows this process raised above the penis head, but when dry it is often applied to it. The four sternopleurals of the female are distinctive.

S. cooleyi is very closely related to an undescribed species, the same mentioned by Dr. Felt in his annual report for 1912 (New York State Museum Bulletin 165, pp. 80-82), under the name of *S. georgina* Weid., a synonym of *S. hæmorrhoidalis* Meig. This undescribed species has a wide distribution throughout the United States.

While engaged on investigation for the Montana State Board of Entomology during the past summer, the writer bred this species extensively from decomposing fish. It was also captured in privies and was common around garbage, especially if the latter contained fish. In one experiment, in which two hundred larvæ were used to determine the length of the larval stages, not a single adult emerged but numerous chalcid parasites were raised from the pupæ.

EXPLANATION OF PLATE XXVI.

(All drawings made with camera lucida).

Fig. 1. Side view of genital segments of male showing penis forceps, anterior and posterior claspers accessory plate.

Fig. 2. Ventral view of fourth ventral plate and profile view to show elevation at posterior extremity of base.

Fig. 3. Posterior view of forceps.

Fig. 4. Genital segments of female (made from a specimen with genital segments partly expanded).

- ac. Anterior claspers.
 ap. Accessory plate.
 as IV. }
 as V. } Fourth and fifth abdominal segments.
 bvp. IV. 'Brush' of fourth ventral plate.
 d. Dorsal limit of anal area.
 f. Forceps.
 fpg. Forceps prong.
 g. 1. First genital segment.
 g. 2. Second genital segment.
 hp. Head of penis.
 1. Lamellæ of fourth ventral plate.
 lg. 1. Lips of first genital segment (♀).
 p. Penis.
 pc. Posterior claspers.
 sp. Spiracle.
 vp. IV. Fourth ventral plate.

A NEW ELACHISTID MOTH FROM MANITOBA.*

BY ARTHUR GIBSON,

Chief Assistant Entomologist, Department of Agriculture, Ottawa.

Among some micros collected at Aweme, Man., by Mr. Norman Criddle, Field Officer of the Dominion Entomological Service, are two specimens of a species of *Heliodines*, of the family Elachistidæ, which is undescribed. The specimens were reared by Mr. Criddle from larvæ found feeding on *Oxybaphus nyctagineus*, a widely occurring representative of the *Nyctaginaceæ* in Canada. I therefore propose the name:

Heliodines nyctaginella, sp. nov.

Antennæ dark metallic grayish-purple. Palpi pale yellow, tipped with black. Face, head and thorax blackish, shining; thorax with greenish reflections. Fore-wings bright golden-orange, with nine metallic bluish-gray, more or less elongate, spots, six costal and three dorsal, all edged with black basally. Base of costa and margin of dorsum to first dorsal spot black. Space

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

between first and second costal spots mostly black, particularly at costa and not so wide as space between third, fourth, fifth and sixth spots, which are equidistant. The first dorsal spot is opposite the space between the second and third costal spots, the second dorsal between the third and fourth costal spots and the third dorsal between the fourth and fifth costal spots; apex from last costal spot and edge of dorsum to last dorsal spot black. In this margin of black there is a conspicuous band of metallic blue-gray scales. Cilia brown. Hind wings bronzy-brownish; cilia brown. Abdomen and legs blackish with bronzy-green reflections.

Alar expanse 10 mm.

Habitat:—Aweme, Man., July, 1913 (Norman Criddle). Type deposited in collection of Entomological Branch, Department of Agriculture, Ottawa; paratype deposited in U.S. National Museum, Washington.

As to the placing of the species in the genus *Heliodines*, Mr. Busck, who kindly examined the specimens, states that "the species may be described as *Heliodines*, though differing from the type of this genus *H. roesella* Linn., of Europe, in having the apical veins in forewings separate, not stalked. In this character the species agrees with the closely allied genera *Lamprolophus* Busck, and *Embola* Walsm., but both of these have pectinated posterior tibiae and this character has probably more weight in this group than the slight difference in the venation."

H. nyctaginella has smooth tibiae like *H. roesella*. It comes nearest to *H. albaciliella* Busck, being nearly identical in markings but much smaller and without the white cilia in the hind wings.

During the past season Mr. Criddle sent me larvæ of *H. nyctaginella*, from which the following note was made:

Mature Larva—Length 6 mm., dull green, darker dorsally. Thoracic shield black, pale stripe in centre. Anal shield blackish. Tubercles blackish each in a pale circle; single-haired; setæ dark. Feet pale. Head pale brown, marked outwardly with black.

The first moth emerged July 17, and others up till July 24. These specimens have been compared with the type and no apparent variation occurs.

THREE NEW SPECIES OF TRYPETIDÆ FROM COLORADO.*

BY F. L. THOMAS, AMHERST, MASS.

While working upon the Trypetidæ of New England, I had the opportunity of examining much western material. In that loaned by Mr. Charles W. Johnson, Curator of the Boston Society of Natural History, there were three specimens from Colorado, which are described below as new species. The types are located in Mr. Johnson's private collections.

Eutreta simplex, n. sp.

Type—One female from Colorado.

Brown; face without black spots. Wings broad, reticulate, with a white crescent seaming the tip. Scutellum with four bristles. Posterior basal cross-vein obtusely angled; small cross-vein two-thirds along the discal cell; third vein with bristles on the under surface of the wing. Length ♀ 6.5 mm., wing 5 mm.

Head—Front pale brown, slightly tapering, and about one-third the width of the head. Three lower frontals; the second pair of upper frontals, the

post-vertical and outer vertical bristles white; cilia of the posterior orbit consisting of coarse white and fine black bristles. Epicephalon (that portion above the neck) yellow and dark brown, the remainder of the cephalon lighter brown. Eyes large, oval, with no traces of any transverse stripes. Cheeks narrow with brown bristles. Oral margin projecting and slightly arcuate. Face pale yellow without black spots, hollowed. Antennæ yellowish brown, reaching nearly to the oral margin; third segment with distinct but not a sharp anterior corner; second segment with a distinct pale spine. Arista with black bristle and brown base.

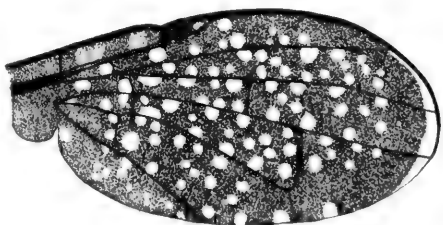


Fig. 33—*Eutreta simplex*, wing.

remains of the cephalon lighter brown. Eyes large, oval, with no traces of any transverse stripes. Cheeks narrow with brown bristles. Oral margin projecting and slightly arcuate. Face pale yellow without black spots, hollowed. Antennæ yellowish brown, reaching nearly to the oral margin; third segment with distinct but not a sharp anterior corner; second segment with a distinct pale spine. Arista with black bristle and brown base.

Thorax—Brown; blackish on the notum, metanotum, and sternopleuræ. Short hair whitish; bristles dark brown. First pair

*Contribution from the Entomological Laboratory of the Massachusetts Agricultural College.

of dorso-central bristles close to the transverse suture. Scutellum bearing four bristles, the apical pair being weaker. Halteres yellow.

Abdomen—Brown, becoming darker toward the posterior; the anterior lateral portions are yellowish. Short hair whitish. Macrochætæ black and prominent; Genital segment broad, flat, and yellowish, with a short dark brown stripe on the middle of the base; as long as the last two abdominal segments taken together.

Legs—Yellowish brown with a dark stripe on the under side of each of the hind femora. Fore femora not thickened. Hind tibiae with short strong bristles. Bristles black.

Wings—Broad, reticulate with a white crescent seaming the tip from the second vein to near the middle of the second posterior cell. The reticulation is made up of nearly uniform hyaline dots rather evenly scattered, but wanting in that part of the grayish-brown color which adjoins the white crescent. Stigma darker with two small light coloured spots, the one in the apex being larger and more noticeable. Second vein with a slight convexity above the small crossvein.

Hab—Sunset, Colo., July 13, 1913; collected by Van Duzee at an altitude of 8,000 feet.

This specimen closely resembles *Eutreta sparsa*, but differs principally in not possessing black spots on the face, in having larger hyaline spots on the wing with a light coloured spot in the stigma and without a small clear stripe at the tip of the first longitudinal vein.

***Acidia johnsoni*, n. sp.**

Type—One female from Colorado.

Head pale yellow; thorax and legs yellowish gray; abdomen black with posterior borders of the segments yellow. Wings banded with dark brown; the spaces whitish hyaline. Scutellum with two bristles. Posterior basal cross-vein obtusely angled. Small cross-vein slightly beyond the middle

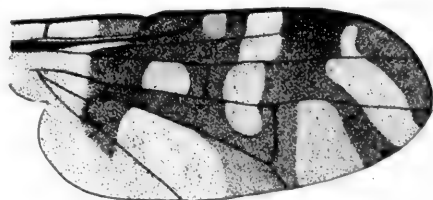


Fig. 34—*Acidia johnsoni*. wing.

of the discal cell. Third vein without bristles. Length, ♀ 5 mm.; wing 4 mm.

Head—Front tapering, but more than one-third the width of the head. Two weak lower frontals; all bristles and hair of the insect are pale yellow or white. Cheeks rather broad. Oral margin slightly projecting and strongly arcuate. Face whitish with shallow antennal grooves. Antennæ missing.

Thorax—Gray; bristles and short hair yellowish. First pair of dorso-central bristles about one-fourth from the transverse suture to the scutellum. The latter is flat and bears two bristles. Metanotum shining black. Halteres yellow.

Abdomen—Black, the posterior borders of the separate segments yellow. On the median line of the last abdominal segment the yellow colour approaches half way to the base. Macrochætæ white and short. Genital segment shining black, heavy conical, constricted, as long as the last two abdominal segments taken together.

Legs—Coxæ yellowish gray; femora gray, yellowish at the tips; tibiæ and tarsi yellow. Hind tibia without a distinct row of short strong bristles.

Wings—Distal portion of wings with two whitish hyaline indentations, separated by a dark oblique cross-band, which is emitted from another dark brown band crossing the wing and covering the posterior cross-vein. The apex of the wing is bordered to a little beyond the fourth vein by a dark band, which is narrowly connected anteriorly with the band crossing the wing. The band crossing the wing is connected along the fifth vein with the dark area in the proximal half of the wing. This area extends from the costa posteriorly to the fifth vein and across the base of the third posterior cell, and contains two whitish hyaline spaces. One is in the marginal cell just beyond the tip of the first longitudinal vein; the second is in the first basal cell below the stigma. The base of the wing is whitish hyaline. In the figure the whitish hyaline spaces are too dark.

The generic location of this species is doubtful.

Urellia apicata, n. sp.

Type—Female from Colorado.

Brown; wings hyaline with radiating picture in the apex, stigma coloured. Scutellum with four bristles. Posterior basal cross-vein right angled; small cross-vein two-thirds along the discal cell; third vein with bristles. Length ♀ 6.5 mm., wing 6 mm.

Head—Front yellowish brown, of uniform width and one-third as wide as the head. Lower frontals varying in size and number,

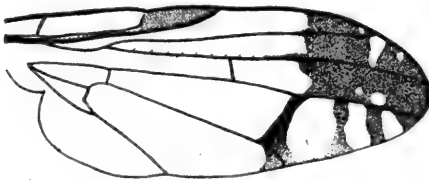


Fig. 35—*Eurellia apicata*, wing.

four on one side and five on the other; all bristles brown and more or less pale, cilia of posterior orbit also pale. Cephalon brown. Cheeks rather broad. Oral opening large, margin not projecting. Face retreating, slightly hollowed and clay-

yellow. Antennæ short, reaching two-thirds to the arcuate oral margin, third segment with rounded anterior corner; second segment with minute spine; arista brown.

Thorax—Brown; bristles brown, short hair yellowish. First pair of dorso-central bristles one-third from the transverse suture to the scutellum. The latter flat and bearing four bristles, the middle pair being a little the shorter. Halteres brown.

Abdomen—Dark brown, shining; short hair, dark brown. Macrochaetæ prominent, brown. Genital segment of the female broad, flat, and brown tipped with black; as long as the last two abdominal segments taken together.

Legs—Light brown with bristles of the same colour. Hind tibia with row of short strong bristles, fore-femora strongly armed as usual.

Wings—Hyaline with the fuscous area in the apex beyond the hind crossvein and above the fourth vein; stigma fuscous. Running posteriorly from the black spot are three rays, two crossing the second posterior cell and one covering the hind cross-vein. The dark area contains two large and three small hyaline spots; a large one just beyond the tip of the second vein

and reaching to the third vein, with a small spot each side on the costal margin; the other large spot is directly below in the first posterior cell on the fourth vein with a small spot on the proximal side.

Hab.—Colorado.

This specimen which has the characteristic wing picture of the genus *Urellia*, differs considerably in structure from other members of that genus which have been examined. Among the constant characters for species having four or two bristles on the scutellum are the following: three lower frontal bristles, narrow cheeks, first pair of dorso-central bristles close to transverse suture, macrochaetae weak, hind tibia without a row of short strong bristles, posterior basal cross-vein obtusely angled, small cross-vein three-fourths along the discal cell, and the third vein bare. The structure of *Urellia apicata* differs from these characters as follows: four or five lower frontal bristles, broad cheeks, first pair of dorso-central bristles one-third from the transverse suture to the scutellum, macrochaetae prominent, hind tibia with a row of short strong bristles, posterior basal cross-vein right angled, small cross-vein only two-thirds along the discal cell, and the third vein with bristles.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Fifty-first Annual Meeting of the Entomological Society of Ontario was held at the Royal Canadian Institute, Toronto, on Thursday and Friday, November 5 and 6, 1914—Dr. C. Gordon Hewitt, President of the Society, occupying the chair throughout the sessions.

Among the members present were Prof. J. H. Comstock, Cornell University, Ithaca, N. Y.; Rev. T. W. Fyles, Ottawa; Dr. C. G. Hewitt, and Messrs. A. Gibson and J. M. Swaine, Entomological Branch, Ottawa; Messrs. N. Criddle, W. A. Ross, E. H. Strickland and H. F. Hudson, Field Officers of the Branch; Rev. Prof. C. J. S. Bethune, Prof. L. Caesar and Mr. A. W. Baker, O. A. College, Guelph; Prof. W. Lochhead, Macdonald College, Que.; Prof. J. Dearness, London; Dr. A. Cosens, Prof. E. M. Walker and Messrs. J. B. Williams, A. Smith, C. Snazelle, E. H.

Craigie, Geo. Duff and S. Logier, Toronto; Mr. F. J. A. Morris, Peterborough; Mr. J. Evans, Trenton; Prof. W. H. Brittain, Truro, N. S.; and Mr. Vernon King, Charleston, Mo.

Among the visitors were Prof. C. R. Crosby, Cornell University, Ithaca, N. Y.; Mr. J. C. Chapais, St. Denis-en-bas, Que.; Rev. Father Leopold, La Trappe, Que., and Messrs. A. B. Baird and S. H. Hord, O. A. College, Guelph.

On Thursday morning a meeting of the Council was held in the University Biological Building, at which the report of the proceedings during the past year was drawn up, and several matters relative to the welfare of the society were discussed. A suggestion that the next Annual Meeting be held at Ottawa was afterwards put before the General Meeting of the Society and adopted.

The regular proceedings commenced at 2 p.m. in the Lecture Room of the Royal Canadian Institute, and the interest felt by those present in the varied programme was shown by the lengthy discussions which followed many of the papers. The first order of business was the reading of the Reports of the Directors on the insects of the year. Reports were presented by Mr. A. Gibson, Ottawa; Mr. C. E. Grant, Orillia; Dr. A. Cosens, Toronto; Mr. F. J. A. Morris, Peterborough, and Mr. W. A. Ross, Jordan Harbour. These Reports contained an unusual number of interesting observations. Dr. Hewitt, the President, then read the Annual Address, which was a very able and complete account of the rise and progress of Applied Entomology in Canada, and will form a most valuable contribution to our literature of the history of Canadian Entomology. Appreciative remarks upon this address were made by Dr. Bethune and Dr. Fyles, after which a valuable Paper on the Insects of the Season in Ontario was presented by Prof. Caesar. Considerable discussion followed this paper, particularly on the work of the Tarnished Plant Bug and other capsids in orchards and nursery stock and the methods for their control.

On Thursday evening a Public Meeting was held in the Lecture Hall of the University Biological Building, and was well attended, many members of the University staff and that of the

various Collegiate Institutes and of the Royal Canadian Institute having been noticed in the audience.

The President, Dr. Hewitt, introduced the lecturer, Prof. J. H. Comstock, of Cornell University, who gave a most interesting and stimulating address on the "Habits of Spiders," a subject upon which there is probably no one more competent to speak. The lantern illustrations, made from Prof. Comstock's own photographs, were extraordinarily fine examples of insect photography. A vote of thanks, proposed by Prof. Lochhead and seconded by Prof. Dearnness, was extended to Prof. Comstock for his instructive and entertaining address. After the lecture an informal gathering took place, at which refreshments were served and a pleasant chat enjoyed by the members and visitors.

On Friday morning the meeting was resumed and continued until late in the afternoon. The Reports of the Council and of the various Officers and Branches of the Society were read and adopted. No Report of the Delegate to the Royal Society was received, owing to the unfortunate death of Mr. Henry H. Lyman, who had been appointed in that capacity. The election of Officers, which then followed, resulted in the re-election of all the officers of the past year, with the exception of the Delegate to the Royal Society, for which Prof. Lochhead was chosen. Two new members were elected—Mr. J. C. Chapais, St. Denis-en-bas, Que., and Rev. Father Leopold, La Trappe, Que.

The following papers were read: "Injurious Insects of Quebec in 1914" and "The Work of Henri Fabre," by Prof. W. Lochhead; "The Outbreak of the Army Worm in Canada in 1914," by Mr. A. Gibson; "The Army Worm in Ontario," by Mr. A. W. Baker; "Variation in Colour of the Bristles of the Hedgehog Caterpillar," *Isia isabella*, by Mr. Gibson; "Mountains and Hills," by the Rev. Dr. Fyles; "Forest and Shade Insects of the Farm," by Mr. J. M. Swaine; "An Imported Red Spider attacking Fruit Trees," and "Cherry Fruit Flies," by Prof. L. Caesar, and "Locust Control in Eastern Canada." by Mr. Gibson.

Special mention should be made of the great pleasure felt by everyone present in listening to Dr. Fyles' charming paper, which

was read by the venerable author himself in his delightful and inimitable style.

The following is a list of the officers of the Society for the ensuing year:—

PRESIDENT—C. Gordon Hewitt, D.Sc., F.R.S.C., Dominion Entomologist, Entomological Branch, Ottawa.

VICE-PRESIDENT—Mr. A. F. Winn, Westmount, Que.

SECRETARY TREASURER—Mr. A. W. Baker, B.S.A., Lecturer in Entomology, O. A. College, Guelph.

CURATOR—Mr. G. J. Spencer, B. A., O. A. College, Guelph.

LIBRARIAN—Rev. Prof. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College, Guelph.

DIRECTORS—Division No. 1: Mr. Arthur Gibson, Entomological Branch, Ottawa. Division No. 2: Mr. C. E. Grant, Orillia. Division No. 3: Dr. A. Cosens, M.A., Ph.D., Parkdale Collegiate Institute, Toronto. Division No. 4: Mr. C. W. Nash, Provincial Biologist, East Toronto. Division No. 5: Mr. F. J. A. Morris, Peterborough. Division No. 6: Mr. R. S. Hamilton, Collegiate Institute, Galt. Division No. 7: Mr. W. A. Ross, Jordan Harbour.

DELEGATE TO THE ROYAL SOCIETY OF CANADA—Prof. Wm. Lochhead, Professor of Biology, Macdonald College, Que.

AUDITORS—Prof. J. E. Howitt, M.S.A., and Prof. L. Caesar, B.A., M.S.A., O. A. College, Guelph.

CHANGE OF ADDRESS.

Mr. E. P. Van Duzee wishes to call the attention of his correspondents to his recent change of address to "Department of Agriculture, University of California, Berkeley, California."

THE WAVY STRIPED FLEA-BEETLE

(Phyllotreta sinuata Steph.)

BY E. MELVILLE DUPORTE, MACDONALD COLLEGE, QUE.

The fact that this insect has not before been reported as a pest in Canada serves as an excuse for the publication of a short note concerning it.

Phyllotreta sinuata is an introduced species and is generally distributed throughout England and the continent of Europe. Horn in 1889 describes it as occurring in America from the New England States to Georgia and westward to Missouri. Sanderson states that in the Middle States the larvæ mine in the leaves of wild pepper grass (*Lepidium virginicum*) and Professor Blatchley informs me that it is a very common species throughout Indiana.

My attention was first drawn to the insect in June, 1913, when the larvæ were observed mining in the leaves of cress and feeding on the foliage of radish. The adults were obtained by rearing these larvæ and were also collected in the field. The cress was practically destroyed by the beetle and its larvæ.

The insect is again present at Macdonald College this season feeding on radish, turnips and cabbage. It is often associated with the turnip flea-beetle (*Phyllotreta vittata* Fab.) and it is probably owing to its close resemblance to this species that it has escaped detection, for recently, in examining a collection of *P. vittata* which was made in 1912, I found several specimens of *P. sinuata* which I had not noticed at the time they were collected.

The larva of *P. sinuata* is a small cruciform grub, about 4 mm. long. The head and pronotum are dark brown, the latter being crossed by a light-coloured median line. The second and third thoracic segments as well as the first eight abdominal segments bear several brown setigerous tubercles of various sizes. The last abdominal segment is deep brown or black and fringed

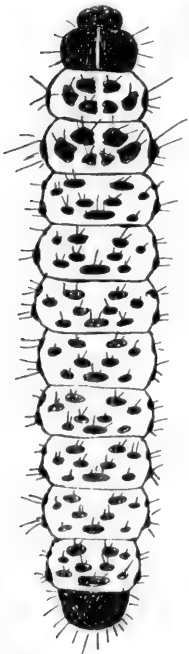


Fig. 36.—*Phyllotreta sinuata* Steph., larva.

with lighter coloured setæ. The general colour is green, owing to the chlorophyll of the leaf on which it feeds.

The pupa is yellow and is found in a small cell in the soil around the affected plants.

The adult is an elongate oval beetle, piceous. Elytron with narrow yellow sinuate vitta. Head punctulate, thorax and elytron punctate. Antennæ not quite half as long as body, joint 4 in the male equal in length but much wider than joint 2 or 3, joint 5 longer than the preceding two and much dilated. Except for the broad post-humeral branch, the vitta is almost uniform in width throughout; the distal portion is usually very slightly wider than the middle portion, but quite often the width is practically uniform throughout; the proximal portion of the vitta does not bend towards the suture, but is almost parallel to it.

Length 2.5 mm.

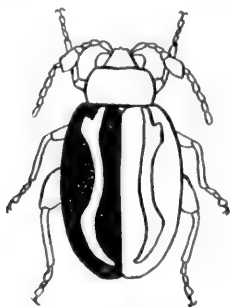


Fig. 37—*Phyllotreta sinuata*
Steph., male.

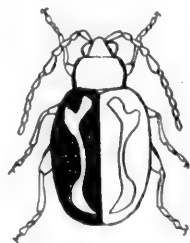


Fig. 38—*Phyllotreta vittata*
Fab., male.

The following are the chief points of difference between *P. sinuata* and *P. vittata*.

1. *P. sinuata* is larger, measuring 2.5 mm., while *P. vittata* is 2.0 mm. long.
2. In *sinuata* the length of the antennæ is quite equal to half that of the body, but in *vittata* it is somewhat greater.
3. The fifth antennal joint of the male in *sinuata* is very much broader than the preceding joint and slightly longer than the combined length of joints 3 and 4, while in *vittata* the corres-

ponding joint is but slightly broader than the preceding ones and not as long as joints 3 and 4.

4. In *sinuata* the basal portion of the vitta is nearly parallel to the suture, and the middle portion very little or not at all narrower than the distal, while in *vittata* the basal portion bends towards the suture and the middle portion is decidedly narrower than the distal.

5. In *sinuata* the prothorax is twice as wide as it is long, while in *vittata* its width is only about one-third greater than its length.

A SPECIES OF MEGASTIGMUS REARED FROM LARCH SEEDS.*

BY S. MARCOVITCH, ITHACA, N. Y.

On September 10, 1913, the seeds of the larch trees, *Larix laricina* Du Roi, around the Cornell insectary, Ithaca, N. Y., were found to be infested by a white larva. The seeds were kept indoors during the winter, and on April 2, 1914, the first adults of a species of *Megastigmus* emerged. The larva completely devours the kernel, and fills the entire seed making it difficult to open one without injuring the larva. Examined on July 17, the larvae were nearly two-thirds grown. That it feeds on the kernel as do all of the known American forms of this genus is quite conclusive, since only one kind of larva was found in the seeds. This species is apparently undescribed.

***Megastigmus laricis*, n. sp.**

Female.—Length 2.1 mm.; abdomen 1 mm.; ovipositor 1.6 mm. General colour black; face, front nearly to base of the antennae yellowish; occiput, antennal grooves, and vertex, black; posterior eye-margin and cheeks, dark brown. Prothorax black, and finely rugulose. Anterior portion of mesonotum smooth, posterior part with fine transversely curved striae. Scutellum finely rugulose. Propodeum finely reticulate-punctate with a medium longitudinal carina, which is broken in the middle. Antennae brown, scape yellowish. Anterior coxae yellow; middle coxae brownish yellow; posterior coxae black; rest of legs brownish yellow, except femora,

*Contribution from the Entomological Laboratory of Cornell University.
December, 1914

which are brownish black, but lighter at the tip. Wings hyaline. Abdomen shining black, sometimes with three indistinct yellow spots on the sides. Ovipositor brownish black.

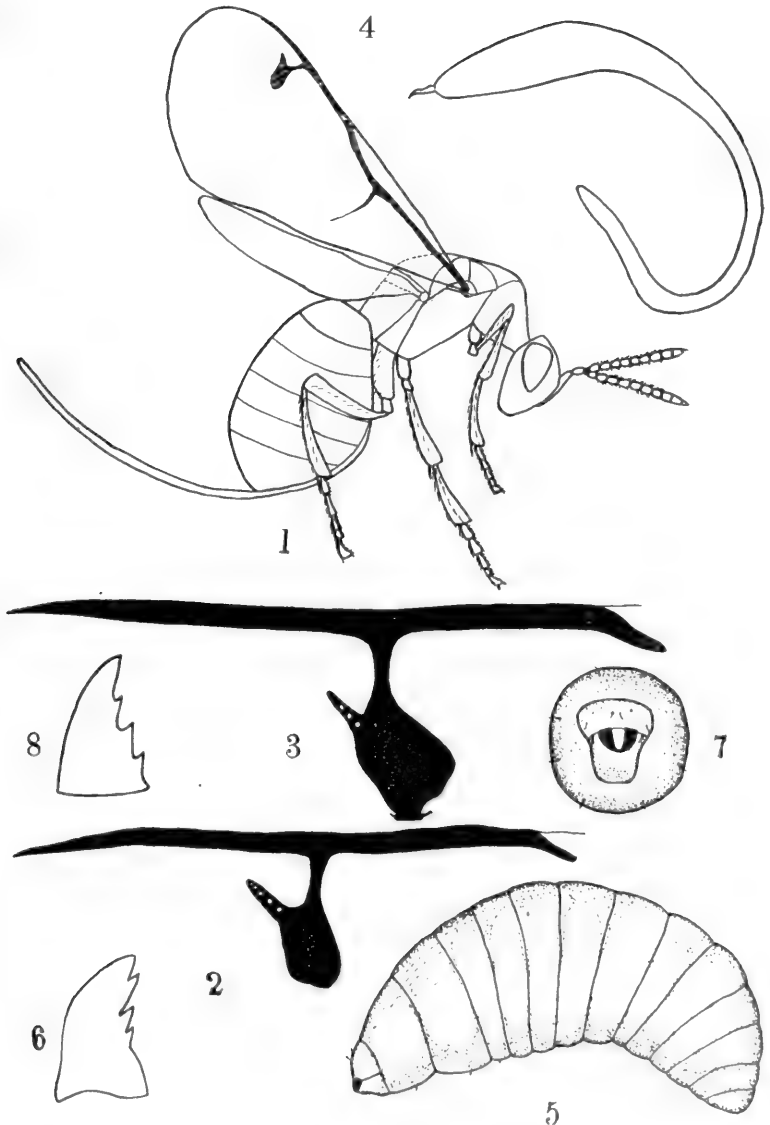
Male.—Length 2.5 mm.; abdomen 1 mm. Vertex and occiput black; face, cheeks and upper portion of front, yellow; portion bordering the upper posterior angle of the eye brownish. Whole dorsal aspect of thorax black. The brownish spot on the sides of the prothorax somewhat rectangular, and more distinct than in the female. Antennæ brownish, scape yellow. Front coxæ yellow; middle coxæ brownish, black towards base; hind coxæ black. Legs yellowish. Stigmal club somewhat truncate behind. Propodeum finely reticulate-punctate with an indistinct longitudinal median carina. Abdomen brownish black, lighter beneath.

Larva.—Length 2.1 mm.; width 9 mm. Colour dull white, middle segments a little darker. The mandibles are brownish, and armed with four teeth (Fig. 6). Supporting the mandibles is a thick fleshy labium, thicker on the caudal end. The larva is sparsely clothed with short setæ.

Egg.—The egg as obtained by dissection of the female is white, smooth, and spindle-shaped, with a long pedicel at one end, and a vestige of one at the opposite end. Length of body of egg .22 mm.; tail-like process .44 mm.; vestige .031 mm.

Described from 15 females and 12 males, Ithaca, N. Y., July 17, 1914. Types deposited in the Cornell University collection.

Specimens were compared with *Megastigmus atedius* Walker in the Oxford Museum by C. O. Waterhouse. The latter is 4 mm. long; the striæ of the thorax are coarser, and the stigmal club is nearly circular. Specimens were also compared with *Megastigmus japonicus* and *Megastigmus koebelei* Ashmead, by J. C. Crawford in the U. S. National Museum. *M. japonicus* is entirely yellow. The striæ of the mesonotum are coarser and straight. They are much more strongly elevated than in *laricis*, and continue across the parapsoidal areas. *M. koebelei* has the dorsum of the thorax green, with the transverse striæ much coarser. The parapsoidal furrows are indistinct, and the apical part of the scutellum has a finer sculpture than the basal part.



MEGASTIGMUS LARICIS, N. SP.

According to Crosby's table of the North American species of *Megastigmus* (Ann. Ent. Soc. Am., VI, p. 156, 1913) this species runs down to *M. lasiocarpi* Crosby. I have rearranged his table to include the present species as follows.

TABLE OF SPECIES (FEMALES).

1. Ovipositor not longer than abdomen.....	2
Ovipositor longer than abdomen.....	3
2. Stigmal club oval	<i>brevicaudis</i>
Stigmal club elongate	<i>physocarpus</i>
3. Front wings marked with a brownish spot adjoining the hind margin of the submarginal vein.....	<i>albifrons</i>
Front wings not so marked.....	4
4. Stigma surrounded by a clouded area.....	<i>nigrovariegatus</i>
Stigma not surrounded by a clouded area.....	5
5. Mesonotum black, with an oblong reddish orange area covering the posterior half of the middle lobe, the inner angles of the scapulæ and axillæ and all of the scutellum.....	<i>pinus</i>
Not so marked.....	6
6. Black species.....	7
Yellow species.....	9
7. Pronotum with two yellow spots.....	<i>tsugæ</i>
Pronotum black without yellow spots.....	8
8. An elongate yellow spot on each side of the prothorax; length 3.7 mm.	<i>lasiocarpus</i>
Sides of prothorax black; length 2 mm.....	<i>laricus</i>
9. Axillæ yellow; stigmal vein as long as the club is wide	<i>spermatrophus</i>
Axillæ black except inner angle; stigmal vein shorter than width of the club.....	<i>aculeatus</i>

In the fall of 1913 I also found the larva of *Megastigmus physocarpus* Crosby in the seeds of *Physocarpus opulifolius* at Ithaca, N. Y. It is similar in form to the larva of *M. laricus*, and measures 1.9 mm. long by 8 mm. wide. The mandibles have four teeth (Fig. 8).

EXPLANATION OF PLATE XXVII.

1, *M. laricus*, female; 2, stigmal club of female; 3, stigmal club of male; 4, egg; 5, larva; 6, mandible of larva; 7, head of larva from in front; mandible of larva of *M. physocarpus*.

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DR. E. M. WALKER,

Biological Department,
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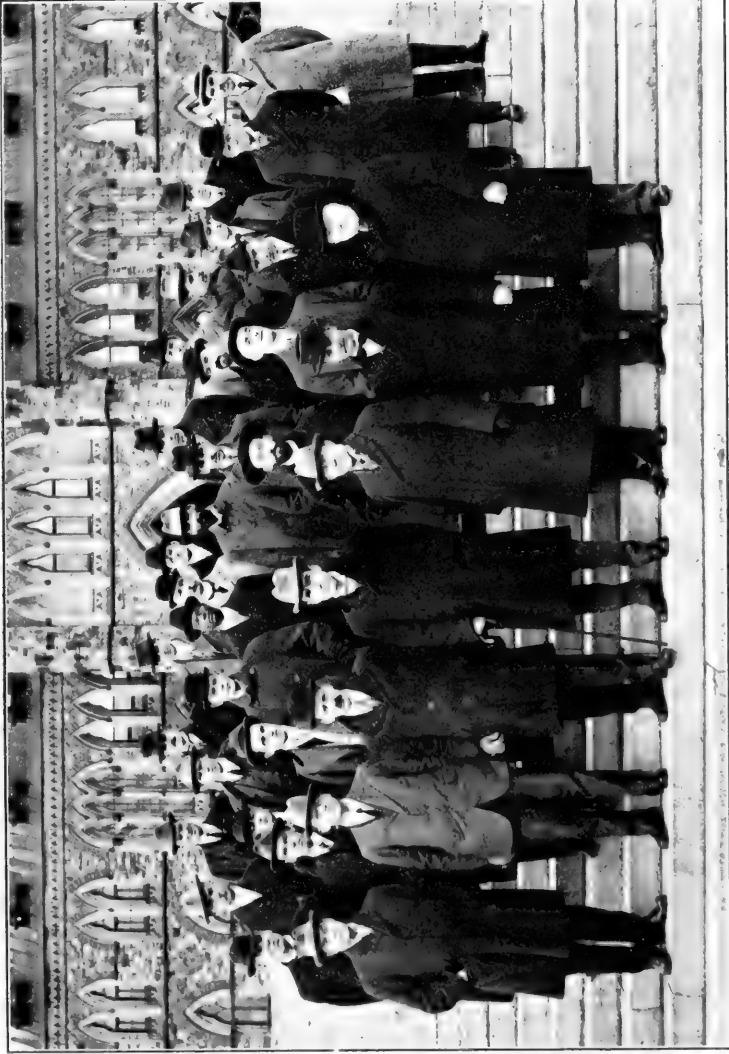
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BRAUN, MISS ANETTE F.	CINCINNATI, O.
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GERMAIN, BRO.	OTTAWA, ONT.
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MATHESON, DR. ROBERT, Cornell University	ITHACA, N. Y.
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WEISS, H. B., N. J. Agricultural College	NEW BRUNSWICK, N. J.
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WINN, A. F.	WESTMOUNT, QUE.
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WOODS, WM. COLCORD, Me. Agri. Experiment Station	ORONO, ME.
WOODWORTH, C. W., University of California	BERKELEY, CAL.



KEY TO PHOTOGRAPH OF ENTOMOLOGISTS ATTENDING THE
FIFTY-SECOND ANNUAL MEETING OF THE ENTO-
MOLOGICAL SOCIETY OF ONTARIO,
OTTAWA, NOVEMBER
4-5th, 1915.

1. G. E. Sanders, Annapolis Royal, N. S.
2. H. G. Crawford, Guelph, Ont.
3. H. G. Payne, Truro, N. S.
4. W. T. Macoun, Ottawa, Ont.
5. H. Glasgow, Geneva, N. Y.
6. N. Criddle, Treesbank, Man.
7. R. N. Chrystal, Vancouver, B. C.
8. C. E. Petch, Hemmingford, Que.
9. W. A. Ross, Vineland Station, Ont.
10. W. H. Brittain, Truro, N. S.
11. L. S. McLaine, Fredericton, N. B.
12. L. Caesar, Guelph, Ont.
13. J. D. Tothill, Fredericton, N. B.
14. F. W. L. Sladen, Ottawa, Ont.
15. E. H. Strickland, Lethbridge, Alta.
16. E. M. Du Porte, Macdonald College, Que.
17. J. M. Swaine, Ottawa, Ont.
18. R. C. Treherne, Agassiz, B. C.
19. T. Wilson, Vancouver, B. C.
20. W. Lochhead, Macdonald College, Que.
21. J. R. Gareau, Strathroy, Ont.
22. F. Letourneau, Oak, Que.
23. Rev. Father Leopold, Oka, Que.
24. A. Gibson, Ottawa, Ont.
25. A. W. Baker, Guelph, Ont.
26. J. C. Chapais, St. Denis en Bas, Que.
27. A. F. Burgess, Melrose Highlands, Mass.
28. H. T. Fernald, Amherst, Mass.
29. C. Gordon Hewitt, Ottawa, Ont.
30. A. F. Winn, Westmount, Que.
31. C. P. Lounsbury, Pretoria, South Africa.
32. T. Rankin, Macdonald College, Que.
33. F. J. A. Morris, Peterboro, Ont.



Entomologists attending the 52nd Annual Meeting of the Entomological Society of Ontario, Nov. 4-5, 1915



The Canadian Entomologist.

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No. 1

FURTHER NOTES ON ALBERTA LEPIDOPTERA, WITH DESCRIPTION OF A NEW SPECIES.

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

(Continued from Vol. XLVI, p. 403.)

603. **Hadena violacea** Grt.—A specimen taken at Banff on Sept 20th, 1901, by Mr. Sanson. I have also a few British Columbia records.

604. **Hyppa indistincta** Sm.—I took a female at light at the Laggan Chalet on July 18th, 1907. It agrees with the figures and description of the female type from Mt. Hood, Oregon, which I have seen in the Brooklyn Museum. This was stated to be a male in the description. I have a similar female from Kaslo, and have seen others in Mr. Cockle's collection. Dr. Dyar records the species as *indistincta* in the Kootenai List, but suggests that both *brunneicrista* Smith and *rectilinea* Dyar (not Esper), from Alaska, are the same thing.

As to the distinctness of *brunneicrista* I have little doubt. *Indistincta* wholly lacks the rusty fulvous marks characteristic of that species, and the terminal line in both my specimens is slightly angulated in the submedian interspace, where it is preceded by a blackish crescent-shaped cloud edged with a few chocolate brown scales of the same shade as the lower portion of the median area. In this respect it resembles *xylinoides* rather than *brunneicrista*, which lacks the black crescent-shaped cloud in the submedian interspace, in which the rusty fulvous shade is paler than any of the brown shades on the wing. The angle, however, does not seem obvious in Smith's figure, and may be variable. The maculation of *indistincta* is, as its name implies, less distinct than in the others, and the general colour more dull and even, without the contrasting white. In my Laggan specimen the black line on the collar is incomplete centrally, but in the Kaslo example the collar is damaged. No such line is referred to in the description. The wing form is that of *brunneicrista*, and shorter than *xylinoides*.

I have examined the Alaskan specimens in the Washington Museum, which were referred to *rectilinea* by Dyar. I should call them *indistincta*. Of the five specimens, only one is a male, and that lacks antennæ. That is most unfortunate, as I have seen no other male which I could call *indistincta*, and the other three North American Hyppas, which include the No. 177 of my Calgary list, are separable from each other by male antennæ. European *rectilinea* is nearest my No. 177 on both antennal and other characters.

605. **Helotropha reniformis*** Grt.—Taken at High River by Mr. Thomas Baird, in 1912.

606. **Momaphana comstocki** Grt.—A fine male, taken, I think, on an electric light pole at Edmonton on May 13th, 1914, by Mr. Valentine Fernekes, to whose generosity I am indebted for the specimen. The type in the British Museum is a much worn male from New York, and there is also a good female there from Orillia, Ont. Hampson gives a wood-cut of the type, but the black markings there shown are too numerous and too intense. Making allowance for that, the Edmonton specimen agrees so well with the wood-cut, Hampson's description, and my notes, as to make me feel confident in the determination. Another type is said to be in the Cornell University at Ithaca, N. Y. The species appears to be very rare everywhere.

A species which has for many years passed under this name in B. C. collections, was described as *Feralia columbiana* by Smith in CAN. ENT., XXXV, p. 9, Jan., 1903, from two males, one from New Westminster, B. C., from Dr. Fletcher, and the other from "North West Territory," from Dr. Ottolengui. A figure of the type is in the British Museum, and is copied by Sir George Hampson. The green of my only two specimens of *columbiana*, which are males, is much darker than that of *comstocki*, and in this and most other characters of colour and pattern, Smith's species has, as he pointed out in the description, more resemblance to *jocosa* than to *comstocki*. The orbicular and reniform of *comstocki* are larger and the wings wider in proportion to their length. As to the generic characters, I do not feel quite sure that the proboscis of my *columbiana* is non-functional, as that of *jocosa*

*Not verified.

appears to be, though Mr. Day tells me that he is not aware that the species has ever been taken either at treacle or shallows. And as to veins 6 and 7 of secondaries arising from upper angle of cell in *Feralia*, as described by Hampson, they do in one of my *columbiana*, but in the other are most distinctly stalked.

607. **Homohadena infixa** Walk.—Very rare. I have only three Alberta specimens in the collection. A female, head of Pine Creek, July 23rd, 1901; a male from the Red Deer River, July 6th, 1905; and a male from Edmonton, May 14th, 1910, the latter taken by Mr. F. S. Carr, at light. The female was included in my original notes under *badistriga* (No. 181). Walker's type of *infixa* is a badly worn male from Florida. Type *kappa* Grt. is a male from Kansas, and apparently the specimen figured by Hampson. They appeared to me to be the same species. I have eleven specimens from Cartwright, Man., and have labelled one of these as very like type *kappa*.

Dinalda Smith was described in Journ. N. Y. Ent. Soc., XVI, p. 94, June, 1908, from a male from Winnipeg, and a female from Sandy Lake, Newfoundland, both in the Rutgers College collection, where I have seen them. The male is labelled July 19th, 1897, apparently by Mr. Hanham. I made no comment on the female, so presumably accepted them as one species. I noted that the male was a small gray species, and probably the same as that in my collection from Manitoba, which I had compared with the type of *kappa*. Messrs. Barnes and McDunnough figure a Southern Manitoba female in their Contributions II, No. 1, Pl. XI, fig. 14, as *dinalda*, concerning which they say on page 24: "Probably this species, judging from the description; we have not seen the type. It is probably identical with *fifia* Dyar, from Kaslo, B. C., which we do not know." I feel confident in referring *dinalda* to *infixa*, though typical specimens of *infixa* are rather larger and browner, as are some of my Manitoba series.

Fifia Dyar was described in CAN. ENT., XXXVI, p. 30, Feb., 1904, from two specimens from Kaslo, as a variety of *badistriga*. I saw a female type at Washington, and noted that it was a species strange to me, though I had previously had a Manitoba specimen of *infixa* labelled "*badistriga* var. *fifia*" by Dyar himself.

I have no Kaslo specimens of any *Homohadena* in my collection, and have always been in doubt as to the identity of *fifia*. But if I am to accept Dr. Dyar's identification, which would not seem unreasonable, that would make *fifia* a synonym of *infixa*, and distinct from *badistriga*, from which latter I have always been inclined to dissociate it. Hampson's published figure of *fifia* is from a figure sent him of the type, and may be misleading. I have compared my Calgary female *infixa* with the same figure from which Hampson's was taken, and my note is: "Extremely like figure of *fifia* in British Museum, but more even on costa and with darker thorax." The evidence, therefore, seems to point to *fifia* being *infixa*, but at present I must leave the matter open. Holland's Plate XXI, fig. 1, is *infixa*, and not *badistriga*, as stated. *Badistriga* is much more strigate, and has the transverse lines more deeply curved.

In the Rutgers College collection I saw a photograph labelled *retroversa* Morr., presumably of the type in the Tepper collection. My note on this says: "It looks to me almost exactly like the male type of *dinalda* Smith," with which I compared it. In that case Hampson's figure under *retroversa*, which is copied from a figure of a specimen in the U. S. National Museum, can hardly be correct. Barnes and McDunnough have a coloured figure of type *retroversa*, described, I believe, from Missouri, and figure a specimen from that state as agreeing with it. (Contr. II, No. 1, pl. XI, fig. 11.) I have Manitoba and Alberta specimens of *infixa* resembling their figure very closely indeed. I dare comment no further.

608. ***Oncocnemis regina*** Sm.—Described from a male from Regina, the capital of Saskatchewan. The capture is attributed to the late Dr. James Fletcher, but may really have come from Mr. T. N. Willing. I have seen the type at Rutgers College. Mr. J. B. Wallis took a female at Lethbridge, Alta., on Aug. 21st, 1912, which I have examined and compared with the description, and judged to be this species, though it appeared to be much darker and less maculate than the type. Barnes and McDunnough, in Contr. I, No. 4, pl. III, fig. 20, figure as *regina* a Eureka, Utah, specimen, remarking: "Probably this species, though most

of our Utah specimens are decidedly suffused with pink on primaries." I have seen a large number of the species which they figure, and from the same locality, and should call it a rather pale form of *hayesi*, as I understand that. I have seen neither type nor description, but a Colorado specimen from the Grote collection is in the British Museum, and is figured by Hampson. It is much more ochreous than any of the seven Utah specimens in the collection, but I have a Gunnison, Colo., male which scarcely differs from Utah specimens in my series. It is not improbable, however, that *regina* may turn out to be but a pale form of *hayesi*, to which it is, at any rate, very closely allied.

609. **O. barnesii** Sm.—A female taken at Banff, on Oct. 17th, 1910, on an electric light pole, by Mr. Sanson. The specimen was rather worn, but agreed with the description of this species.

610. **O. levis** Grt.—Lethbridge, Alta. One pair, Aug. 24 and 26, 1912. Taken by Mr. J. B. Wallis, to whom I am indebted for the male.

611. **O. glennyi** Grt.—A male labelled Laggan ("B.C." in error, as usual), 5,000 ft., July 28th, is in the Rutgers College collection, and agrees with Sir George Hampson's figure of the type from Colorado. The specimen very likely came from Mr. Bean.

612. **O. chandleri** Grt.—A male from High River, but without date, taken by Mr. Thomas Baird, I have compared with the type of this species, from Colorado, in the British Museum. The type is paler and grayer, and a trifle ochreous, which mine is not. Another male came to light here on Aug. 29th of the present year (1914). A male taken at Lethbridge on Aug. 27th, 1912, by Mr. J. B. Wallis, and in his collection, is similar.

613. **O. figurata** Harv.?—A female from Lethbridge, July 8th, by Mr. J. B. Wallis. I have compared it with the type of *figurata*, from Nevada, in the British Museum. It differs in being more even in colour, in having the transverse lines more constricted in the submedian interspace, where they are joined by a diffuse black blotch instead of a fine line, and in entirely lacking

the fine black longitudinal streak from the cell to the termen near the apex. It differs similarly from Colorado specimens which stood under *figurata* in the Smith collection, and from the Eureka, Utah, specimen, figured as such by Barnes and McDunnough in Contr. I, No. 4, pl. III, fig. 22. That figure appears to have a black collar not possessed by either my specimens nor by the type, though mine has a blackish head. The tegulæ are disarranged as a result of papering, and may be dark inferiorly. The fore tibiæ have a large claw on the inner side, and a small one on the outer, as Hampson says of type *figurata*.

614. **Platagrotis speciosa** Hbn. var. **arctica** Zett.?—I have two Alberta specimens which I refer doubtfully to this form. A male which I took at the Chalet lights at Laggan, on July 14th, 1904, and a female which turned up at treacle on Pine Creek on August 16th of the same year. I submitted both to Dr. Dyar some years ago, and he called them *speciosa*. A similar male taken by Mrs. Nicholl in Wilcox Pass during 1907 is in the British Museum, and has been recorded as *speciosa* var. *arctica*, by Sir George Hampson in Can. Ent. XL, p. 102, March 1908. The species has long been known in Northern Europe, and both names were first applied to European forms. The typical form in Europe is, as Hampson describes it, "gray white, strongly irrorated with black-brown." Against var. *arctica* in Staudinger's catalogue is a note in Latin, which translates: "smaller, darker, with hind wings nearly unicolorous." Sir George Hampson says of var. *arctica*: "small and dark, with the markings indistinct—Alpine and Arctic." Walker's type of *mixta* is a female from St. Martin's Falls. My note describes it as "gray, black-sprinkled," and, regarding more of the British Museum series continues: "Others, Hudson's Bay and White Mountains, are much like it, and rather smaller only than the usual run of European examples." I have European specimens in my collection which I picked from a series submitted to me to show the considerable variation, and one from Labrador, probably collected by Möschler, sent me by Bang Haas, as var. *arctica*, is more plainly maculate and not nearly as dark as some of those. The Alberta specimens differ in being of a much more bluish dark gray throughout, and in bearing a peculiar resemblance, as regards the primaries, to

Scologramma perplexa, which occurs also both at Laggan and on Pine Creek, and with which I formerly confused them, before noting the very different generic characters.

I have seen in the British Museum Morrison's male type of *perquiritata* from Mt. Washington, but have no further note thereon.

615. **P. gelida** Sparre-Schneider, var. **mevesi** Auriv.?—I have examined four specimens, all males, taken at Banff by Mr. Sanson, which I refer doubtfully as above. Dates are Aug. 19th, 1909; Aug. 19th, Sept. 1st and 5th, 1911. One of these is in my collection. The others are in that of Mr. Sanson, and one of these I have compared with the British Museum material. On the strength of that comparison I recorded the species as *sincera* H.-S. in 43rd Rept. Ent. Soc., Ont. (1912), p. 119, 1913, notwithstanding that, as there stated, I found the form to resemble more closely some specimens standing under *gelida*. *Sincera* is European, and stands in our North American lists as from Labrador. Hampson adds: "U.S.A., mountains of northern and middle states." *Gelida* has not previously been recorded from North America. In January of the present year (1914), I again examined the British Museum series under both names, though I had then no Banff specimen with me. From my notes I conclude that a specimen standing as "ab. *mevesi* Auriv." from Bergen, Norway, agreed with the Banff form better than did anything else there, and so tentatively I record it. Comparing it with typical *gelida*, Hampson says of *mevesi*: "Browner: fore wing without the pinkish patch on the reniform; hind wing more irrorated with brown." Hampson refers both *gelida* and *sincera* to *Anomogyna* Staud., with which the present form agrees structurally.

616. **P. imperita** Hbn.—Calgary July 23rd, 1908, at light; and Didsbury Aug. 5th and 8th, 1905; all taken by by Mr. C. G. Garrett. Banff, July 30th to Aug. 4th, four specimens, by Mr. Sanson. One Calgary and two Banff specimens are in my collection. One of these I have compared in the British Museum, and have labelled it as being like Labrador specimens there standing, and smaller only than the female type *discincta* Morr. from St. Martin's Falls. Lübner's figures, which I have carefully

examined, were from Labrador specimens. A Rama, Labrador, specimen in my collection, from Prof. Smith, is slightly smaller than the local series, and differs in being less blue-gray, and a trifle ochreous.

617. **Protagrotis nichollæ** Hamps.—(Can. Ent., XL, 102, March, 1908). Described from Alberta and B.C. material taken by Mrs. Nicholl. The male type is from Simpson River, 7,000 ft., Aug. 13th, 1904, and the female type from Glacier, 4,100 ft., Aug. 3rd, 1907. Both localities are in B.C. The rest are four Alberta specimens, three males and a female, Wilcox Peak, July 29th and 31st, 1907, and Brobokton Creek, Aug. 12th, 1907. I am not aware that I have ever seen any other specimens. The impression received after viewing the specimens on two different visits, was that the species somewhat resembled a large *Scotogramma* near *promulsa*. Hampson places the genus *Protagrotis* after *Euretagrotis* and *Rhynchagrotis* at the end of his vol. IV.

618. **Semiophora elimata** Guen.—Banff, July 28th, 1910. One male. N. B. Sanson. The specimen is near the var. *badicollis* Grt. as diagnosed by Hampson, that is having the black markings strong. I have seen neither the type nor description of that form. For a further note on this species, vide Ent. News, XXIV, 359, Oct. 1913.

619. **Setagrotis vernilis** Grt. syn. **filiis** Smith.—(Smith, Trans. Am. Ent. Soc., XXXIII, 127, April 1907; Dod, Ent. News, XXIV, 361, Oct. 1913, re syn.) Banff, Aug. 14th—Sept. 11th, 1910-11, Sanson. Laggan, Aug. 9th, in Prof. Smith's collection, probably from Mr. T. E. Bean. Grote's type is a male from Colorado in the British Museum, and one of my Banff specimens agrees with it exactly. Smith described *filiis* from a single male from Pullman, Washington. When I first saw the type in his collection I took it for an unusually dark blue-gray form of *infimatis*. At that time I did not know *vernilis*, as the species which I had standing wrongly under that name in my collection, and which I recorded as *vernilis* in 41st Rept. Ent. Soc. Ont., 1911 (the "Entomological Record" for 1910, p. 10), was *vocalis*.

(To be continued).

GEOMETRID NOTES — REVISION OF THE GENUS
HYDRIOMENA HUB., GROUP WITH
LONG PALPI.

BY L. W. SWETT, BOSTON, MASS.

This group may be distinguished from the groups with short and moderate palpi by the greater length of these appendages, which are beak-like; the slightly larger size and the slighter variability in colour. The prevailing shades seem to be olive-green and white with variations of black and less of the red, except in *Hydriomena ruberata* Freyer. I have regarded *H. speciosata* Pack. as typical of this group, because it is less confused in general collections than the other species.

14. ***Hydriomena speciosata*** Pack., (Proc. Boston Soc. Nat. Hist., XVI, p. 22, 1874; Monog., p. 102, 1876).

This large, showy, green and white, mottled species is fairly well known to the average collector. The long beak-like palpi are typical of this group. The specimen figured by Packard in the Monograph (Pl. VIII, fig. 37) is a variety and not the one from which the original description was drawn. I have limited the type to the one from which the original description was drawn, there being two distinct forms before him at that time. The type is the green form with white mottlings and the one figured in the Monograph is the black-bordered variety, which I described in the Can. Ent. as *Hydriomena speciosata* Pack., variety *agassizi* Swett (vol. XLII, p. 277, Aug. 1910). The normal form of *speciosata* I have from British Columbia and California and I should not be surprised if it had quite an extended range even through South America as there are several closely-related forms figured in the Biologia Cent. Amer. The typical *speciosata* is dark olive-green with a white ground colour and five black bands crossing the fore wings, and has black dots at the ends of the veins and a black apical streak. The margin of the fore wing is greenish where in the variety *agassizi* it is intense black. The

hind wings of both are dark and smoky. The types (2 ♂, Mendocino City, Calif., Alexander Agassiz) are in the Museum of Comparative Zoology, Cambridge, Mass. It is a rather rare species but Mr. E. H. Blackmore, of Victoria, B.C., took a nice series, the dates of capture ranging from June 29 to Aug. 10, 1913.

Hydriomena speciosata, var. (a) **agassizi** Swett, (Can. Ent., vol. XLII, Aug. 1910). This is the form figured by Packard in the Monograph, Plate VIII, fig. 37, under *speciosata*, to which I have just alluded. *Agassizi* seems to be a variation towards melanism, the entire outer border being black, with green and white mottlings. The central band is twice as wide in *agassizi* as in *speciosata* and the whole insect has a black appearance. It is evidently a rare variety as the type is the only specimen I have seen. The type (1 ♂, Mendocino City, Calif., Alexander Agassiz) is in the Museum of Comp. Zoology, Cambridge, Mass.

Hydriomena speciosata, var. (b) **taylori** Swett, (Can. Ent., vol. XLII, p. 277, Aug. 1910).

This seems to be a colour variety of *speciosata* in which the green and white is replaced by a brownish-olive. It seems to be local, as I have never seen it from any place but Vancouver Island, where it has been taken at Nanaimo and Victoria. The type was submitted to me by the late Rev. G. W. Taylor, as he was uncertain of the characters of the true *speciosata*, having been misled by the figure of one form and the description of another.

Type, 1 ♂, July 22, 1908, from Rev. G. W. Taylor, Departure Bay, in my collection. Cotype, 1 ♂, in the collection of Mr. A. J. Croker, July 1, 1909, Victoria, B.C. Other specimens from Victoria, July 3, 1913, have been received from Mr. E. H. Blackmore.

15. **Hydriomena costipunctata** Barnes and McD. (Contrib. to Nat. Hist. of Lepid. of North America, vol. 1, no. 5, p. 33, July 1912; plate II, fig. 14).

This form is closely allied to *speciosata* and also to some of the Mexican species, but Dr. Barnes, with his large series, has no doubt been able to see the distinguishing characters. Personally, I regard it as a variety of *speciosata* Pack., the figure, as judged by plates, are sometimes rather unreliable as they do not bring out the minute differences. It has a purple-brown ground colour and apical patch and lacks the median white shading of *magnificata*. It may be that *H. magnificata* Taylor belongs to the group with long instead of the group with moderate palpi as I listed it. When I was working on this group the Rev. G. W. Taylor sent me a photograph of his type but the palpi were blurred and appeared to be of moderate length. Shortly after this I wrote him about the matter, but unfortunately illness prevented him from replying. Now that his collection has passed into Dr. Barnes' hands I can ascertain its position from the latter.

H. costipunctata, according to the colour, must be close to var. *taylori* Swett.

Types, 1 ♂, 1 ♀, Tucson, Ariz., in the Barnes collection.

16. **Hydriomena barnesata** Swett, (Can. Ent., vol. XLI, July, 1909; Barnes and McD., Contrib. Nat. Hist. Lepid. North Am., vol. 1, no. 4, 1912; pl. XIV, fig. 19-22).

This species has very long palpi, possibly the longest of the group, and the general appearance is different from any of the others. The broad smoky mesial band with its three black lines, and the clear white mesial space beyond make it resemble in a way some of the German varieties of *autumnalis* with pointed or elongated wings. The general colour is olive-green and white. The hind wings are dark smoky brown. It is a large species and evidently rather rare as I have only seen a few specimens, three from Dr. Barnes and one from Mr. Grossbeck.

Types, 3 ♂ (coll. Barnes, 2 ♂; coll. Grossbeck, 1 ♂), Huachuca Mts., Ariz. Paratype, 1 ♂, Palmerlee, Ariz., in my collection. Through the kindness of Dr. Barnes, I also have 1 ♀ from Fort Wingate, N. Mex., which does not differ materially from the male.

(To be continued.)

NORTH AMERICAN DIPTERA.

BY J. R. MALLOCH, F.E.S., URBANA, ILL.

The new species described in this paper were taken during a field trip in connection with an investigation of the occurrence of *Simuliidæ* in the southern part of the State of Illinois. The types are deposited in the collection of the Illinois State Laboratory of Natural History. This paper is published by permission of Dr. Stephen A. Forbes, State Entomologist.

The present opportunity may be taken to draw attention to a curious error which occurs in my paper on *Simuliidæ*.^{*} In the last page proof there appeared a period after the word *Simulium* in the first caption of the generic table. In making the change to a comma the compositor, evidently by mistake, took out the last line of table instead of last line of caption I, thus causing the same line to appear twice, and deleting the alternative to caption 2, which should read, "Face broad, basal cell absent....*Prosimulium*, p. 24."

Botanobia hinkleyi, new species.

Female.—Black. Frons reddish brown, slightly obscured by grayish pollen, the anterior fourth pale yellow, surface hairs yellow; ocellar triangle opaque; face obscure, whitish yellow; antennæ brown, the lower portion of third joint, especially towards base and on inner side, yellowish; arista brown; cheeks concolorous with face, obscured with gray posteriorly; clypeus gray; proboscis brown; palpi yellow. Mesonotum black with dense gray pollinosity, which obscures the surface, with the exception of the areas occupied by four longitudinal vittæ, those areas shining; pleuræ black, upper half gray pollinose, lower half highly glossy; scutellum slightly gray pollinose, but shining; thoracic hairs brownish yellow, the bristles black. Abdomen distinctly shining, with but slight indications of dusting; surface hairs soft, white. Legs yellow, black on coxæ except their apices, femora except narrowly at apices, the fore and mid tibiæ at the middle, the hind tibiæ except their bases, and on the apices of the tarsi; surface hairs pale. Wings clear, veins brown. Halteres pale yellow, the stems brownish.

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January, 1915

Frons slightly less than one-half the width of head, the surface hairs short, though numerous, those on the lateral margins not long, though setulose; triangle short and broad. not reaching to middle of frons, and not half as broad as frons at vertex; antenna with third joint as broad as cheek at middle, which is equal to one-third the height of eye; cheeks with many soft hairs, which are very short, the anterior hair distinguishable, but not vibrissalike; a distinct ridge traverses the cheek mid way between the eye and the lower margin; eye slightly higher than long, pubescent. Surface of mesonotum unpunctured, the space between the median pair of vittæ impressed; surface hairs numerous, though short, and regularly distributed; bristling normal; scutellum haired as mesonotum, and with four marginal bristles, the basal pair very much shorter than the apical pair, the latter not closely approximated, cruciata; surface of scutellum convex, its outline rounded. Abdomen ovate, as long as thorax. Legs normal. Wing with a distinct break at apex of auxiliary vein, which vein is traceable; first costal division subequal to second, third one half as long as latter; inner cross-vein at a little before the end of first vein; the distance between its upper extremity and the inner cross-vein about three-fourths the length of last section of fifth vein, and one-third as long as last section of fourth; veins 3 and 4 subparallel.

Length 2 mm.

Type locality.—Dubois, Ill., April 24, 1914. Taken by sweeping evergreens (J. R. Malloch).

Paratype.—Same locality. Taken by sweeping. Related to *trigramma* Loew, from which the difference in the thoracic markings, especially, will serve to separate it.

Named in honour of Mr. A. A. Hinkley, the well-known conchologist, on whose ground the species was taken, and to whom we are indebted for much hospitality.

Agromyza aristata, new species.

Female.—Black; thorax very densely covered with pale gray pollen, entirely opaque; abdomen less densely pollinose, slightly shining. Head bright yellow, only the upper third of frons, includ-

ing the ocellar region, and back of head black, with grayish pollinosity; antennæ, palpi and proboscis yellow; arista and head bristles blackish, the former yellow at base. Thorax without pale markings, except below wing base, where it is obscurely yellowish. Legs yellow, including the coxæ. Wings clear, veins brown, fourth and fifth less distinct than the others. Squamæ yellow, fringe concolorous, margin brownish. Halteres yellow, knobs whitish.

Frons about one-half the head width, orbits poorly defined; four pairs of orbital bristles present, which are of moderate strength, the anterior two pairs incurved, the posterior two backwardly directed; frontal triangle not well defined; antennæ of moderate size, third joint disc-like, arista tapering, bare, very short, its length barely exceeding the height of the third antennal joint; cheek at posterior margin as high as eye, at anterior margin about one-half as high, marginal hairs weak and pale, vibrissa black and well differentiated, though not strong. Mesonotum with four pairs of dorso-central bristles, which decrease slightly in strength anteriorly, the anterior pair slightly in front of suture, about five irregular rows of discal setulæ between the anterior dorso-centrals; the pair of bristles between the posterior dorso-centrals of moderate length. Abdomen ovate, penultimate segment short, ovipositor rather short and broad; posterior margins of all segments with distinct bristly hairs, which are most noticeable on the last segments. Legs of moderate strength, their surfaces with short black hairs; mid tibia without posterior bristles. Wings slender; costa indistinguishable from slightly beyond apex of third vein; veins 3 and 4 gradually divergent on their apical portions; fourth vein reaching wing margin at about same distance behind apex of wing as third vein does before apex; auxiliary vein indistinct; inner cross-vein distinctly beyond apex of first, and near to apical third of discal cell; last section of fourth vein about six times as long as penultimate section; last section of fifth vein about four-fifths as long as penultimate section.

Length 2 mm.

Type locality.—Gleason Dune, Havana, Ill., April 30, 1914 (Hart & Malloch).

Paratypes.—Havana, April 30 and May 1, 3 specimens; Golconda, Ill., April 18, 1914, on bank of Ohio River, and St. Joseph, Ill., May 3, 1914, 3 specimens (Hart & Malloch).

Male.—Similar to the female in coloration, bristling and venation. The hypopygium is normal in size and yellowish in colour.

Allotype.—Same data as type.

This species, through its possession of a pale yellow face and frons and the discontinuance of the costal vein, will run down to section 13 in my table of species in this genus,* but may readily be separated from the two species included there as follows: From *brevicostalis* Malloch by the lateral margins of the disc of mesonotum being concolorous with the disc, and from *davisi* Walton by the yellow antennæ. *Parvicella* Coquillett is a much more slender species than *aristata*, and is essentially different in many respects.

The food plant of *aristata* is unknown, the specimens being the result of general collecting in different situations.

Agromyza pruinosa Coquillett.

It may be of interest to record the occurrence of this species at St. Joseph, Ill., on May 3, 1914. The writer took three females on the bank of Salt Fork, by sweeping the branches of various trees. River birch (*Betula nigra*) is recorded only for the southern part of the State, and no birch trees occur at the place where the insect was taken, so that it must feed upon some other tree here. Further investigation may be made to discover its habits in this locality.

Agromyza infumata, new species.

Male.—Black. Head black, frons opaque on centre stripe, orbits and ocellar region shining; apex of proboscis pale brown. Mesonotum shining, but with distinct brownish pollinosity; vertical pleural suture and below wing base brown; squamæ gray, margin and fringes brown. Abdomen shining black, without pollinosity. Legs black. Wings slightly grayish, veins dark brown. Halteres yellow, knobs white.

*Am. Ent. Soc. Amer., Vol. 6, 1913, p. 271.

Frons at vertex about one-half the width of head, at anterior margin slightly over one-third the head width; orbits well defined, five pairs of orbital bristles present, the anterior three pairs incurved, the upper two pairs backwardly directed, all the bristles moderately long but fine, orbital hairs weak; frontal triangle distinct, not reaching to middle of frons; antennæ normal in size, third joint rounded; arista thickened at base, tapering to beyond middle, bare, its length equal to anterior width of frons; face very slightly concave; cheek barely as high as third antennal joint, at its highest point about one-fourth as high as eye, marginal hairs numerous, but weak, vibrissæ differentiated but not strong; eye higher than long. Mesonotum with four pairs of dorso-central bristles; discal setulæ distinct, but not very numerous, about five irregular lines between the anterior dorso-centrals; no bristles between the posterior pair, the setulæ continued to between the latter. Abdomen rather slender, the surface with numerous rather strong hairs; hypopygium normal. Legs with short surface hairs; no posterior bristles on mid tibia. Costa to end of fourth vein, which is almost exactly at wing tip; auxiliary vein indistinct, but complete, not fused with first; veins 2, 3 and 4 distinctly divergent apically; outer cross-vein oblique, its upper extremity in vertical line with apex of first vein; inner cross-vein at middle of discal cell; last section of fourth vein about eight times as long as penultimate section; last section of fifth vein twice as long as penultimate section; sixth vein almost reaching wing margin.

Length 2 mm.

Type locality.—Dubois, Ill., April 24, 1914, taken by sweeping in woods (Hard & Malloch).

This species belongs to the group which is dealt with between captions 28 to 34 in my table of species in *Agromyza*, above referred to, and is most closely related to *fragariæ* Malloch, from which it may readily be separated by the very different wing venation. This character also serves to distinguish the species from any other in this group, as does also the absence of the mid tibial bristles. Food plant unknown.

SOME CHALCIDOID HYMENOPTERA FROM NORTH QUEENSLAND.

BY A. A. GIRAULT, NELSON (CAIRNS), AUSTRALIA.

The types of the following species are in the Queensland Museum, at Brisbane.

Family TRICHOGRAMMATIDÆ.

LATHROMERINI.

Genus *Lathromerella* Girault.1. *Lathromerella fasciata* Girault.

Five females of this beautiful species were taken June 3, 1913, by sweeping the forested slopes of Mount Pyramid (from 1,500 to 2,500 feet), Nelson, North Queensland, by Mr. Alan P. Dodd. The metathorax plus propodeum are black on each side having a wide mesial portion concolorous (dorsal aspect). The two ring-joints are verified.

Genus *Lathromeroides* Girault.1. *Lathromeroides fasciativentris* n. sp.

Female.—Length 1.30 mm.

Exactly similar to the type, *longicorpus* Girault, but the abdomen banded with four or five black cross stripes. The black dot under the stigmal vein is surrounded with suffused blackish. Two ring-joints. Mandibles tridentate.

Male.—Not known.

Described from one specimen captured with the foregoing *Lathromerella*.

Habitat.—Australia, Nelson (Cairns), Queensland.

Type.—The above specimen on a slide. Later, the species was compared with the type of *longicorpus*. It is distinct.

Chaetostrichini

Genus *Neobrachista* Girault.

The antennæ in this genus were wrongly described as bearing but one funicular joint; there are two but the first is wider than long and not very distinctly separated, though distinct enough in specimens of the following new species. In the type species, however, it is still shorter and resembles more one of the ring-joints except that it is wider and is intimately connected with the

funicle. The genus is distinguished from *Brachistella* and *Abbella* by its very short marginal vein, and its long, slender stigmal. It is gratifying to me to be able to throw light on this point.

1. **Neobrachista novifasciata** n. sp.

Female.—Length 1.00 mm.

Closely allied with the type species, *fasciata* Girault, but more robust, the abdomen broader (a little wider than the thorax, distinctly narrower in *fasciata*), and with but three black stripes across it, one a little out from base, the second a little distad of the middle, and the third a little distad of the mid-distance from the second to apex. The first funicle joint is a little longer and more distinct (yet not quite half the length of the second which is a little wider than long; in the type species the first joint is only about a fourth the length of the second which is a little longer than wide). Second, black stripe of abdomen interrupted at the meson, the others continuous and straight. Mandibles tridentate. Also the fore wings are shorter and broader, subtruncate at apex (bearing about 26 lines of discal cilia across the widest point). Fore wings slightly clouded, more distinctly under the stigmal vein and along the venation. Thorax with a *distinct* median sulcus (not present in the single specimen of the type species before me though slightly indicated in places, nevertheless plainly absent), as deep as the parapsidal furrows.

Male.—Not known.

Described from a single specimen captured with the above *Lathromerella*.

Habitat.—Australia, Nelson (Cairns), Queensland.

Type.—The above specimen on a slide with two ♀'s of *Lathromerella fasciata* Girault.

Family MYMARIDÆ.

Genus *Polynema* Haliday.

1. **Polynema zolai** n. sp.

Male.—Length 1.50 mm. Large.

Jet black, the wings hyaline, the venation black, also the antennæ (but the pedicel brown) and the legs except the tarsi, knees, tips of tibiæ and all of cephalic tibiæ which are brown. Characterized by the wings which are broad, subtranslucent and

with short marginal fringes the longest of which are only about a sixth the greatest wing width; only about twelve lines of discal ciliation which is scattered, most numerous cephalo-distad and practically absent over all of the proximal half of the blade which is about two and a quarter times longer than broad. Antennæ longitudinally striate, the joints shortening distad, the proximal joint of funicle as long as the second, somewhat brownish, the club joint a little longer than the distal funicle joint which is about a fourth shorter than joint 1 of the funicle, the latter about $2\frac{1}{2}$ times longer than wide at the base. A very short, narrow, minute ring-joint is present.

Female.—Not known.

Described from one male specimen given to me by Mr. A. P. Dodd, who captured it by sweeping the edge of jungle, May 20, 1913.

Habitat.—Australia, Kuranda, North Queensland.

Type.—The above specimen on a slide.

Respectfully dedicated to Emile Zola for his "La Débâcle," wherein the horrors of war are ably pictured to us.

2. *Polynema speciosissimum*, n. sp.

Female.—Length 1.50 mm. Large, the fore wing banded.

Black, the head except the dusty vertex, the prothorax and mesonotum reddish brown. Petiole of abdomen, coxæ, cephalic femora, all trochanters and proximal half or more of all tibiæ, white. Tarsi reddish brown, also the scape and pedicel. Funicle joints 4 and 5 white, antennæ and legs otherwise black, except tips of front tibiæ, which are yellowish. Fore wings banded as in *franklini* Girault, but the cross-band is very intense jet black and decidedly longer, distinctly less than its own length from the apex of the venation. Scape not distinctly sculptured, the first funicle joint elongate but only $\frac{2}{3}$ the length of the second, which is very long, subequal to the third, both longest; joint 1 longer than 6, subequal to 4, which is slightly longer than 5 (funicle). Cross-band of fore wing followed by a broad, naked area from margin to margin, the black band itself one and a third times longer than wide (cephalo-caudad). Sculpture inconspicuous. Discal cilia in the black band very dense and longer than the fine, shorter,

less dense ciliation distad, the longest marginal cilia about three-fourths the greatest wing width.

Male.—Unknown.

Described from a single female captured by sweeping in a jungle-pocket, June 4, 1913. This species is certainly one of the most remarkably coloured mymarids known.

Habitat.—Australia, Nelson, North Queensland.

Type.—The above specimen on a slide.

Genus *Gonatocerus* Nees.

1. *Gonatocerus competi* Girault.

A single very pale female of this species was taken on May 29, 1913, at an elevation of 1,500 feet, forest, Nelson, North Queensland. A round spot is present on the base of the scutellum.

(To be continued.)

A NEW GENUS AND A NEW SPECIES OF LEPIDOPTERA FROM ARIZONA.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

Having had occasion to examine the types of the species described as *Mamestra antonito* Barnes (Can. Ent., vol. 39, p. 14, 1907), we were surprised to find that the ♂ and ♀ types represented respectively two entirely different species, structurally widely apart, neither of which could remain associated with the genus *Mamestra*, or *Polia*, as it is now called by Hampson.

The ♂ type, labelled *Barathra antonito*, which we figured in our "Contributions," vol. I, no. 4, pl. VI, fig. 6, and from which the original description was drawn, has hairy eyes, a fact which led to its being placed in *Mamestra*; the mid and hind tibiae are, however, distinctly spined, which would throw it into Hampson's subfamily *Agrotinae*, and associate it with the two genera, *Ala* Staud. and *Trichorthosia* Grt., the only two described genera combining hairy eyes and spined tibiae; of these *Ala* contains several Heliothid-like moths from Central Asia which have nothing in common, apart from the above mentioned features, with *antonito* Barnes; *parallela* Grt., the type of the genus *Trichorthosia* is, as the name implies, rather Orthosian in appear-

ance and is further characterized by the flat hairy appressed thoracic vestiture with slight tuft of metallic scaling on metathorax and no abdominal tufting. In *antonito* Barnes the thoracic vestiture is loose and composed chiefly of large spatulate scales; there is a slight divided tuft on the metathorax and a small tuft on the basal abdominal segment; the ♂ antennæ show a rather peculiar structure in that they are very strongly lamellate, each lamella being considerably excavated centrally, the two ends thus projecting far beyond the central portion and presenting to a casual glance the appearance of bipectinations; the fore tibiæ are unarmed, the palpi short, upturned, with 3rd joint rather porrect and the tongue is well developed; the species evidently represents a new generic type for which we would propose the name *Mimobarrathra*; besides the ♂ type of *antonito* we have six further ♂'s from White Mts., Ariz., before us from which we have drawn up the above generic characterization. The so-called ♀ type of *antonito* Barnes labelled "So. Arizona, Poling" does not, as already mentioned, belong to this species at all; it has naked eyes, unspined tibiæ, the fore tibiæ however with well developed apical claw on inner side; the thoracic vestiture is composed of loose spatulate scales, but the specimen is too rubbed to determine the nature of the tufting. It would fall into Hampson's subfamily Acronyctinæ and according to his tables belong either to the genus *Copanarta* Grt. or to *Leucocnemis* Hamp. It is apparently undescribed and bears but little affinity to the already described species of either of these two genera, but as the specimen is considerably worn we dislike to create a new genus for it and place it provisionally in *Leucocnemis* Hamp. with following characterization:—

***Leucocnemis barbara*, sp. nov.**

Head and thorax clothed with an admixture of white, black and pale ochreous scaling; primaries white, heavily sprinkled with smoky, the ground colour almost obliterated and only showing distinctly in subterminal area; basal area sprinkled with orange scaling, especially before lower portion of t. a. line, which is black, outcurved and lunulate; orbicular round, orange, with dark centre and black outer line; reniform broad, figure-of-eight-shaped, open above and below, with pale centre broadly margined with

orange, the whole surrounded by black line; t. p. line single dentate, sinuous, black, shaded outwardly above vein 1 with orange, this shading covering entire s. t. space; s. t. line indicated by broken orange scaling on dark blotches; fringes checkered white and black. Secondaries smoky, paler in basal half and slightly hyaline, crossed by an indistinct smoky line. Beneath, primaries smoky, secondaries as above. Expanse 30 mm.

Habitat.—South Arizona (Poling). One ♀.

Type.—Coll. Barnes.

FIELD NOTES AND QUESTIONS.

Interesting New Jersey Captures.

On April 7, 1914, a large Carabid was taken at Arlington, N.J., from a case of Japanese azaleas. Mr. E. A. Schwarz to whom it was sent identified it as *Damaster blaptoides* Kollar and said that it was a rather rare species, the genus being peculiar to Japan. Inasmuch as it is a beneficial insect its introduction into the United States would be desirable.

Eucactophagus graphipterus Champion was taken during April, 1914, in a greenhouse at Summit, N.J. This member of the family Calandridæ was determined by Mr. Schwarz who has the following to say concerning it, "Very interesting; a native of Costa Rica and U.S. of Columbia; only three specimens are known. The one figured in Biol. Centr.-Amer., vol IV, part 7, plate IV, fig. 35, was found by Prof. Britton in a greenhouse at Connecticut. Larvæ and other biological material of this species are greatly desired by the U.S. National Museum, also more information regarding nature of damage to orchids."

HARRY. B. WEISS, New Brunswick, N.J.

Callopietria floridensis Guen. in New Jersey. The work of this insect known as the Florida Fern Caterpillar or the Southern Fern-Cutworm was first noted in New Jersey at Wehawken, Riverton and Rutherford during September and October, 1914, where the larvæ were doing considerable damage to ferns in greenhouses, attacking such species as *Adiantum*, *Cyrtomium*, *Nephrolepis*, *Pteris*, *Polypodium*, *Blechnum* and *Asparagus sprengeri*. Both forms of larvæ were present with the

green ones largely in the majority, although the black ones were by no means scarce. Handpicking of the caterpillars and shaking of the infested plants supplemented by "swatting" the moths at night with the ordinary wire "fly swatters" gave the best results. Light traps and stale beer and molasses attracted only a few moths. Paris green and hellebore burned the foliage as did arsenate of lead to a slight extent. The chief objection to arsenate of lead was the discolouration of the foliage, which followed its use. Poisoned bran and molasses was not successful, as the larvæ preferred the ferns. A detailed account of this insect can be found in Bull. 125, Bur. Ent. U.S. Dept. Agric., by F. H. Chittenden, and in the 27th Report of the State Entomologist of Illinois which contains an article by J. J. Davis. Inasmuch as neither of these publications mentions the hatching period of the egg, I might say that eggs under my observation hatched in from five to seven days. Considering the fact that it is a troublesome species once it gains a foothold in the fern house, it would pay fern growers to be on the watch for it when receiving plants from other establishments. It can be readily transported in the egg, larval and pupal stages.

HARRY B. WEISS, New Brunswick, N.J.

Priophorus acericaulis MacG. in New Jersey. This saw-fly known as the Maple Leaf-Stem Borer is listed in Insects of New Jersey as being very local and recorded from South Orange. During May and June, 1914, it was found injuring maple trees on the property of Mr. T. Romaine, Hackensack, N.J. The leaves started to drop about May 20th, and in a few days the ground beneath the infested trees was covered. Mr. Romaine had observed this unusual pest for the past four years and during that time it had not spread at all to adjoining maples. An account of its life history by Dr. W. E. Britton can be found in Ent. News, vol. 17, Nov., 1906, and acting on the suggestion contained therein, kerosene emulsion at the rate of one to twelve was applied twice to the ground beneath the trees while the larvæ were entering. It is somewhat unusual to run across the work of this insect which is not by any means common.

HARRY B. WEISS, New Brunswick, N.J.

POPULAR AND ECONOMIC ENTOMOLOGY.

(This is the first of a series of articles, which, it is hoped, will appeal to our amateur readers and those primarily interested in agriculture. They are not offered as original contributions to science, but may incidentally contain new observations.—Ed.)

SOME INHABITANTS OF A SAND PLAIN IN JUNE.*

BY NORMAN CRIDDLE, TREESBANK, MAN.

The locality chosen for this paper is a drifting, undulated sand plain, some two miles in length and not more than half that distance across at its widest point. It is surrounded on three sides by low, sparsely-grassed, sand dunes, not infrequently scalloped out and bare to the south, and having a denser, or even luxuriant vegetation on the north side. Between these ridges are low, undulated valleys, which in early days were thickly wooded, and often contained small ponds. Now much of the larger timber has been destroyed by fire and the ponds are dry. Scattered over all this area, however, are still numerous white spruce, while aspen poplars are again rapidly making their way through the often dense willow scrub.

On the east of our plain is a large bog extending for a number of miles, containing the usual vegetation including larch, black spruce, birch and a variety of small shrubs and plants too numerous to mention.

On the sand plain, itself, with which we are chiefly concerned, are several islands of trees, surrounded, that is, by sand, and upon which are larch, poplars, birch, willow, maple, cherry, etc., while in the valleys sheltered from the actual drift may be found *Elæagnus argentea*, *Arctostaphylos uva-ursi*, *Petalostemon candida*, and *P. villosa*, *Senecio manitobensis*, wild sunflowers and others.

The sand itself is yellowish-white and on account of constantly drifting, remains permanently wet a few inches below the surface. It is this condition that enables it to support the plants mentioned above as well as a binding grass, *Orizopsis cuspidata*, and two others which grow extensively, namely, a stout form of *Andropogon furcatus* and *Calamovilfa longifolia*.

The date of our trip is June 20th—the locality Aweme, and Province Manitoba.

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

Almost the first plant to attract our attention as we climb into the loose sand is the beautiful Veined Dock, *Rumex venosus*. Just now, however, its chief attraction lies in the fact that it harbours three different species of beetles. First there is that bright little Chrysomelid, *Gastroidea formosa*, whose colour is in striking contrast to the sand, but harmonizes, instead, with the plant it feeds upon. Then there is an active, narrow, black beetle, probably *Anthicus monticola* Casey; and lastly a species closely related to the famous Alfalfa Weevil, namely, *Phytonomus quadricollis*. This beetle is very apt to be overlooked unless we inspect the plants closely, its colour both above and below being almost identical with the sand, and then it has a habit of clinging to the stems near their base when it often becomes partly buried by the drift. Lastly, added to its remarkable protective colouration, are its habit of shamming death whereby it may easily be lost among the sand. The larvæ feed upon the plant and later spin silken cocoons among the leaves, where they change to pupæ, and towards autumn to beetles, passing the winter in this stage, presumably buried among the leaves and sand.

Having passed the objects just discussed and climbed upon the sand to where it is level, probably the first object to attract us will be a species of tiger beetle called *Cicindela limbata*, a beautiful little creature which delights in the pure drifting sand with perhaps on odd clump of grass for shelter. It is here in hundreds running actively about and readily taking wing when disturbed; but it is not a strong flier and consequently seems to depend largely upon its protective colours to escape capture, which, however, avails little when man is the hunter. Larval holes are common enough, being more often met with in the valleys where they are somewhat sheltered from the wind. They are quite shallow burrows, in fact, the shallowest of any of our local species. Two sizes occur at this time, those containing larvæ that are about to change to pupæ, and others much smaller which have yet a full year in which to do so.

A collector visiting a situation like this for the first time, and not knowing the habits of tiger beetles, is apt to be disappointed if the day be either unusually hot or cold. For while every

indication points to a profitable hunting ground, there will hardly be a beetle in sight. Experience, however, teaches that appearance is often deceptive, and here we have no exception to the rule. In reality the beetles are merely hiding from heat or cold, as the case may be. Personally, I have found such periods among the most profitable for collecting, as one soon gets to recognize the peculiar little heaps of sand thrown out as a badger would throw it out, with the entrance carefully closed. These heaps of sand are more compact than those of wasps so common here, and are therefore easily recognized. The holes are always on a slant, and can be readily traced by pushing a stalk of grass along them. Then by moving the sand carefully the beetle will be revealed ready to rush out, which it will do and escape too, if one is not careful. Their temporary homes are seldom more than six inches long and are never used more than once. On cold or rainy days, however, they will be occupied until the return of fine weather.

As a rule, tiger beetles retire beneath the ground each night, but occasionally some species at least, acquire that desire for travelling, which is common to nearly all creation in some shape or form and which, of course, is one of the chief factors in the distribution of animals. Then they disregard all their usual habits and with other diurnal insects fly long distances at night, often indeed in the very darkest of nights. Some species of *Cicindela*, however, do this travelling in the day time when, of course, they run a greater risk of falling a prey to birds.

Moving down into a hollow, sheltered by spruce and Wolf Willow (*Elæagnus*), where the sand is no longer drifting, but still shows many bare spots among the sparse herbage, we encounter a form of *Cicindela lecontei* recently described as a new species by Colonel Casey. It is an interesting tiger beetle, varying from greenish-bronze to rich wine colour and usually having the white markings united into a continuous marginal band. It is not a strong flier, but on account of its habit of remaining on the ground and running to the edge when a net is thrown over it, it often escapes. The larval holes are common here in company with those of *Cicindela lengi (venusta)*. The latter, however, prefer rather more open situations, as does also the adult.

It is bordering the habitat of *C. lecontei* but nearer the drifting sand, that we meet with the finest of all our tiger beetles, a large strong-flying insect which will often travel three hundred feet or more at a stretch. This is *C. manitoba* Leng., next to *limbata*, the commonest on the sand. He is a great terror to ants and other small insects, nor does he take amiss medium-sized beetles, in fact there is one, *Disonycha quinquevittata*, a regular pest on a sand-binding willow (*Salix longifolia*), which seems to form a goodly proportion of the tiger's food. The larvæ of *C. manitoba*, while very similar to other species, are quite original in their methods of constructing a burrow. Other species have nearly a straight hole usually at right angles to the surface, but *manitoba* constructs a cup-like pit into which the burrow enters horizontally from one side and then gradually curls downwards to a perpendicular position. The advantage of this is that it forms a regular death trap to the unsuspecting insect which happens to be crawling near. Possibly this simple method of procuring food is at least in part responsible for the larger size of the species.

Returning again to the centre of the sand we encounter a longish valley blown a'most down to water and sheltered by sand banks. Here on a hot day, we shall encounter all the tiger beetles already mentioned, as well as *obliquata*, *12-guttata* and *repanda*. Among the wet sand here are numerous heaps of sand evidently shoved up by an animal burrowing straight downwards. Select a fresh one and dig carefully to five or six inches and you will discover a roundish beetle rather like a large lady-bird beetle superficially, which in reality, however, belongs to the Carabidæ and is *Omophron americanum*.

In the higher spots are the larval holes of another tiger beetle called *C. lepida*. They are right on the drifting sand and one wonders how the insects manage to keep their holes open or procure sufficient food in such a desert. As a matter of fact there is evidence to indicate that such unfavorable conditions have at least lengthened the larval life to a year beyond the average. Should we be lucky enough to discover a mature larval burrow we might, at this time, trace from it that of the pupal chamber which is the longest I have yet come across. The larva when mature

constructs a burrow branching out semi-horizontally from the original one, commencing about two inches below the surface and having an average length of nine inches, though some I examined extended for eleven. The burrows slant downwards to a depth of five inches from the surface at their extremity. Here in an enlarged chamber the pupa develops, and afterwards the beetle. The adult of *C. lepida* appears toward the end of June and is as perfect as can well be in its colour resemblance to the sand. It is a very weak flier, due doubtless to its being far safer on the sand in its deceiving dress than it ever would be in an attempt to escape by flight.

Lepidoptera are not very much in evidence here in June, but there are a few prizes well worth scouting for. Should we venture to the edge near the swamp we should probably see several butterflies not strictly belonging to the sand, such as our old friend *Eneis jutta*, common enough farther in. Returning to the drier sand we may with good luck see a great rarity called *Copablepharon convexipennis*, though I have no records before July. This species is generally at rest on the sand and unless one is very carefully on the lookout—for it is another sand colour mimic—it will have departed almost before we are aware of its presence.

Among the spreading shoots of *Salix longifolia* may be found a sandy-coloured cutworm, probably *Agrotis aurulenta*. Its work is plain enough to see, but it prefers as a resting place the cool moist sand, and may, therefore, be several inches below the surface.

Another moth very rare at this time, but common a month later, is *Pseudotamila awemensis* Dyar, found as yet nowhere else. Its fore-wings, like so many other creatures found here, resembles the sand, but the secondaries are pure black. It may be found throughout July resting on the sand, or more often on the flowers of Skeleton Weed, *Lygodesmia juncea*.

Among Orthoptera various species of grasshoppers are in evidence, chiefly, however as nymphs. *Hippiscus latifasciatus* is common, as elsewhere, but to my eye looking rather paler than its brethren of the prairies, as if there were an attempt to harmonize just a little with the sand. *Hippiscus neglectus* turns up on the edges of our tree islands or upon the borders of the sand in small numbers.

Then there are various species of *Melanoplus*, viz. *atlanis*, *angustipennis*, *pickardi*, *scudderi*, and probably one or two others. None as yet, however, have reached the winged state. We shall also observe *Ochrilidea cinerea* and perhaps *Amphitornus bieglor* in the more grassy spots. But, the most interesting of all and the only species that can in any way be called indigenous to sand is *Trimerotropis agrestis*. It is present over the whole area in various stages of development, but what makes it particularly interesting is its close resemblance in colour to the sand. It seems to have an instinctive knowledge of its protective colouration, and as a result individuals will be found quite motionless often partly buried. The advantage of such protection is, of course, obvious. On a bare area such as it inhabits, contrasting colours would at once attract the attention of birds, such as crows, robins and others, found in the vicinity, but with a dress matched so perfectly detection is reduced to a minimum.

Of bees and wasps there are numbers, a rich collecting ground for a student of the Hymenoptera never as yet worked over. Among the curiosities to a novice are numbers of large semi-cylindrical cocoons originally buried, but often exposed by the winds having shifted the sand. They belong to a large clumsy predaceous wasp (*Bembex pruinos*), which late in the season becomes a perfect nuisance, buzzing noisily around one's person after flies. To those who do not know they prove quite a terror and I have seen some interesting movements due to fear of being stung. As a matter of fact, however, they appear to be exceedingly harmless, and I have never observed them sting anything larger than a fly, which they use as food for their larvæ.

We shall also meet with numerous true flies (Diptera) though the majority of them are not indigenous to the sand but have been reared in the bog close by—tabanids are there in thousands and it is hardly safe at times to take horses into the vicinity. They do not particularly trouble mankind, however, and on the sand, males are often more plentiful than females, indeed they can be seen hovering in every sunny glade but dart away like a flash when disturbed.

A few flies, however, make their homes here. One, a very pretty Bee-fly, probably belonging to the genus *Exoprosopa*, I

caught some years ago, just emerging from a spot where I had previously marked a *Cicindela* burrow, and as the latter was no longer present I suspect the fly of having been the cause, particularly as Prof. V. E. Shelford records an allied genus as preying upon the larvæ of tiger beetles. Several other species are known to be parasitic, and one has the distinction of destroying locust eggs.

Lastly, as part of the fauna, there is a very beautiful spider (*Geolycosa*) which burrows large holes in the sand, as winter approaches going down five or six feet, but at this time they are comparatively shallow and the females are often but a few inches down with a host of young clinging to their backs. When disturbed with a straw they bite it savagely, and can bite hard too, but curiously enough they have a mortal dread of the various black wasps found later on, which usually paralyze and make use of them for food. I have seen the spiders make frantic efforts to escape from a wasp half their size and eventually when escape was impossible, turn over on their backs and fight, but they fought in despair with the knowledge of almost certain death awaiting them, and thus it always ended. The wasp while keeping at a safe distance was eventually able to use her sting, and soon after was dragging the spider to her burrow.

CATERPILLARS AS WEATHER PROPHETS.

In a Toronto newspaper there recently appeared an article taken from the "New York American," in which a forecast is given of the weather during the approaching winter, stating that "after the most intense cold weather we have experienced for years we shall have a mild spell and great thaws and floods; we shall have a very late and backward spring, with real winter at the time we should have fine spring-like weather. The caterpillar shows light in front, followed with a very well-defined spot of considerable size, and this dark indicates our mid-winter snap. Then the light appears again, and this indicated the warm spell, and if there was no more dark there would be a prospect of a very early spring, but another dark spot appears toward the rear of the caterpillar, and this will bring the late and unseasonable cold at a time we should have our mild weather."

Further on it is stated that "corn husks and the chaff of grain were heavier this season than common, and weed seeds are obtained in heavier coverings than are usually noticed. Larvæ of insects are deeper in the earth. Field mice and other burrowing animals are going deeper, and bark of new wood is much thicker, and weeds are thicker where roots will need protection. All these indicate severe freezing."

The prophet does not tell us what caterpillar he found, but if he had met with a banded larva of the Milkweed Butterfly (*Danaida plexippus*), he might have foretold the whole year of uniform variations during each month, as shown by the stripes on each segment. This is the first time that predictions have been based, so far as we know, upon the markings of caterpillars.

C. J. S. B.

BOOK REVIEW.

THE GENITALIA OF THE BRITISH GEOMETRIDÆ. By F. N. Pierce, F.E.S., The Elms, Dingle, Liverpool, Eng., 1914. Clothbound, price 10/-.

This is a companion volume to the work on the "Genitalia of the British Noctuidæ" published by Mr. Pierce in 1909 and it is gratifying to learn that the reception accorded it was so encouraging that not only is the volume on the Geometridæ before us, but the author promises that an account of the Genitalia of the Tortricidæ will follow at an early date.

The superficial resemblances that exist between many species of the Geometridæ of Europe and those of North America and especially of Canada have led to endless muddles in our lists, some collectors and authors considering them identical while others are equally certain that they are not. Having now such excellent drawings and descriptions of these structural details of practically every one of the British species, made not from one slide of each but from five or six up to over twenty specimens, and checked and rechecked by the author and his friend, the Rev. C. R. N. Burrows, F.E.S., we should be able to determine whether in our related N.A. species these structures show positively that they are distinct or that they are the same species.

Turning to the book, the introduction gives the names and descriptions of the various parts, a few of which have been altered from those used in the *Noctuidæ*, so as to adopt names which had the right of priority of usage and it is to be hoped that no further changing will be necessary.

This is followed by a classification of the British species based on the male and female genitalia, comprising 78 pages. The family is divided into two primary divisions, designated as *Gnathoi* and *Agnathoi*, according to whether the gnathos is present or absent. The former comprises ten and the latter fifteen sub-families, producing an arrangement quite unfamiliar and which will no doubt give food for thought and pen to those who hold that no classification should be based on one set of characters only.

The figures of the male organs are given on 48 plates—the name of the species being printed below each drawing—a decided improvement on having numbers and a key somewhere else. In many cases the female genitalia are figured to the left of the male.

The book and its illustrations, showing not only the diversity but also the wonderful beauty of these structures as exhibited in one single family, cannot help being of the greatest interest to Lepidopterists and I am sure that the author will gladly extend to any of our readers the privilege offered the writer in a recent letter, namely to give his assistance in forming opinions on the connections of certain species or genera.

A. F. WINN.

WE would remind our readers that subscriptions are now due, and that these and all other business matters connected with the Society or Magazine, such as advertisements, requests for back numbers, etc., should be addressed, *not to the Editor*, but to

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FURTHER NOTES ON ALBERTA LEPIDOPTERA, WITH DESCRIPTION OF A NEW SPECIES.

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

(Continued from page 8.)

620. *Agrotis bollii* Grt.?—One female at light, September 3rd, 1904. This is the specimen mentioned by me in *Can. Ent.*, XXXVII, p. 58, Feb., 1905, as "darker and less clearly marked" than *Euxoa mollis*, from which I can easily distinguish it now that I know the latter species better. Grote described the species as *Agrotis hilaris* from a Texas male, which is in the British Museum, but he afterwards found the name preoccupied in the genus in Europe, and substituted *bollii*. Sir George Hampson, however, placing the European and North American *hilaris* in different genera, restores the prior name, which Grote never altered on the type label. The type has a black collar, which my specimen has not, and lacks a dark brown costal mark near the apex possessed by mine, which is also less grey and has the orbicular of different shape. There were no other specimens in the British Museum. A female from Huachuca Mountains, Ariz., in Smith's collection, I think the only one he had standing as *bollii*, appeared more like mine, and also lacked the black collar.

621. *Noctua acarnea* Smith.—(*Journ. N. Y. Ent. Soc.* XIII, 194, Dec., 1905).

Described from a single male taken by Mr. Sanson at the Banff Museum on July 11th, 1902. I examined the specimen in Smith's collection in January, 1910, and took very careful notes thereon, as it appeared quite distinct from anything I had previously seen. Nor could I, until just before writing the present article, discover anything which might be it amongst the material sent me for naming from time to time by Mr. Sanson. But by good fortune I have before me at this moment a male in good condition taken by him on an electric light pole on July 4th, 1914, and submitted to me just in time for recording here.

It fits Smith's description and my notes exactly, with the exception that I should not call the discoidal spots in the recent capture "large," and the space between them is scarcely darker than the ground. The expanse is 36 mm., a trifle smaller than the size given of the type. It would never have occurred to me to associate the species with *bicarnea* at all. In type of maculation it comes much nearer to *dislocata* Sm., but the colour differs entirely, being very even "dark, almost blackish brown, with a purplish tinge," except for bright, pale carneous patagia, and a carneous shade in and round the reniform. The apparent purplish tinge is probably really due to slight iridescence. All the tibiae are spined, the fore tibiae on the inner side only, as is often the case with *dislocata* and *calgary*. I was unable, however, to discover any spines on the fore tibiae of the type, but noted that they were not in a position easy for examination. The antennae are minutely ciliate, and in the recent capture at any rate, rather heavily scaled as well. The eyes are without lashes. The head and thorax are thickly clothed with rough hair only, without crests. The wing form and general build is like *dislocata*, in which the antennal structure is similar except that *dislocata* has fewer scales, and rather longer ciliations. The thoracic vestiture is rather rougher than in *dislocata*. As far as these characters go, it seems referable to *Episilia* Hbn., which is used by Hampson as prior to *Pachnobia* Gn. and *Choephora* Grt. It appears to me that both *calgary* and *dislocata*, if not some others which Hampson refers to *Agrotis*, fit better with *Episilia*, as both have loose hairy vestiture without obvious crests. But *acarneã* has one structural peculiarity not hitherto observed in any North American genus referred to the Agrotids except *Trichorthosia*, to which this is quite distantly related. The eyes are sparsely and finely hairy. I mentioned this to Prof. Smith after examining the type, but he was unable to find the hairs and told me that I was mistaken. If I had not been very sure of my point, however, I should not have taken a note on the fact, and on examining the eyes of the recent capture I find the same. The hairs are not easily noticeable, I admit, and anyone might be excused for overlooking them. They are most easily seen in strong sunlight. They are not much easier to find in some specimens of *Perigea alfkenii*, though they are finer in *acarneã*

than in that species. The apparent general relationship to *dislocata* and *calgary* led me to expect to find that these might have hairy eyes, but an examination of a considerable number of specimens has failed to reveal any.

622. **N. bairdii** Smith.—(Journ. N. Y. Ent. Soc. XVI, 84, June, 1908). Described from a single female taken at High River by Mr. Thomas Baird. I saw and took notes on it before Fletcher recognized it in Mr. Baird's collection as something strange and sent it to Smith. Smith says after the description: "There is no very near ally to this species. It belongs obviously to the *lubricans* series, and stands next *atricincta*, than which it is much larger, quite different in ground colour and without the obvious transverse lines. So far as they go, however, the lines in *bairdii* correspond in position with those of *atricincta*." I saw the specimen for the second time at Rutgers College, and noted that it was "rather like a large *digna*. Possibly an ally of *exuberans*. Certainly not *atricincta*." I have certainly never met with another specimen in Alberta that could be this species.

623. **N. vocalis** Grt.?—Banff, July 30th, 1910. N. B. Sanson. In 41st Rept. Ent. Soc. Ont. for 1910 (page 10 of the "Record") I erroneously recorded this specimen as *vernilis*. I corrected the error in Ent. News, XXIV, 361, Oct., 1913, and on page 360 I followed Dr. Dyar in citing *planifrons* and *congrua* as synonyms. From my notes I judge my No. 623 to have been *vocalis*, though I cannot be quite sure of it until I see the specimen again. It was most certainly not *vernilis*. (q. v. No. 618).

624. **Chorizagrotis boretha** Smith*.—(Journ. N. Y. Ent. Soc., XVI, 86, June, 1908). Described from three males and a female from Kaslo, B. C. I have seen a male and female type in the Rutgers College collection. A note after Smith's description states that it is allied to *terrealis*, and in a general way resembles *perexcellens*. I believe that the supposed relationship to *terrealis* was based on an erroneous identification of that species, and failed to notice any resemblance to *perexcellens*. I have two perfect females taken on my place here on Pine Creek, on Aug. 16th, 1901, and Aug. 27th, 1905, exactly alike, and beyond all doubt one species, which I have never yet succeeded in closely associating

*Breeding results have now shown that Nos. 225 and 244 of this list are one species, *sordida* Smith, and in all probability forms of *boretha*.

with anything else listed by me in this series of papers. One of these I have compared with the types of *boretha* and labelled it "Like female type but greyer." On this comparison I base the present record, but it may be as well to remark that my notes state that "The male type is almost like some *ochrogaster*." Whereas my two females bear not the slightest resemblance to any *ochrogaster* that I ever saw, my note seems to suggest that either the range of variation in *boretha* is very wide, or that the female type is not really the same species as the male.

The same Pine Creek female I also compared with the unique female type—lacking abdomen—of *Porosagrotis thanatologia* Dyar, from Kaslo, which I found in the Washington collection. (Proc. U. S. Nat. Mus., XXVII, p. 833, 1914—"Kootenai List"). I noted that it was probably the same species, but my specimen did not match it sufficiently closely to justify making a positive reference.

625. *Rhizagrotis querula* sp. nov.—Head, collar, thorax, and primaries uniform pale fuscous brown, faintly olivaceous, sparsely irrorate with darker scales, but without any streakiness or contrast in shades. *Lagena*, to which the new species is closely allied, has the inferior portion of the collar paler than any other part of the insect, and the upper portion contrastingly dark brown, these two shades being divided by a black line, absent in *querula*. *Lagena*, in all its observed variations is longitudinally streaky, the most conspicuous streaks consisting of long, inwardly dentate or sagittate dark brown marks on the termen, which contrast with the intervening pale streaks bordering the dark veins, especially on 1, 3, 4, and 7. In *querula*, though there is a faint indication of a series of dark subterminal shades in the interspaces, most evident in the male type, but entirely lacking in the female, the actual terminal space is in all six specimens very slightly paler than that immediately preceding it. In *querula* the conjoined discoidal spots, though outlined by a pale shade and partially defined by black scales, have not the whitish annuli of *lagena*, and unlike those of that species, are not contrasted by a darkening of the cell before and below them. A fine black basal streak is present in all but one, and all show indications of dark t. p. lines, produced to points on the veins, and in two of the males they are well marked, continuous, some specimens showing a faint t. a. line as well. But

these are occasionally discernible in *lagena*. In *querula* the secondaries of both sexes are slightly dull, and in the male lack the clear whiteness of those of *lagena*. Antennæ and all superficial structural characters, as in *lagena*. Expanse: Male 38-44 mm.; female 46 mm. (equalling *lagena* in size).

Described from five males and one female from the Red Deer River, about 50 miles to the north east of Gleichen, Alta. July 1st and 3rd, 1905; and July 23rd and 24th, 1907. All but one in good condition. Taken by Mr. A. F. Hudson and the author at dusk at snowberry flowers, and at treacle.

Types.—♂ in the collection of the author, ♀ in that of Dr. Wm. Barnes. I have made three of the remaining four males co-types.

This is the species which I recorded under the name *lagena* in 37th Rept. Ent. Soc. Ont. for 1906, p. 94, 1907, and 38th Rept., p. 121, 1908 (page 9 of the "Record" for 1907). It is possible that it may turn out to be merely a variety of that species, though I have nothing suggesting an intergrade, and have no record of *lagena* from Canada. The type of *lagena* is a female from Nevada, and is figured by Hampson. I have compared it with one of my Utah specimens, of which I have a long series. I have it also from Colorado, New Mexico, and Arizona, and it is recorded from Montana.

626. **Feltia volubilis** Harv.—I have three males and a female which I took at the Chalet lights, Laggan, on July 17th and 18th, 1907, and Mr. Sanson took a male at Banff on about June 24th, 1914. One of the males I have compared with the male type from New York in the British Museum, and found it a very close match. It is of the dark red-brown form figured by Hampson, but differs from all my eastern specimens of that form in having the secondaries uniformly dark. I have one Washington and one Oregon specimen with secondaries pale as in the eastern form. On the other hand, all my eastern examples of the paler and greyer *stigmosa* have uniform dark secondaries in both sexes. Holland's Plate XXII, fig. 23, is of this latter form. The two forms appear to be now universally accepted as one species, though I can find no record that both have ever been bred from one. Specimens from some localities certainly appear about intermediate. For instance, I

have Manitoba males which belong to neither extreme, but have the centrally pale subhyaline secondaries of typical *volubilis*.

I have a Kaslo male exactly like those from Laggan. Other Kaslo specimens have vinous red shades contrasting with a pale, sometimes almost violaceous grey ground, like typical *vancouverensis* from Vancouver Island. But study of a long Kaslo series has left me in serious doubt as to whether *vancouverensis* and *volubilis* are really distinct. A somewhat intermediate form is that named *semiclarata* by Grote, of which the type is from Washington Territory. I have compared a Kaslo male with it, and found it to match exactly. A Corvallis, Oregon specimen, perhaps a trifle nearer to typical *vancouverensis* than is *semiclarata*, I have compared with Strecker's three female types of *atha* from Seattle, Washington, and believe it to be the same.

As a rule a good point of distinction between *vancouverensis* and *volubilis* is in the subterminal line. In the former this is more or less distinct, crenulate, with a fairly well marked and not very deep W. In *volubilis* it is often lacking, or when faintly indicated is sharply dentate, with a W reaching clear to the margin. But this character does not always hold, and where colour characters fail, as is so often the case in the material from the mountain districts inland, a positive reference to either *vancouverensis* or *volubilis* is not always possible. Dr. Dyar apparently met with this difficulty when, in the Kootenai List, after recording the capture of seventy-five specimens of *vancouverensis*, he follows them up with only one of *volubilis*, adding: "This seems to me only an extreme form of *vancouverensis*." (Proc. U. S. Nat. Mus., XXVII, p. 832, 1904). I should add that I have examined other Kaslo material of this group besides that in my own collection.

627. **Porosagrotis orthogonia** Morr. var. **delorata** Smith. The North-western Canadian form of *orthogonia* was described as a species as *delorata* by Smith in Journ. N. Y. Ent. Soc., XVI, p. 87, June, 1908, from a single male taken at High River by Mr. Baird. Mrs. Nicholl had taken a male which stands in the British Museum collection labelled "B. C. prairie 1. IX. 07," though the specimen is recorded by Sir George Hampson, under *orthogonia*, in Can. Ent. XL, p. 102, March, 1908, as from "Alberta prairie." From the date, and knowledge of Mrs. Nicholl's movements, I should judge

Alberta to be its most probable origin. I had for some years previously had a couple of specimens in my collection from Regina, Assa. In the spring of 1911 "cutworm" larvæ were reported as doing very serious damage to fodder and field crops in Southern Alberta, round Lethbridge, Monarch, etc. (42nd Rept. Ent. Soc. Ont. for 1911, p. 94 [p. 6 of the "Record"]—1912). Larvæ sent to the Experimental Farm at Ottawa produced specimens of *delorata* on Aug. 14th and 20th of the same year, the specimens being sent to me for determination. I received a couple more males from Mr. Baird labelled High River, Sept. 1st, 1911, and have seen two pairs taken by Mr. J. B. Wallis at Lethbridge on Aug. 23rd to 26th, 1912. *Orthogonia* was described from Glencoe, Nebraska. I have specimens from Colorado, and a very large number from Utah. The few Canadian specimens I have seen have all been more uniformly dark olivaceous in tone than is usual with southern examples, and have wholly dark secondaries. Morrison's type, which I have not seen, had the "markings well expressed," and secondaries whitish inwardly. Pale secondaries are usual in my southern series, but some have them very nearly as dark as Canadian specimens, and differ scarcely if at all as to primaries. In short, comparing Alberta specimens with some of my darkest from Colorado and Utah, there is really no difference worthy of remark. I should never have considered the darkest forms to be worthy of a varietal name, but as one has been named, let *delorata* stand for a dark olivaceous variation of *orthogonia* without pale shades and with wholly dark secondaries in the male. I have previously explained that the *orthogonia* recorded by me with a query as No. 236 in my original notes (Can. Ent., XXXVII, p. 53, Feb. 1905) was a different species. I now believe that specimen to have been a badly worn and bleached *ridingsiana*.

628. **Euxoa rabiata** Smith.—(Trans. Am. Ent. Soc., XXXVI, p. 255, Nov., 1910). Described from six males and two females from Volga, South Dakota; Colorado; and Calgary, one of the females being from the latter place, and dated Aug. 29th. I happen to have taken some notes on a group of specimens standing separated in Smith's collection, from which, or from a selection of which the description referred to was subsequently made. Judging from these notes in conjunction with the description, I think it very

probable that the name refers to *dargo* Strecker (No. 237 of this list), or to a mixture of that and *niveilinea*. The latter species I have never taken.

629. **E. dolens** Smith.—(Can. Ent., XXXVIII, p. 226, *Setagrotis*, July, 1906); syn. *quinta* Smith (Ann. N. Y. Acad. Sci., XVIII, p. 97, *Euxoa*, Jan., 1908). *Dolens* was described from a male and two females from Beulah, Man., and Arrowhead Lake, B. C. I saw a pair of types in Smith's collection, the male from Beulah, and the female from Arrowhead Lake. *Quinta* was described from three males and two females from High River (Baird), and Kaslo (Cockle), and I have seen a type from the former locality in Smith's collection. I made the reference in my notes after direct comparison of the types, and Smith admitted its correctness to me personally. It is a close ally of and agrees structurally with *scandens* Riley, which Hampson places in *Lycophotia* Hbn. Both species lack the tuberculate frons of *Euxoa*. Compared with *scandens* the newer species is darker, has more distinct t. a. and t. p. lines, and uniform dark secondaries. I have a defective male from High River, dated September 7th, 1908. The dates given under the description of *dolens* are Arrowhead Lake, June 8-15, and Beulah, Aug. 28th. Under *quinta*, Kaslo, June 1st, 30th, and July 7th and 10th. No dates to the High River types.

Quebecensis was described from a single female from Quebec, and referred doubtfully to *Setagrotis*. I have seen the type in the Washington Museum, and though I had nothing with which to compare it, I believe that this will be found to be a prior name to *dolens*.

630. **E. septentrionalis** Walk.—A male at Lethbridge on Aug. 21st, 1912, by Mr. Wallis. This is the only example taken in Alberta that I have seen, which I have been quite certain was this species, and all the records I have seen under the name from other places in Canada east of the Rockies have proved erroneous upon investigation. It is a species sometimes very closely resembling *messoria*, so closely in fact as to make separation very difficult, but it is undoubtedly distinct, as listed by Hampson, who correctly makes *incubita* Smith a synonym. It is sometimes very common on Vancouver Island. Another very closely resembling, though smaller species, is *pestula* Smith. (My Nos. 249 and 265).

[631. **E. rufula** Smith.—In Prof. Smith's collection I found a specimen marked "*rufula* Smith Xd type," and bearing label "Ft. Calgary, N. W. B. C." Smith told me, however, that the accuracy of the label was doubtful. That is to say, that it is doubtful whether the specimen was really taken at Calgary, which, though formerly a fort, was never in B. C. *Rufula* is not a synonym of *infausta* as listed by both Smith and Hampson, but is the species figured by Hampson, I think erroneously, as *basiflava*.]

632. **E. compressipennis** Smith.—A female taken at Banff, at light, on Aug. 19th, 1909. In 41st Rept. Ent. Soc. Ont. for 1910 (page 11 of the "Record"), 1911, I recorded the specimen as *basiflava*, and an added note says: "This was described from N. W. B. C. *Compressipennis* was described from Yosemite, B. C. The types are identical." That note unfortunately contains two inaccuracies. *Compressipennis* was described from Yosemite, California, which I feel convinced was the statement that I sent into print. But "the types are identical" was my own unguarded statement. What I should have said was that the male type of *compressipennis* in the Washington Museum was absolutely identical with the female type of *basiflava* in the same collection. The latter was described from "North West British Columbia" (possibly meaning the Alberta Rockies—who can tell?), I think from a single pair only. I had previously seen the male type also in the Neumoegen collection in the Brooklyn Museum, and do not feel confident that it is the same species, and must therefore modify my positive reference until I can positively identify the male type.

633. **E. obeliscoides** Gn. and var. *infusa* Smith.—*Infusa* was described as a species from two males, from Cartwright, Man., and Black Hills, Wyo. The Cartwright specimen is the type in the Washington Museum. The other I have not seen. A note after the description adds: "The species is really *obeliscoides* without the contrasting costa, and with the t. p. line lost so that there is an almost even shade below the cell from t. a. line to outer margin; the terminal space being scarcely deeper. The ground colour and general variation in tint are as in *obeliscoides*, but the species is perceptibly smaller."

Obeliscoides is not rare at Cartwright, and most specimens that I have seen from there entirely lack the red-brown shades of

Guenée's type and of Grote's *sexatilis*. I have no note as to whether the type of *infusa* lacks them, and they occasionally exist in Manitoba specimens, but it was not on their absence that the supposed species was based. The costa is not usually very contrasting and occasionally the t. p. line is very indistinct, so I suppose Smith's name should stand for a rather small form possessing these characters, which are not characteristic of the prairie race as a whole.

I have a female taken here on September 2nd, 1907, to which the varietal name seems applicable, and have seen a male of the species taken at Lethbridge by Mr. Wallis on August 8th, 1912.

It is practically impossible to distinguish some Manitoba females from some of that sex of British *obelisca* Hbn. in my possession, though North American males appear to have finer antennal serrations than males of *obelisca*.

634. **E. colata** Grt.—I saw a male in Smith's collection labelled "Laggan, 6,800 ft.," presumably from Bean. A male taken by Mrs. Nicholl at 8,000 ft. on Wilcox Peak is in the British Museum, and is evidently the same species as the female type there from Mt. Hood, Oregon. A third male, in splendid condition, was taken by Mr. Sanson on the summit of Sulphur Mt., Banff, about 7,200 ft. The species appears to be more closely allied to *mollis* than to *divergens*, with which Grote associated it.

(To be continued.)

SOME CHALCIDOID HYMENOPTERA FROM NORTH QUEENSLAND.

BY A. A. GIRAULT, NELSON (CAIRNS), AUSTRALIA.

(Continued from page 20.)

Family ELASMIDÆ.

Genus *Elasmus* Westwood.

1. **Elasmus margiscutellum**, n. sp.

Female.—Length 1.70 mm.

Dark metallic green, the distal margins of mesopostscutellum and the scutellum margined with lemon yellow. Sides of thorax and legs black, the tegulae, knees, tarsi and distal half or less of intermediate and cephalic femora pale yellowish white, the antennæ

brownish. Abdomen with base concolorous transversely and also the distal fourth, the rather long intervening portion orange yellow marked along each side (from both dorsal and ventral aspects) with a longitudinal row of from 3 to 4 black dots. Wings subhyaline. Mandibles with eleven teeth, the first two large, the others minute. First ring-joint very short. First funicle joint longer than the pedicel, the distal one only slightly longer than the pedicel but longer than any of the club joints.

Male.—Not known.

Described from one female captured by sweeping the forest growths on Mount Pyramid (1500—2500 feet), June 2, 1913 (A. P. Dodd).

Habitat.—Australia—Nelson (Cairns), Queensland.

Type.—The above female on a tag and a slide with the head.

2. *Elasmus orientalis*, n. sp.

Female.—Length 1.57 mm.

Like *pallidicornis* Girault, but the antennal concolorous with the body, the scape (except slightly above) pale brown and the cephalic tibiae are white; also the knees. Moreover, the funicle joints are subequal, all distinctly longer than wide and each a little longer than the pedicel.

Male.—Not known.

Described from one female captured by sweeping in a jungle, May 18, 1913 (A. P. Dodd).

Habitat.—Australia—Kuranda, Queensland.

Type.—The above specimen on a card or tag.

Family CHALCIDIDÆ.

CHALCITELLINI.

Genus *Chalcitelloides* Girault.

1. *Chalcitelloides nigrithorax*, n. sp.

Female.—Length 2.60 mm.

Black but like the type species (*nigriscutum*) except that only the scape, pedicel and first four funicle joints are red; abdomen blood red, but black above and along upper half of each side (a little proximad of middle), the petiole black; tegulae and legs (except coxae) blood red, the hind femur with a long rounded black spot centrally. Antennae 11-jointed. Fore wings lightly stained.

Funicle joints after the first wider than long, the rather indistinctly sutured first club joint shorter than the other joint of that part; joints of funicle widening distad, the flagellum clavate. Punctures of thorax not densely confluent, separated. (Median carina of propodeum not seen distinctly).

Male.—Not known.

Described from one female captured from a window, November 4, 1912.

Habitat.—Australia—Proserpine, Queensland.

Type.—The above specimen on a tag and a slide bearing the head, a fore and a hind leg.

The antennæ of this genus were originally described as being 10-jointed, but a re-examination of the type, shows that its club is 2-jointed, the black portion being the distal or second joint.

Family AGAONIDÆ.

Genus *Agaon* Dalmar.

1. *Agaon nigriventre*, n. sp.

Female.—Length 2.20 mm., excluding ovipositor, which is exerted for a length about equal to that of the abdomen.

Orange yellow, the posterior margin of the head, flagellum, all of the abdomen except at base, an hour-glass shaped marking down meson of pronotum and cephalic part of scutum (a smaller end cephalad; shaped like an inverted egg-cup), a stripe across apex of thorax (about apex of scutellum), the tegulæ and a dot in a line longitudinally with them, cephalad (opposite the apex of the egg-cup-shaped marking) jet black; also the valves of the ovipositor. Agreeing with all the characters of the genus as given by Ashmead, but the mandibles bidentate at apex (but four teeth or even five in all), the antennæ 9-jointed without a ring-joint, the scape hemispherically dilated (foliaceously). First and second funicle joints subequal, longer, longer than the pedicel, which is subequal to the distal funicle joint. Postmarginal vein longer than either marginal and stigmal, the latter shortest. Wings hyaline. Body glabrous.

Male.—Unknown.

Described from one female received from the South Australian Museum, Adelaide, mounted on a card labelled "A. M. Lea."

Habitat.—Australia—Mount Tambourine, Queensland.

Type.—The above specimen, the head on a slide.

Family PTEROMALIDÆ.

SPIEGIGASTEINI.

Eurydinotomorpha, new genus.

Female.—Closely allied with *Eurydinotella* Girault but the abdomen is long, pointed conic-ovate, the second segment occupying only about a fifth (or slightly more) of the surface, the abdomen longer than the head and thorax united. Postmarginal vein very long, over twice the length of the stigmal. First funicle joint longest, longer than the pedicel. Propodeum with abbreviated median and lateral carinae. Parapsidal furrows a little over half complete. Second abdominal segment nearly four times the length of the third, the fourth nearly twice the length of the third, subequal to segment 5, segment 6 a little longer than 4 and 5 while 7 is apparently as long as, or longer than, 2. Petiole distinct, but short. Caudal margin of abdominal segments straight. The genus has the habitus of *Sympiesis* of the Eulophidae.

Male.—Not known.

Type.—The following species.

1. **Eurydinotomorpha pax**, n. sp.

Female.—Length 3.00 mm.

Metallic shining blue, the abdomen æneous green, purple dorsad, the wings hyaline, the venation tarsi, tips of tibiae and scape pale yellow, the femora and tibiae reddish brown, the coxae concolorous. Pedicel and first ring-joint suffused with pallid. First club joint forming over half the club, subequal to the third funicle joint which is a fourth longer than the pedicel. Short white hairs on mesoscutum giving an effect somewhat as is common with species of *Catolaccus*. Head and thorax reticulated, the propodeum more densely so, the network smaller, the abdomen finely so. Funicle and club black.

Male.—Unknown.

Described from one female captured by sweeping in jungle, October 28, 1911.

Habitat.—Australia—Babinda (near Cairns), N. Queensland.

Type.—The above specimen on a tag and a slide with hind legs and the head.

Family MISCOGASTERIDÆ.

PIRENINÆ.

Erotolepsiella, new genus.

Female.—Running to *Erotolepsia* Howard, but the stigmal and postmarginal veins extremely long, subequal, each over three-fourths the length of the marginal, the antennal pedicel somewhat shorter than the solid club, the eyes naked or nearly so. There is a single ring-joint and the first funicle joint is subquadrate and narrower than the others, the second and third joints longest. Fore wings banded. Cephalic femur somewhat swollen, but simple. Mandibles tridentate. Parapsidal furrows complete, delicate. Abdomen pointed conic-ovate, the second segment longest but occupying only about a third of the surface, its caudal margin entire. Propodeum with a neck but with no carinæ, rugose, the scutellum with a not very distinct cross-furrow before apex. Abdomen with a short, stout petiole. Antennæ 11-jointed. With the habitus of the Pteromalidæ.

Male.—Unknown.

Type.—The following species.

1. ***Erotolepsiella bifasciata***, n. sp.

Female.—Length 1.80 mm.

Purplish brown, the tip of the abdomen ringed narrowly with white, the distal part of metathorax and the short abdominal petiole also white. Legs concolorous, the tarsi yellowish white, the antennæ concolorous. Fore wings with two conspicuous black-brown bands across them, the first narrow and from the bend of the submarginal vein, the second very broad and from the stigmal vein. Thorax punctate.

Male.—Not known.

Described from a single female captured by sweeping in jungle, October 28, 1911.

Habitat.—Australia—Babinda, North Queensland.

Type.—The above specimen on a tag and a slide with the head and posterior tibia.

Family CALLIMOMIDÆ.

MEGASTIGMINÆ.

Genus *Neomegastigmus* Girault.1. *Neomegastigmus collaris*, n. sp.

Female.—Length 1.35 mm., excluding the ovipositor, which is about equal to the abdomen in length.

Like *lividus*, but the ovipositor is shorter and the pronotum pale orange yellow; also the legs are whiter, not pale lemon yellow. The scutellum is uniformly sculptured in both species, like the rest of the mesonotum. Also the head is dark orange yellow. Abdomen subsessile.

Male.—Not known.

Described from a single female captured by sweeping in open forest (grasses), March 11, 1912.

Habitat.—Australia—Thursday Island, Torres Strait.

Type.—The above specimen on a tag, the head on a slide.

2. *Neomegastigmus petiolatus*, n. sp.

Female.—Length 1.95 mm., excluding the black exerted valves of the ovipositor, which are about two-thirds the length of the abdomen.

Orange yellow, the abdomen (its short, distinct petiole pallid), propodeum and distal third of scutellum purplish black. Fuscous spot from stigma large, nearly a band across the wing. Caudal margin of segments 2-4 of abdomen incised at meson, the incision large, wide on segment 2, minute on segment 4. Cephalic legs (femur and distad) pale the others concolorous with the abdomen, but all tarsi pale, the antennæ straw yellow; funicle joints all shorter than the pedicel. Thorax densely reticulated and transversely lineolated.

Male.—Not known.

Described from one female captured by sweeping lantana and other bushes in a field near town, October 21, 1911.

Habitat.—Australia—Mackay, Queensland.

Type.—The above specimen on a tag and a slide bearing the head.

3. *Neomegastigmus lividus* Girault.

One female by sweeping lantana and other bushes in a meadow near the town of Mackay, Queensland, October 21, 1911.

IDARNINÆ.

Genus *Philotrypesis* Foerster.1. ***Philotrypesis longiventris***, n. sp.

Female.—Length 2.75 mm., exclusive of the ovipositor. Brownish black, the legs including the coxæ yellowish brown, the wings hyaline; sides and venter of abdomen yellowish brown. Scape concolorous with the legs, the flagellum black, the black pedicel subequal to the first funicle joint, the next two (joints 2 and 3) funicle joints subequal, each a little shorter than 1; distal funicle joint a little longer than each of the three club joints. Clypeal area yellow. Mandibles bidentate. Body, including propodeum and abdomen, finely scaly, the propodeum without a median carina.

Male.—Unknown.

Described from one female captured by sweeping in a jungle pocket, June 4, 1913.

Habitat.—Australia—Nelson (Cairns), Queensland.

Type.—The above specimen on a tag, the head on a slide.

Genus *Sycoscaptella* Westwood.1. ***Sycoscaptella angela***, n. sp.

Female.—Length 2.26 mm., excluding the black ovipositor, which is nearly as long as the body.

Deep pinkish orange, the wings hyaline, the legs and scape concolorous, the flagellum dusky. Three transverse black spots across meson of abdomen, the first smallest, all more or less triangular; also a black dot at meson, apex of fifth segment and which is nearly joined to the narrow black dorsal surface of the (following) two produced or tubular segments of which the second is shorter. Postmarginal vein longer than the stigmal. Propodeum with three delicate sulci at meson, separate, the scutellum simple, but both it and the scutum with a median longitudinal impression. Thorax finely reticulated. Antennæ 13-jointed, three ring and club joints, the funicle joints only slightly longer than wide and more or less equal. Mandibles bidentate.

Male.—Unknown.

Described from one female captured by sweeping in forest, November 6, 1912.

Habitat.—Australia—Ayr, Queensland.

Type.—The above specimen on a tag and a slide with the head.

NOTES FROM OTTAWA.

Mr. H. F. Hudson, Field Officer of the Entomological Branch, in charge of the Entomological Laboratory at Strathroy, Ont., has given up his Entomological work and has joined the First Battery of the Canadian Field Artillery of the Second Contingent which is expected to leave for England for service abroad early in 1915. He is now in training with his company at London, Ont. The good wishes of his many Entomological friends will go with him.

Mr. J. B. Gareau has been appointed a Field Officer and Inspector of the Entomological Branch and commences his duties on January 1st. Mr. Gareau is a graduate of the Quebec Forestry School and during the last two years has been an officer of the Forest Service of British Columbia. He has also studied under Prof. Kellogg at Stanford University, California from which institution he was appointed. Mr. Gareau will continue the work formerly carried on by Mr. Hudson.

POPULAR AND ECONOMIC ENTOMOLOGY.

DEFORMED APPLES AND THE CAUSES.

BY L. CAESAR, GUELPH, ONT.

It is a very common occurrence in almost every district to find apples that are so deformed that they have to be rejected as culls. Neglected orchards have usually, as one would expect, the greater proportion of such fruit; there are, however, exceptions where the best cared-for orchards suffer severely. Although most of the causes of these deformities have now been discovered there are still some cases that have not yet been solved.

Insect Injuries as a Cause.

The chief insects to which malformed apples may be attributed are Plum Curculio, Apple Curculio, Leaf-bugs or Capsids, Aphids, Apple Maggot or Railroad Worm, Leaf-rollers and Green Fruit-worms. Each of these will now be discussed in turn.

Plum Curculio. Many apples and pears are deformed as a result of the egg-laying and early feeding habits of this small snout-beetle. The injury in such cases is done while the fruit is still small. The eggs in these apples or pears either fail to hatch

or the young larvæ die very early, because if they live, the fruit almost always falls prematurely. The malformation is due to the tissues immediately around the injured area not growing or growing very slowly while the rest of the apple grows at the normal rate; therefore a depression is produced at the affected part. There are often several such depressions in a fruit. There is usually a scar at the point of injury. Uncultivated and neglected orchards and those bordering on woods or thickets or waste places are regularly much worse attacked than well cultivated and sprayed ones.

Apple Curculio. This is also a snout-beetle. It is smaller than the Plum Curculio, and has a longer and more slender snout.

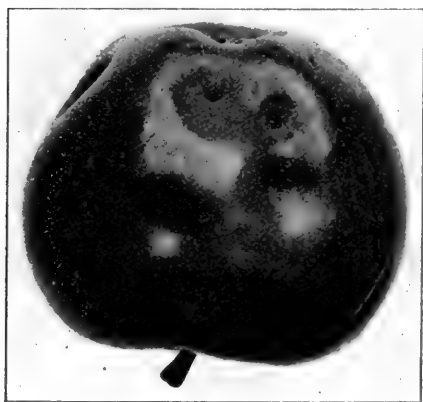


Fig. 1.—The work of the Apple Curculio. Notice the little holes at the bottom of the punctures and the uniform inverted cone type of the depression.

With this it eats deep holes into the fruit for feeding and egg-laying purposes. As in the case of the Plum Curculio, apples usually drop early if the larvæ from the eggs hatch and live; otherwise they remain on the tree, but are deformed in the manner shown in the photograph. Note the regular inverted, cone-shaped outline of the depression with the little hole at the apex. This helps in the identification of the injury. Apple Curculios are not very common in

most parts of Canada, but there are a few counties in which they do much damage.

Leaf-Bugs or Capsids. These insects have in recent years been found to be the cause of a large number of deformed apples in the Northern United States and in parts of Canada. At least five species are now known to cause malformed apples, viz., *Hetero-*

cordylus malinus, *Lygidea mendax*, *Neurocolpus nubilus*, *Paracalacoris colon* and *Lygus invitus*. The injuries in each case are made while the fruit is still small and are caused by the nymphs or young bugs making deep punctures into it with their needle-like mouth

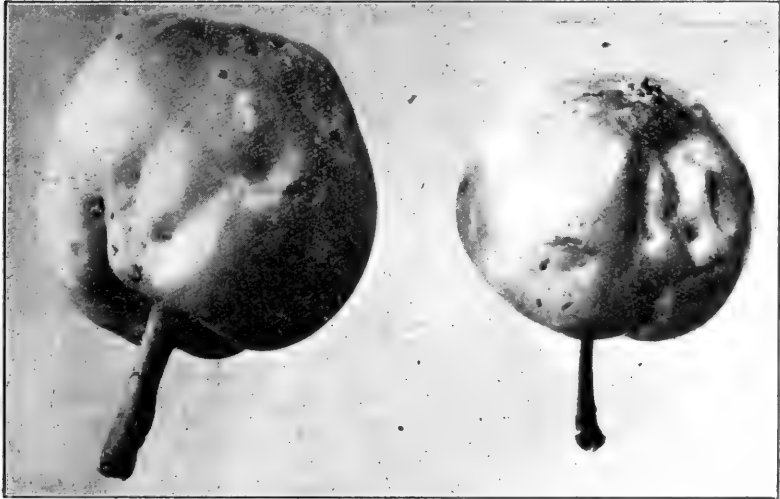


Fig. 2.—Work of Capsids or Leaf-bugs on apples. This is done when the apples are very small.

parts. The juice is sucked out through these punctures. Very severely injured apples usually drop off. The remainder hang on but are often much distorted in consequence of the punctures received. The nymphs of the first two species are red and easily seen; those of the others are usually greenish or brownish green colour, and are more likely to escape observation. The addition of a tobacco extract, such as Black-leaf 40, to the regular Codling Moth spray will do much to destroy these insects.

Aphids. Most fruit growers are familiar with the clusters of small woody, more or less deformed apples caused by these sucking insects. Wherever the aphids feed upon a young apple, they leave little depressions or dimples. In many cases these depressions disappear with the growth of the apple. The peculiar tenacity with which a badly infested cluster of fruit hangs on the

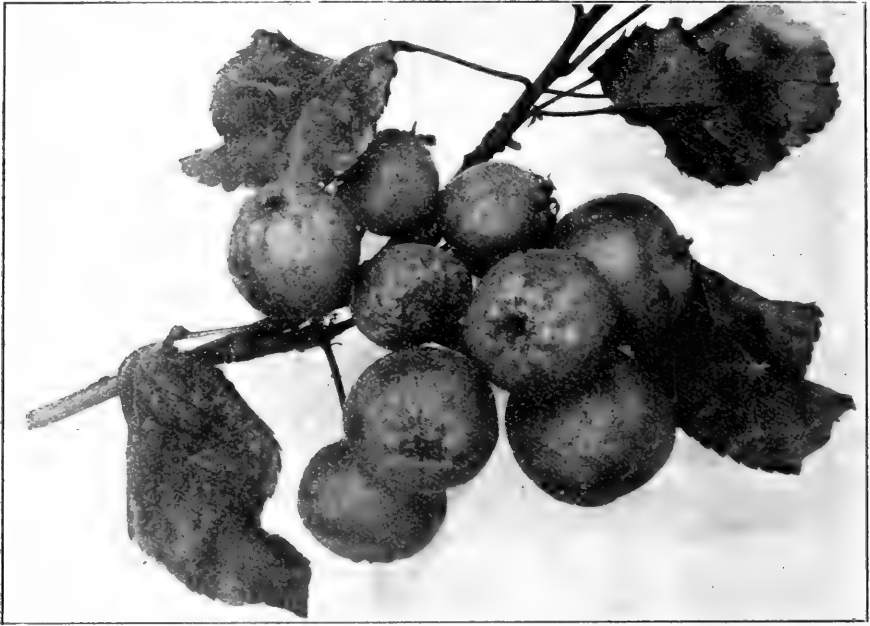


Fig. 3.—Cluster of small, woody, deformed apples, caused by the feeding of Aphids on twigs, leaves and fruit.

tree seems to be the result of the small amount of food and sap that the fruit and fruit stems receive in consequence of the feeding of the insects on the leaves and new growth of the branch that bears the cluster. Such partial starvation produces tough tissues in stems and fruit.

Apple Maggot or Railroad Worm.—If the fruit is only slightly infested with this insect it seldom produces any noticeable deformity except the very small depressions where the eggs are laid, but if the infestation is severe almost every apple on the tree may be rendered unsightly by ridges and hulges on the surface. These are partly the result of numerous egg punctures and partly of the death and therefore failure to grow of tissues here and there just beneath the skin wherever the larvæ happened to tunnel when feeding.

Leaf-Rollers and Green Fruit Worms.—These are greenish caterpillars that attack the apples soon after they are formed and frequently eat deep holes in them. As the apples grow these injuries callous over but are often so deep that the fruit is distorted and cannot be marketed. Any other biting insect that eats out similar areas may also cause a deformed fruit.

Other Causes of Deformities.

Although most of the deformities of apples are caused by insects, a number is due to some of the following factors: Frost injury, fungus diseases, imperfect fertilization, Bitter Pit disease or spray injury.

Frost Injury.—Fruit recently set may become partly frozen with the result that the injured area will fail to develop normally and a malformed apple will be produced. It is claimed that frost injury to blossom buds may also cause deformed fruits.

Fungous Diseases. Any fungus disease, such as Apple Scab, which attacks one side of the apple much worse than the other, will by interfering with the growth of that side cause a deformity.

Bitter Pit Disease.—This is a disease of apples due neither to a fungus nor a bacterium, but so far as known to weather conditions. Good growing weather in spring, or early summer

followed by drought, seems in Ontario to be the chief cause. Soil conditions and the individuality of the tree are apparently contributing factors. The disease takes various forms; sometimes the apples look quite sound but, when cut open, are found to have dry dead areas here and there through them; at other times, especially in the case of Baldwins, the surface is pitted with

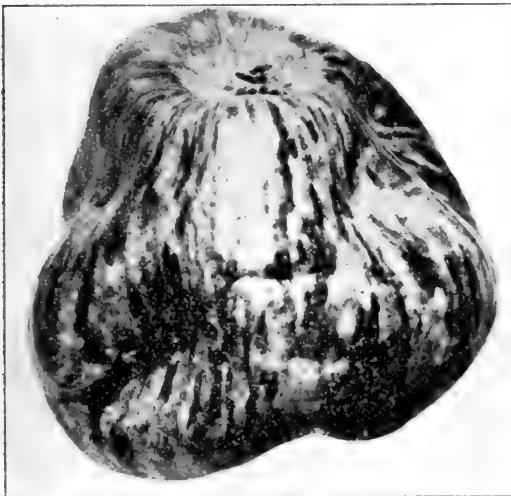


Fig. 4.—Duchess Apple deformed by a very severe attack of Bitter Pit Disease.

small depressed areas that are at first somewhat darker in colour than the rest of the epidermis and later turn brown; in still other cases the injury inside the fruit is so severe that the whole apple becomes much distorted and unfit for use. This last kind of injury is not nearly so common as either of the others.

Imperfect Fertilization.—If during the blossom period one or more of the pistils of the fruit fails to be fertilized the result is often a lop-sided or malformed fruit.

Spray Injury.—Sometimes spray mixtures, especially Bordeaux, injures a portion of the epidermis of a young fruit and, if the injury is sufficiently deep, will cause an interruption in the growth of that side and consequently a deformity. The failure of the surface over these injuries to keep pace with the growth of the tissues beneath often leads to its becoming cracked.

A NEW SPECIES OF THE GENUS NEPHROCERUS.

BY CHARLES W. JOHNSON, BOSTON, MASS.

The determination of the two American species of this genus has presented some difficulties owing to the dearth of material and to their close resemblance to some of the European species. Through the kindness of Mr. Frederick Knab, I have been able to study both sexes of *N. daeckei* and the specimen of the undescribed species collected by Mrs. A. T. Slosson, on Mt. Washington, N. H., in 1897. During the past two seasons six specimens of the latter have been collected, thus giving ample material to define more clearly our two species.

The following table, including the three European species will show some of the structural characters separating them from the American species:—

TABLE OF SPECIES.

- | | |
|---|--------------------------|
| 1. Last tarsal joints of all the legs without conspicuously long, bristly hairs, arista entirely black..... | <i>lapponica</i> Zett. |
| Last tarsal joints of all the legs with 4-7 long, bristly hairs..... | 2 |
| 2. Hind tibiæ rather twisted, widened at the end, and with a circle of bristles at the tip..... | <i>flavicornis</i> Zett. |

- Hind tibiae simple, not noticeably widened at the ends, and without a circle of bristles at the tip.....3
3. Arista entirely black, third joint of the antennæ small, brown.....*scutellatus* Macq.
Arista with the thickened basal portion yellow, antennæ entirely bright yellow.....4
4. Abdomen with two distinct bands in both sexes; upper half of front of female linear.....*daeckei* Johns.
Abdomen indistinctly banded in the male, in the female the lateral margins are yellow, upper half of the front of the female not linear.....*slossonæ* sp. n.

***Nephrocerus daeckei* Johnson.**

N. daeckei Johns., Ent. News, Vol. XIV, p. 107, 1903.

In this species the sexes are so similar that one of the co-types before me was inadvertently referred to as a male, probably because the front is so narrow. For about one-half its length it is a mere line. The sides of the first and the posterior margins of the second and third abdominal segments are widely margined with yellow. The wings are proportionately broader and not of equal width as in the following species.

In addition to the types from Richmond Hill, Long Island, N. Y., July 2, 1901, I have examined two males from Plummer's Island, Md., June 29, 1913 (R. E. Shannon), and one female, Franconia, N. H. (Mrs. Slosson) in the U. S. National Museum.

***Nephrocerus slossonæ*, sp. n.**

Nephrocerus, n. sp. Ent. News, Vol. VIII, p. 237, 1897.

Male.—Face and front covered with silvery white tomentum, vertical triangle and occiput black, grayish pruinose, occipital orbits deeply emarginate, mouth parts and antennæ light yellow, arista black, the thickened base light yellow. Thorax, discal portion black, shining, the anterior third covered with a grayish bloom, humeri, broad lateral stripes, and the scutellum, yellow, the latter much darker than the humeri, pleura livid, a lighter

area below the base of the wing bearing a small black spot, metanotum black. Abdomen black, shining, thinly covered with quite long yellow hair, with conspicuous tufts on the sides of the first segment, sides of the first and the posterior margins of the second and third segments brownish, hypopygium brown, the two large rounded glands diverted to the right, with a black, spirally coiled "flagellum" below. Legs and halteres light yellow, the long bristles at the end of the last tarsal joints four in number, posterior tibiae nearly straight, not noticeably thickened and without bristles. Wings long, narrow, of nearly equal width, grayish hyaline, posterior branch of the fifth longitudinal vein scarcely reaching the margin, tegulae yellow.

Length 8 mm., wing 9 mm.

Female.—Front narrow below the vertex, gradually widening above the antennae, about four times its width at the vertex. Thorax similar to that of the male except that the pleura are light yellow with small black point below the base of the wing, and black spots between the coxae, disc of the scutellum and the metanotum blackish. Abdomen dark yellow, with an irregular, broad dorsal line of black constricted at the margins and covering about one-third of each of the first five segments, the fourth and fifth segments also narrowly margined posteriorly with black, sixth and seventh segments and the hook-like ovipositor entirely yellow.

Length 7.5, wing 8.5 mm.

Five males and two females. Holotype, allotype and one paratype, Bretton Woods, N. H., June 25 and 28, 1913 (C. W. Johnson), and one paratype (♂), Mt. Washington above Base Station, N. H., July 4, 1914 (C. A. Frost), in the collection of the Boston Society of Natural History. One paratype (♂) summit of Mt. Washington (Mrs. Slosson) in U. S. National Museum. One paratype (♂) Bretton Woods, June 28, in Museum of Comparative Zoology, and one (♂) Mt. Washington above Base Station, July 4, in the author's collection. The specimens collected by Mrs. Slosson and one of those collected by Mr. Frost have the abdomen entirely black.

AN IMPORTED RED SPIDER ATTACKING FRUIT TREES.

BY L. CAESAR, PROVINCIAL ENTOMOLOGIST, GUELPH, ONT.

For some time the writer had suspected that the Red Spider so common on fruit trees in Ontario was not our common species, *Tetranychus bimaculatus*. Accordingly specimens were sent in September, 1912, to Mr. Nathan Banks of the Bureau of Entomology, Washington, D. C., with some details as to the extent of its distribution and the food plants attacked. In reply Mr. Banks stated that the species was *Tetranychus pilosus*, an European species that attacks fruit trees, and that its relationship to *Tetranychus mytilaspidis*, which feeds chiefly on oranges, was very close and, perhaps, identical.

Tetranychus pilosus is about the same size as *bimaculatus*, but differs from it in several respects:—It is more nearly circular in outline, somewhat stouter and has a number of distinct white tubercles on the dorsal surface, with a fine hair arising from each. It is dark red in colour, many specimens being blackish, with the mouth parts and usually a dorsal longitudinal area much paler than the rest of the upper surface, whereas the colour of *T. bimaculatus* varies from greenish yellow to red. The latter species feeds largely on the lower surface beneath a fine silken web, in or under the protection of which it lays its eggs; the former feeds and lays its eggs on both

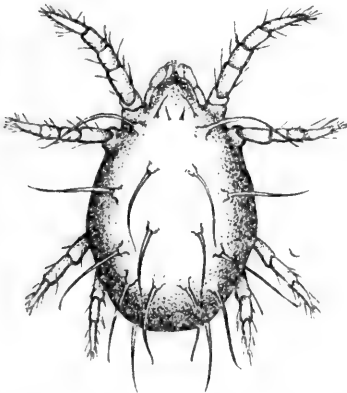


Fig. 5.—*Tetranychus pilosus*, adult female, greatly enlarged.
(Drawn by Miss M. Hearle.)

surfaces, and makes no web, but fastens its eggs by a few fine silken threads to the leaf or twig on which they are laid. The eggs are uniformly blood red, while those of *bimaculatus* are pearly white. *T. pilosus* passes the winter in the egg stage, these being deposited in the axils of the twigs and branches. *T. bimaculatus* passes the winter as adults in the ground or in sheltered hiding places.

The host plants of *T. pilosus* so far as observed are the European plum, apple, sour cherry, pear, peach and hawthorn. European plums are by far the favorites, with apples next and then sour cherries. Peaches and Japanese plums are very little infested. Hawthorns in a few apparently exceptional cases have been severely attacked.

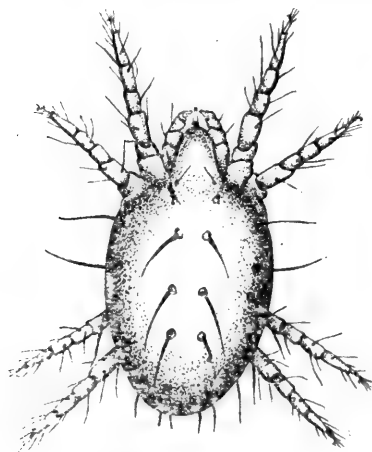


Fig. 6. — *Tetranychus bimaculatus*, adult female, greatly enlarged. (Drawn by Miss M. Hearle.)

The foliage of badly infested trees becomes covered with numerous fine, whitish blotches very noticeable on the upper surface. After a time such leaves become brownish and at a distance of a hundred yards or more the whole of the foliage has the appearance of being covered with fine road dust.

This hitherto unrecorded Red Spider has been found by the writer in most of the fruit districts of the Province. That it has not been mentioned earlier appears to have been due to its close resemblance to our common species, *Tetranychus bimaculatus*.

GEOMETRID NOTES.—REVISION OF THE GENUS HYDRIOMENA, HUB., GROUP WITH LONG PALPI.

BY L. W. SWETT, BOSTON, MASS.

(Continued from page 11,)

17. ***Hydriomena bistriolata*** Zell. (Verh. zool.—bot. Ges. Wien, XXII, p. 493, 1872; Packard, Monograph, p. 95, 1876, Pl. VIII, fig. 32). This species with long palpi was placed incorrectly as a variety of *H. californiata* with which it has nothing in common. The general ground colour is dark olive-green and white. It is quite a striking species, as the entire wing seems to be surrounded with olive green and has a white mesial space. It appears like a specimen of *autumnalis* with the entire wing suffused with dark olive-green and the white central portion contrasting

sharply. There is a tendency for the extra-discal bands to unite at the inner margin of the wing. The entire outer margin is olive-green, not lighter near the outer margin as is usual. The median band is much wider than usual and the basal runs almost straight across the wing, slightly curved outward. The intradiscal band is strongly notched on the fore wing at vein 2. This seems to be a rare species and is in few collections. The specimens referred to in the Packard monograph from Kentucky and Missouri I do not think belong to this species, as the Kentucky specimen is *autumnalis*, while the Missouri specimen is not in the collection, but was probably returned to the sender, Dr. Riley, and should be in the National Museum collection at Washington. The palpi are very stout and the head is rather broad, so that it could not possibly be confused with *autumnalis*, and how it should be referred to the latter I cannot guess. I believe it is strictly Texan.

Types.—1 ♂ 10, Dallas, Tex., March 16 (Boll).

Type.—1 ♀ Texas (Boll) in Zeller collection.

it is a striking species and can be confused with no other.

18. **Hydriomena regulata** Pears. (Proc. Ent. Soc. Wash.; Vol. XI, p. 131, 1909).

This is a peculiar species with olive and liver coloured shadings and has a little less than usual the general appearance of the *Hydriomena* group. The markings are not common for the *Hydriomena*, as I know of no other with liver coloured shadings, and I believe it to be rare, as the specimens in Mr. R. F. Pearsall's collection are all I have seen. It has no discal spots on primaries, the secondaries dusky and shaded with yellow brown.

Types.—2 ♂s, Douglas Ariz., Aug. 22 and 23, 1908.

19. **Hydriomena edenata** Swett. (Can. Ent., Vol XLI, p. 232, July, 1909).

This species is a large broad-winged one, on the pattern of *ruberata* Freger. It has a wide black bar just above inner margin of primaries which serves to separate it from *ruberata*, besides the other differences which I have already pointed out in the description. There is an error in the original description (Can. Ent., vol. XLI, p. 232, July, 1909), which I overlooked until now. Instead of "5 males" read "5 females," and instead of

"Eden Vale, Colo." read "Eden Vale, Calif." This species seems to have quite a wide range and is more common than the others. I had specimens from Mr. E. H. Blackmore, Victoria, B. C., and have heard that a specimen was even taken in Newfoundland, but cannot verify it.

Type.—1 ♀ in my collection, 4 ♀s, Mr. Broadwell's collection; 1 ♂ in Mr. J. G. Grossbeck's collection, which was sent me to compare.

H. edenata is an early species on the wing, occurring from April 5 to May 4, 1913, at Victoria.

20. *Hydriomena chiricahuata* Swett (Can. Ent., Vol. XLI, p. 231, July, 1909, Barnes and McD., Contrib. Nat. Hist. Lepid. North Am., Vol. I, No. 4, 1912.)

This species is figured by Drs. Barnes and McD. in their valuable work, in which a clear idea of the markings is given. It is quite a small and slender species and has a peculiar narrow mesial line, and the line on hind wings show only as dots. This is a very rare species and does not approach any other very closely, unless it looks superficially like a small *barnesata* with narrow mesial space.

Types.—2 ♂, Huachuca Mts. and Chiricahua Mts., Ariz., in Dr. Barnes' collection.

20. *Hydriomena similaris* Hulst, Trans. Amer. Ent. Soc., Vol. XXIII, 1896, p. 284.

This species is very closely allied to *ruberata*, from which it is difficult to distinguish. There is a peculiar pale blue and faded rusty look to the bands in *similaris*, while in *ruberata* they are bold and well defined and either smoky or brick red as the type species. *Similaris* occurs in June and July, while *ruberata*, to my knowledge, is only found in early May. This is rather a common form in Nevada, and, strange to say, is correctly labelled in most collections. How far it varies I cannot say, as my material has been somewhat limited, though it is not a rare species.

Type.—Colorado, Mr. Graef.

22. *Hydriomena ruberata* Freyer (Neu. Beit. Schmett., Vol. I, p. 67, pl. 36, fig. 2, 1831).

This little-understood species was first determined for Rev. G. W. Taylor by Mr. Lewis B. Prout of London, England. Mr.

Wolley Dod in his list (Can. Ent., Vol. XXXVIII, p. 253, 1906) also recorded it from Alberta. It did not seem to be clearly understood in Europe, for several of the older authors speak about varieties of *autumnalis* with long palpi and reddish markings. Freiherr Von Hoyningen-Heune in the Berl. Ent. Zeit., Vol. LI, p. 255, 1906, says that it is confounded with *autumnalis* in the majority of collections in Europe. It seems strange that Guenée and Packard did not note the length of the palpi, which would have separated it at a glance. The typical *ruberata* Freyer has a rust-red shading to the bands that cross the wings and rather a narrow mesial space; the mesial band, however, is quite wide. The discal dots are small and linear, and the hind wings are light ashen with two heavy, dark curved bands. Mr. Prout believes we have the true *ruberata* here in North America, as I sent him specimens to compare with European examples, and I have also specimens from Europe in my collection, which run very close to ours. I have not compared the genitalia as yet, and until that is done we can not be sure of its standing. There are several varieties which I am inclined to think occur in North America, namely, *literata* Donovan and *griscens* Hoyningen-Heune. *Ruberata* flies to light in New England in early May, and is more common in the mountainous districts, therefore I am inclined to believe it will be met with more commonly northward.

Hydriomena ruberata var. (a) **literata** Donovan. (Brit. Ins., Vol. XIV, 1808, p. 80, pl. 499, fig. 2, 1810; Speyer. Stett. Ent. Zeit., p. 171, 1872).

Literata in the plate has white spots at ends of the veins, clear mesial space with discal spot like the letter T reversed. The discal spot does not seem to me a sufficient basis upon which to establish a variety, but the author's statement that it lacks the reddish markings and is grayish, that the bands are of the colour of the wings, and that it resembles *autumnalis*, except in the palpi, appears to justify its status as a variety. A form occurs here that is grayish without the red markings, and possibly it had better be referred to this variety until more is known of *ruberata*.

Hydriomena ruberata Var. (b) **griscens** Hoyningen Heune (Berl. Ent. Zeit., Vol. LI, p. 257, 1906).

This variety is a unicolorous gray and the bands and red shadings are lacking. It is like the unicolorous variety of *autumnalis*.

Hydriomena ruberata Var. (c) **glaucata** Packard (Proc. Bost. Soc. Nat. Hist., XVI, 20, 1874; Catal. of the Phal. of California, No. 2, Boston, Dec., 1873, Pl. I, fig. 6; Monograph p. 96, 1876).

The type is not in the Museum of Comp. Zool. at Cambridge, Mass., and I suppose therefore that it was returned to Edwards, its sender, as was Packard's custom, and should be in the American Museum of Natural History, New York. There is a specimen in the Edwards collection in the American Museum, New York, that answers closely to the description and figure, but unfortunately the head is missing, the most important part. The piece torn from the wing is as in the figure and the lines correspond, but it is impossible to tell where it belongs without the head. The plate is fairly clear and the figure shows the long beak-like palpi, and Packard speaks of them particularly in the description, so we know from the description at least where the type belonged. Since *ruberata* is the only closely allied species that has reddish shaded bands, with gray and unicolorous variations, and since we know green varieties always occur with red, it seems reasonable to suppose that this is a green variety of *ruberata* or else a closely allied species. This seems hardly possible, as I have specimens which agree line for line with *glaucata*, only they lack the red shading. I received a specimen from Mr. Broadwell which was green, and agreed with *glaucata* in every respect.

This form has broad full-rounded wings with five watery bands crossing them, and has a pale green ground colour with pale ashen hind wings.

Type.—1 ♀ (Edwards), Calif., probably in American Museum of Natural History, New York.

This includes all the species and varieties so far listed, and, I hope, will help to separate the many tangles. The genus *Hydriomena*, as a whole, seems a very compact and natural group, if we exclude the heterogeneous forms. The palpi and colour scheme seem to be very constant characters, and I believe eventually the other forms will be transferred to other genera. Surely

Coenocalpe magnoliata does not belong here, but until we know the genitalia and life histories better, we had better leave them as they are. Mr. Louis B. Prout is in accord with me that the larval characters and imagoes are quite distinct from those of the other species listed under *Hydriomena*. *Hera contracta*, for example, has a strong hooked clasper, which shows it does not belong to *Hydriomena*.

In regard to life histories, very little seems to be known of the American forms, but in Europe *H. furcata*, *autumnalis* and *ruberata* have been bred for years

I take this opportunity of correcting two errors of sex-signs, which appeared in former papers of mine on this genus. In the description of *Hydriomena henshawi* (Can. Ent., Vol. XLIV, p. 164, 1912) instead of "Type 1 ♂, Nevada," read "Type 1 ♀, Nevada." In the description of *H. nubilofasciata* Pack. var. *cumulata* Swett (Can. Ent., Vol. XLII, p. 281, 1910), instead of "Types 2 ♂, Feb. 6, 1874, Sanzalito, Cal." read "Types 2 ♀," etc.

I realize that the task of unravelling this variable group has been a difficult one, and that my work is incomplete, but I hope that I have at least made some of the puzzling forms more easily recognizable to the average collector.

SYNOPSIS OF SPECIES AND VARIETIES.

14. *Hydriomena speciosata* Pack.—Green and white mottled:
 Var. *agassizi* Swett.—Black and green.
 Var. *taylori* Swett.—Green and brown.
15. *Hydriomena costipunctata* Barnes and McD.—Green and brownish purple.
16. *Hydriomena barnesata* Swett.—Green and white.
17. *Hydriomena bistriolata* Zell.—Green suffused, white mesial space.
18. *Hydriomena regulata* Pears.—Green and liver coloured.
19. *Hydriomena edenata* Swett.—Green and white (black bar).
20. *Hydriomena chiricahuata* Swett.—Green and white, narrow mesial band.
21. *Hydriomena similis* Hulst.—Green with bluish bands.
22. *Hydriomena ruberata* Freyer.—Gray with reddish shaded bands.

22. *Hydriomena* var. *literata* Donovan.—Gray, bands unicolorous.
Var. *griscens* Hoyn.-Heune.—Gray suffused,
without bands.
Var. *glaucata* Pack.—Pale green, with gray bands.

GEOMETRID NOTES—DESCRIPTION OF A NEW VARIETY.

BY L. W. SWETT, BOSTON, MASS.

Hydriomena speciosata Pack., var. *ameliata*, n. var.

Expanse 31–33 mm. Palpi long and blackish; head and thorax greenish; abdomen light ashén. A narrow black bar at base of antennæ. Fore wings olive green, with a broad white mesial band. Base of wings blackish, with possibly the beginning of a black line; between base and first line of mesial band olive green, then another olive green space to the broad irregular black band, then olive green to the intra-discal band. The three irregular lines of the mesial band are very striking; the outer one nearest the discal dot projects outward on median vein, almost touching the dot, and is irregular on the veins. Beyond, the mesial space is greenish white, giving the insect a striking appearance. In some respects it resembles certain varieties of *H. autumnalis* that I have seen from Germany. The extra-discal line is very prominent on the costa and then runs irregularly in dashes across to the inner margin. Half-way between tip of wing and extra-discal line is a broad triangular black spot, which appears to be a broken line running in spots on the veins across the wing. A broad apical black dash. Fringe black and white checkered. Hind wings dark ashen brown with a pale checkered fringe. Wings beneath dark brown, with markings of upper side showing through.

This is the white-banded form that we should expect to find, according to my colour-scheme (vide p. 63), and I should not have described it were it not for its similarity to certain varieties of *H. autumnalis*, from which it can be distinguished by the long palpi.

Type.—1 ♀, Victoria, B. C., July 7, 1914. From Mr. E. H. Blackmore, to whose collection it belongs. It was taken at Garden City, a suburb of Victoria.

Paratype.—1 ♀, Victoria, B. C., July 9, 1914, in my collection, received through the kindness of the collector, Mr. E. H. Blackmore. It was taken at Swan Lake, a suburb of Victoria.

A NEW SPECIES OF THE MYMARID GENUS CAMPTOPTERA FOERSTER FROM AUSTRALIA.

BY A. A. GIRAULT, NELSON (CAIRNS), N. Q., AUSTRALIA.

Hymenoptera Chalcidoidea.

Family Mymaridæ.

Genus *Camptoptera* Foerster.***Camptoptera gregi*, new species.**

Normal position.

¹ *Female*.—Length 0.40 mm. Minute.

Ashy black, the abdomen greyish, except toward tip; legs pallid yellowish, the antennæ ashy black, the scape and pedicel somewhat paler; both wings obscurely fumated throughout. Differing at once from the North American *pulla* and the European *papaveris*, the only other members of the genus, in having the first funicle joint abruptly shorter than the second, not long and nearly equal to it as in those species, but less than half the length of the second joint and distinctly shorter than the pedicel; also, *gregi* is smaller than *pulla* and has the abdomen paler; the first funicle joint is distinctly the shortest of the antennæ. Otherwise as in *pulla* or nearly.

(From one specimen, 2-3 inch objective, 1 inch optic, Bausch and Lomb.)

Male.—Not known.

Described from a single female specimen captured from the window of a residence at Nelson (Cairns), North Queensland, December 27, 1912 (A. P. Dodd).

Habitat.—Australia—Nelson, Queensland.*Type*.—No. Hy 1343, Queensland Museum, Brisbane, the foregoing specimen on a slide.

On February 12, 1913, 9 females were captured in the same place.

Respectfully dedicated to Mr. G. R. Greg for his "The Creed of Christendom."

BOOK REVIEW.

THE ACRIDIIDÆ OF MINNESOTA. By M. P. Somes, University of Minnesota, Agricultural Experiment Station. Bulletin 141. University Farm, July 1914. 100 pp., 4 pls. (3 coloured).

Although a descriptive account of the Orthoptera of Minnesota has already been published* the present bulletin on the family Acridiidae or short-horned grasshoppers will be found to contain much additional information on the distribution, habitats and life-histories of the species described in the earlier work, as well as descriptive notes on 16 species not included in the latter. It also contains keys for the identification of the subfamilies, genera and species.

No fewer than 78 species are listed, a number which exceeds the Ontario list by 30 species; but this is not surprising in view of the geographical position of the state and its relations to the Mississippi Valley and to Lake Superior. Minnesota lies on the borderland between the prairies and the eastern forest region, so that the rich prairie fauna, which is an almost negligible quantity in Ontario, is abundantly represented here, while Carolinian species enter by the Mississippi Valley and Canadian species find their way into the northern counties, the proximity of Lake Superior probably favouring the boreal element in the fauna of this section.

On account of these relations it is to be regretted that the author has not given us some account of the topography of Minnesota from the standpoint of locust distribution, particularly as this phase of the subject was also ignored in Lugger's report.

Many interesting notes are given on the manner of flight, habits of oviposition, etc., of the various species, one of the most noteworthy being the observation of a female of *Melanoplus blatchleyi* in the act of drilling a hole in a piece of dead wood after the manner of *Chloealtis conspersa*, a habit unusual among the Melanopli.

The figures on the plates are all from original drawings, mostly in colour and, with a few exceptions, are fairly accurate and very attractive in appearance. The figure of *Arphia sulphurea*, however,

*Lugger, Otto. The Orthoptera of Minnesota. Third Am. Rept. of the Entomologist of the State Experiment Station of the University of Minnesota, 1897.

appears to be a composite of two species, the head and thorax resembling an *Arphia* fairly closely, but the wings belonging unmistakably to *Circotettix verruculatus*. A number of photographs of habitats and several maps showing the distribution of certain species also appear as text figures.

The following somewhat misleading statements have been noted in the text:

On p. 22 the author states that Bemidji, Minn., where *Chloealtis abdominalis* was taken, "is doubtless near the eastern extreme of the range of this species, which has hitherto been taken in Montana and North Dakota." This species has been recorded from several localities in Ontario and Northern Michigan, ranging eastward beyond Georgian Bay.

On p. 23 *Dichromorpha viridis* is stated to be "common throughout North America," whereas it has never been reported from any part of Canada.

On p. 26 *Mecostethus lineatus* is spoken of as a very rare insect, ranging from New England to Northern Indiana, Illinois and Iowa." In Canada it ranges northward at least as far as Anticosti Island, Temagami District, Ont., and Nipigon, Ont., and is abundant in almost all open marshes in Central and Southern Ontario.

On p. 30 *Gomphocerus clepsydra* is treated as a distinct species from *G. clavatus*, whereas it has for some years been generally regarded as a synonym of the latter.

These are minor matters and detract but little from the value of a useful and interesting account of this attractive group of insects.

SOME SOUTH INDIAN INSECTS AND OTHER ANIMALS OF IMPORTANCE.

By T. Bainbriggge Fletcher, Imperial Entomologist to the Government of India. Printed by the Superintendent, Government Press, Madras, South India, 1914.

As a worthy sequel to "Indian Insect Life," published in 1910 by Maxwell Lefroy, we have this book on the commoner insects of South India, with particular reference to economic forms. It is the first book of its kind produced in South India, and only the second in the whole country, and as such deserves special credit.

It is a quarto volume of 565 pages, and is illustrated with 50 splendid plates and 440 text illustrations. Most of the plates are coloured, and it speaks well for the author and his staff that these profuse, and on the whole, excellent illustrations are mostly original.

The work covers a very wide field, and may be divided into two parts. The first nine chapters deal with insects in general, their zoological status, structure and classification, their habits and the laws which govern them; and the tenth and eleventh chapters deal with pests in general and various means of control, specially adapted to local conditions. Then follow general descriptions of different insects classified as pests of crops and grain, as household pests and as carriers of disease, and the extent to which some are beneficial and useful. One chapter is devoted to a few other animals and birds, both beneficial and injurious. An important section, and one which will be valuable to its readers, is a long list of the commonly-grown plants and crops, with the names of some 800 insects attacking them, and a list of allied plants grouped under natural orders for reference when studying polyphagous insects.

The second and main part of the book is taken up with a study of the orders of insects, dealing mainly with injurious forms under the headings of references, distribution in South India, life-history, food plants, economic status and means of control. This represents an enormous amount of information condensed to a systematic and readily available form, and the profuse illustrations are intended to facilitate the tracing out of any particular insects which may prove injurious. The fact that many of the life-histories are classed as "not worked out" should be a stimulus to entomologists in India. The book ends with a complete index.

The author is to be congratulated on a stupendous work which he confesses was undertaken unexpectedly and executed largely by the exertions of the Madras Department of Entomology in the short space of two years. As a handy and popular work on insects, the book should prove of great value to planters and those interested in entomology, and the low price of six rupees (two dollars) places it within the reach of most people.

G. J. SPENCER.

The Canadian Entomologist.

VOL. XLVII.

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No. 3

POPULAR AND ECONOMIC ENTOMOLOGY.

IMPORTANCE OF OBSERVATIONS ON APPARENTLY UNIMPORTANT INSECTS.

BY F. M. WEBSTER, BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

In the course of the writer's somewhat extended experience in the investigations of insects, with especial reference to their economic significance, he has occasionally found himself confronted with criticisms on account of having apparently expended both time and funds in studying insects whose attacks were, or had been, so far as known, of little or no importance. It therefore seems not out of place to direct attention to a number of instances showing that such restrictions are not always warranted and that the present status of importance of a species cannot be taken as conclusive respecting its future, or indeed near future significance.

Selecting a number of instances in point from my own experience and of others working under my direction, that of *Myochrous denticollis*, the southern corn leaf beetle, which has since become better known by reason of its disastrous attacks on growing corn in Kansas and southern Ohio, may be first mentioned. The first observations made on this insect in the corn field were purely accidental.

The writer happened to be passing through a field of young corn in Tensas Parish, La., in April, 1887, and observed a few of these beetles attacking the plants by gnawing the outside of the stems. There was nothing observed at the time that would indicate the least likelihood of this ever becoming a serious pest, such as it has since proven itself. To have passed over the fact without mention would have been to fail to record the basic observation on the insect as a corn pest.

Curiously enough, during the same month in the same locality the adults of *Ceratoma caminea* were observed attacking cultivated beans in the garden of an old negro, whose cabin was located in

the midst of the Tensas swamps. Although the writer had been familiar with the beetle for years in the North, this was the first time its food plant had ever been determined by him. With this initial observation in mind, the same insect was afterwards observed to attack the leaves of the cow-pea in great numbers. At that time the two observations did not give any basis for assuming that the species would ever become a serious enemy of the bean and much less so of the cow-pea, such as has since been recorded of it.

In the same locality reports were received of peculiar injuries to growing corn which had been observed by planters in previous years. No definite information was just at the time obtainable from this source, and it was not until later, when the writer stumbled, as it were, upon the larvæ of *Diabrotica 12-punctata* in considerable numbers, attacking the growing corn in the fields, that anything definite was known. With this limited knowledge, later observations seemed to be more easily made, with the result that a damage of 75% was observed a week or ten days later in other corn fields.

When Mr. Jas. A. Hyslop made his first observations on the clover root curculio, *Sitones hispidulus*, in April, 1909, there was no indication that the species was of any particular economic importance. It happened to be convenient for Mr. V. L. Wildermuth to continue the work taken up by Mr. Hyslop, because of the latter's transfer to Pullman, Washington, so there was even yet no information obtained that could be presented as an excuse for spending much time upon it. However, the investigation was carried through to completion, and in presenting the matter for publication we found ourselves somewhat at a loss to give satisfactory reasons for asking for the publication of the completed work. The injuries of the larvæ to the roots of clover were so infrequent, and the beetles themselves were not found in any great abundance, so that the species could not be placed among those particularly destructive to the clover plant. Five years later, however, in 1914, the larvæ of the same insect were found to be seriously destructive in alfalfa fields, attacking the alfalfa roots in precisely the same way in which Mr. Wildermuth had observed them to attack the roots of clover. It now turns out that an obscure, though serious trouble, in alfalfa fields which has, up to the present time, puzzled agronomists was really due to the subter-

ranean attacks of the larvæ of this species on the roots of alfalfa. Thus, within five years, this insect has advanced from one of apparently little or no economic importance, to one of the pests of the alfalfa field that must be reckoned with by alfalfa growers in future.

In 1909 Mr. Hyslop, in his entomological investigations about Pullman, Washington, found that the larvæ of the moth *Autographa gamma californica* attacked alfalfa plants, but these injuries were encountered so rarely that there did not appear to be any good reason for paying any special attention to the species. It was, however, convenient to carry on the observations, and in doing this Mr. Hyslop became impressed with the possibility that, in the event of its natural enemies becoming so reduced as to be unable to hold the species in check, it might become an insect of much more economic importance than his observations at that time would indicate. But, here again, it was difficult to explain, clearly, the necessity for the expenditures of time and funds required to carry out the investigation of the species, or to ask for the publication of the results. During the summer of 1914 the very conditions that it was thought might possibly come to prevail, did actually develop. Something transpired to prevent the development of the natural enemies of *Autographa*, in sufficient numbers to keep the pest in check, and as a result, throughout a number of the northwestern States, the species became a veritable scourge, and many letters were received complaining of its ravages.

In June, 1884, *Toxoptera graminum*, now better known as the notorious green bug, was introduced into a breeding cage in northern Indiana, where the writer was temporarily located. Up to that time the species was not known to occur in America excepting at one point, Cabin John Bridge, Maryland, a few miles north of Washington; and while, as later examination of the old records show, that the species had probably been injurious in Virginia two years prior to that date, at the time of the accidental introduction into the writer's breeding cages, it was not known as a destructive insect at all, and therefore the investigation made at that time was barely warranted by its then economic importance. Since that time it has come to be one of the most destructive pests of the grain field, and is probably more dreaded by the grain growers of

northern Texas, Oklahoma, and southern Kansas than any other insect.

Stictocephala festina has not until within the last year or two come to be known as an insect of any economic importance. A few years ago Mr. R. A. Cushman, at that time connected with the southern field crop insect investigations, found a few individuals girdling the stems of alfalfa in Louisiana. The species was, so far as known, of so little importance that a careful investigation was hardly justifiable. Later on its capabilities for seriously injuring the alfalfa became apparent, but still there was not sufficient information at hand to indicate that it would be likely at any time to become a serious pest. It was, however, carefully studied further by Mr. Wildermuth, and suddenly, from out of a stage of obscurity, so far as its alfalfa-destroying habits are concerned, it has jumped into prominence, by becoming seriously destructive during the summer of 1914 in the alfalfa fields of Virginia and some other States.

Other similar instances might be brought forward, but the foregoing is sufficient to show the absolute necessity of carrying out, judiciously, investigations of insects likely to become injurious, whenever a favourable opportunity presents itself for doing so, regardless of what the previous record of these may have been. It has frequently happened that certain species have, to all appearances, come suddenly into prominence and become immensely destructive to crops. Because of their previous supposedly lack of importance, no one having taken the time to investigate them, all inquiries for information relative thereto coming from those who suffered from their ravages, must be given the disappointing information that nothing whatever had been learned of their habits in any of their several stages of development. There are times when an entomologist may be and is criticised for what might appear as a wasteful use of both time and funds in investigating insects not previously known to affect in any way the interests of husbandmen. But let him totally neglect these, and when one of them suddenly jumps into prominence, as is sooner or later bound to be the case with some of them, he will find himself equally, or perhaps even more, severely criticised because he thus finds himself unable to give a full explanation of the activities

of the pest and advise methods of control. All of this goes to emphasize the necessity of investigating carefully, and as thoroughly as possible, using proper judgment of course, insects and their attacks upon vegetation, regardless of whether they are at the time injurious or not. It may be that, even at that very time, the insect is seriously injurious, but its injuries are of such an obscure nature as to be overlooked entirely or perhaps confused with those of some of the older and better known pests. Entomological investigations cannot be undertaken, carried through, and completed by contract, as the erection of buildings, construction of railways, or excavating of canals, but opportunities must be judiciously seized upon, and if the problem is followed faithfully wherever it may lead, one will be surprised at the number of instances like the foregoing, when the final outcome has more than justified the investigation.

NOTES ON THE PUPATION OF THE HOUSE-FLY (*MUSCA DOMESTICA*) AND ITS MODE OF OVERWINTERING.*

BY C. GORDON HEWITT, D. SC.
DOMINION ENTOMOLOGIST, OTTAWA.

The migratory habit of the larvæ of *Musca domestica* evidenced prior to pupation has been observed by most of the investigators who have studied the insect's life history, and these observations have been collected by Hutchison (1914). Levy and Tuck (1913) appear to be the first workers to call attention to the practical value of this habit in fly control, and Hutchison has extended the work along lines that will undoubtedly provide us with an additional means of control of no little value. The principle involved is the capturing of the mature larvæ leaving the manure to pupate, in accordance with their usual custom, either in the cooler outer portions of the piles or in the subjacent soil.

The migratory habit of the larva has also another interest, namely, its relation to the suppression of flies breeding in the usual type of insanitary privy and in latrines. While a few isolated observations have been made in India and elsewhere, I do not know of any exact record of the extent to which the larvæ migrate

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

from the substance in which they have been feeding. Hutchison (*l.c.*) found that the majority of the pupæ were scattered about the drier margins of the heaps of horse-manure, sheltered by the overhanging straw, and that whereas, in one heap, he found about 9000 pupæ in this position, not more than 100 were found below the soil. In this connection the following observation appears to be worthy of record.

Following the experiments which I carried out (1914) on the control of the larvæ by various insecticides, it was decided to examine the soil around and beneath the untreated and consequently natural heap of horse-manure with a view to ascertaining the distance and depth travelled by the larvæ prior to pupation. Also it was desired to discover whether any of the insects were overwintering in the pupal state; to this aspect of the question I shall return later.

The manure was removed on May 13th and the soil subjacent to and around the site of the pile was carefully removed and an approximate record was kept of the numerical abundance of the puparia at the different depths below the surface of the soil to a distance of about four feet around the site. This task was carried out for me by Mr. S. N. Lord, to whom my thanks are due. The results of this examination of the soil, which was a sandy loam, are represented diagrammatically in the accompanying figure.

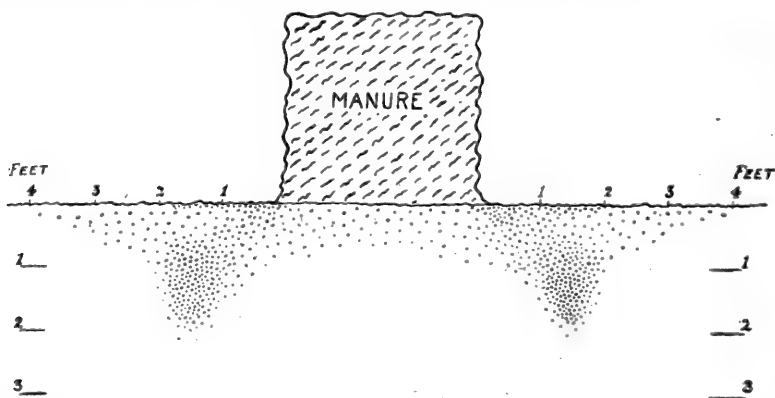


Fig. 7.—Diagrammatic section through heap of manure and subjacent soil to show the migration of the larvæ of *Musca domestica*. The drawing is to scale, distance and depth in feet being indicated. The black dots in the soil represent the puparia. (Original).

A few puparia were found directly beneath the manure pile to a depth of twelve inches. The greatest numbers occurred in the region about eighteen inches from the pile and at a depth of twelve inches to two feet from the surface; this is graphically shown in the figure; the puparia were also numerous immediately below the surface of the soil. The numbers then gradually decreased proportional to the distance from the pile and dwindled away at a distance of about four feet from its base.

This observation is of practical interest to the sanitarian as indicating the habits of the larvæ under normal conditions. It illustrates the ability of the flies to emerge from a depth of two feet, as particular attention was paid to condition of the puparia, and the flies had emerged from all the puparia other than those that had failed to develop.

The Overwintering of the House-fly

The question as to the state in which *Musca domestica* passes the winter has been discussed recently by several workers, and it seems desirable to review the subject again in so far as my experience of conditions in the most northerly temperate latitudes of England and Canada are concerned. In my monograph on the house-fly (1914) the statement is made that three causes contribute to the disappearance of the flies at the end of the summer, namely, retreat into hibernating quarters or into permanently heated places, natural death, and death from *Empusa muscæ*. I must confess that the word "hibernation" has been used in too broad a sense by me, as it has not only implied a dormant state during the winter, which is the usually accepted meaning of the term, but it has also had reference to a possible and sometimes actual state of activity during the winter months. It is in this sense that the word "hibernation" was used, as will be gathered in reading the section under that heading, in the work referred to. It would be preferable to substitute the term "overwintering," as this will adequately cover all conditions and developmental stages and will avoid a possible misuse of the term "hibernation."

Taking all the evidence that is now available, it may be stated that in northerly latitudes *Musca domestica* exists in the overwintering period in the following states:

1. *Dormant*.—In cool retreats where suitable shelter and protection may be found; here flies may truly hibernate.

2. *Periodically active*.—In premises where an increased temperature produces activity in the fly which would otherwise be inactive and dormant.

3. *Permanently active*.—The gradation between the former state, and this would be governed by temperature and the presence of food. Permanently active flies have been found by myself and other observers in every month of the winter season from November to March. I have dissected such flies from December to March and found them capable of reproduction in many instances. Such flies are found in warm bakehouses, kitchens, restaurants and stables. Jepson (1909) used such flies for breeding experiments in February.

4. *In the immature stages*.—The previous states, Nos. 1 to 3, are based on actual observations. That in northerly latitudes *M. domestica* may be found in the developmental stages (egg, larva or pupa) is a statement that has only, so far as I know, a theoretical and experimental basis. It should be possible, one would think, to find *M. domestica* breeding in permanently warm places, such as stables where larval food is present. In many stables, however, the temperatures are very variable, and this fact would lengthen the different stages very considerably. Personally, I have so far failed to discover evidence of *M. domestica* breeding under natural conditions during the winter months in the latitudes of Ottawa (Canada) and England, but observations indicate the possibility of such an occurrence in the presence of suitable conditions.

In the light of the evidence at present available, I think we are still justified in regarding the dormant and periodically active states during the overwintering period as the usual occurrence in northerly latitudes. But there is no doubt that where circumstances render state No. 3 possible, it contributes very materially to an increase in the number of available and active flies early in the spring. I have always held the same view as that suggested by Copeman and Austen (1914): "That the relative lateness of the season at which house-flies annually become abundant may be due to the smallness of the number of individuals that, in an active condition, survive the winter in houses or other buildings." This

idea was supported by my observations in the state of the reproductive organs of a portion of the flies found and dissected during the winter months.

The last contribution to our knowledge on this subject is the report of Copeman and Austen, quoted above, on the results of an examination of the species of flies collected in houses, etc., during the winter months. They state: "In conclusion, it would appear that the customary explanation of the perpetuation of the house-fly from year to year has now been fairly tested, and that the evidence obtained fails to support it. If, however, during the season of greatest fly-prevalence, a selection were made of several centres in which house-flies were present in sufficiently large numbers, it would be worth while during the following winter to endeavour to discover whether living pupæ could be found in any considerable quantity in the local breeding-places."

One serious objection prevents my agreement with their conclusion. The evidence contained in their report points to the fact that practically all the specimens of *M. domestica* that were received were caught in an active condition, and there is no evidence submitted to show that any of their correspondents found these flies as a result of searching for them in the hiding places from which Jepson and I have recorded them. In view of this objection the facts submitted by Copeman and Austen cannot be fairly considered as failing to support the explanation usually given. I may say I have repeatedly applied the test they suggest, and in no case have I been able to find either in England or Canada living pupæ of *M. domestica* under outdoor conditions during the winter. Nor has it ever been possible in my breeding experiments in Canada and in England to carry the insect through the winter in the pupal state. In the experiment described in the first part of this paper a special effort was made to find living puparia among several thousand examined, and not a single healthy puparium was discovered; all were either empty or had failed to develop. Had specimens been overwintering in the pupal condition, it is reasonable to expect that living puparia would have been found in the early part of May, as the adults could not have emerged earlier than that date under Ottawa conditions. It is a matter, however, that requires more observations in different localities, but until evidence is secured

of the insect overwintering in the pupal state we shall be justified in believing from the facts available that in northerly latitudes *Musca domestica* is accustomed normally to overwinter in the adult state.

In more southerly latitudes, where the mean temperature is much higher and where the activity of the flies is practically continuous throughout the winter months, one would expect the occurrence of the insect in an active condition and of the various stages of its development during this period, although the duration of such developmental stages would be lengthened. This has been found to be the case in New Orleans, Florida, in the valuable investigation of the Bureau of Entomology of the United States, Department of Agriculture, according to the verbal statement of Mr. F. C. Bishopp.

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PHYLLOPHILOPSIS, new name—*Phyllophila* Townsend, Proc. Biol. Soc. Wash., XXVIII, 21, is preoccupied, and *Phyllophilopsis*, new name, is hereby proposed to take its place.

CHARLES H. T. TOWNSEND.

NEW EXOTIC TIPULIDÆ (DIPTERA).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.*

The following species of crane-flies have been received from various correspondents during the past year.

Genus *Dicranomyia* Stephens.

1829. *Dicranomyia* Stephens; Cat. Brit. Ins., Vol. II, p. 243.

Dicranomyia fullowayi, sp. n. (Fig. 8).

Small, body coloration brown; wings hyaline with grey spots; *Sc* short, ending opposite the origin of *Rs*.

Male.—Length 3.8 mm.; wing 4.8 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown. Head brownish grey.

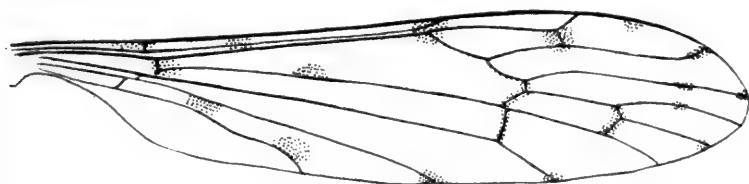


Fig. 8.—*Dicranomyia fullowayi*.

Thoracic dorsum brown without distinct stripes or markings of any kind; postnotum brownish grey. Pleuræ dark brownish black. Halteres light yellow. Legs with the coxæ and trochanters dull yellow; femora brown, paler at the base; tibiae and tarsi brown. Wings hyaline or nearly so with grey spots as follows: At end of *Sc* and origin of *Rs* at end of *R*₁ and cross-vein *r*, along the cord and outer end of cell 1st *M*₂, a blotch in the middle of cell 2nd *R*₁ near the costa, a large blotch on vein *R*₄₊₅ clouds at the ends of most of the veins, a blotch on *M* before the middle, a blotch at the arculus, two large spots in cell 1st *A* touching vein 2nd *A*. Venation as in figure—*Sc* short ending about opposite the origin of *Rs*, *Rs* half again as long as the deflection of *R*₄₊₅ cell 1st *M*₂ very long, basal deflection of *Cu*₁ just beyond the fork of *M*.

Abdomen dark brown, the last segment and the ovipositor more yellowish.

Habitat.—Island of Guam, Ladrões.

*From the Department of Entomology, Cornell University.

Holotype, ♂, Guam, Ladrones, D. T. Fulloway, coll. No. 1384.

Dicranomyia guttula, sp. n. (Fig. 9.)

Brown; wings hyaline with gray spots along the veins; *Sc* short ending opposite the origin of *Rs*.

Female.—Length 4.5—5 mm; wing, 5.7—6.4 mm.

Rostrum, palpi and antennæ dark brown. Head grey.

Thoracic præscutum rich yellowish brown with indications of darker markings behind; scutum similar with an indistinct darker spot on either lobe in front; postnotum light brown with a faint whitish bloom. Pleuræ brown, the dorsal sclerites, including those of the neck, around to the halteres, dark brown. Halteres light brown, the knob darker. Legs with the coxæ and trochanters yellow, femora dull yellow, tibiæ and tarsi light brown. Wings hyaline, the veins with abundant grey spots at short intervals producing a speckled appearance. Venation as in the figure—*Sc* short ending just beyond the origin of *Rs*, *Sc*₂ being exactly opposite the origin of *Rs*, cell *1st M*₂ long and narrow, the outer deflection of *M*₃ long and arcuated, over twice as long as cross-vein *m*, basal deflection of *Cu*₁ just beyond the fork of *M*:



Fig. 9.—*Dicranomyia guttula*.

Abdominal tergites brown, tip of the abdomen, including ovipositor, yellowish; sternites yellowish.

Habitat.—Lor Marquez, South Africa.

Holotype, ♀, Lor Marquez, Africa, C. W. Howard, coll. No. 14.

Paratype, ♀, topotypic.

From *D. irrorata* Enderlein (Zool. Jahrb., vol. 32, pt. 1, p. 74, 75, fig. V1) this species differs in having *Sc* short and in having the spots on the wings confined to the veins.

Genus *Libnotes* Westwood.

1876. *Libnotes* Westwood; Trans. Ent. Soc. Lond., p. 505.

Libnotes picta, sp. n. (Fig. 10.)

Colour yellow, the thoracic dorsum with six rounded black

marks; wings hyaline with scanty brown spots including three along the costa; cross-vein r at the tip of R_1 .

Male.—Length about 6 mm.; wing, 7.1 mm.

Rostrum yellowish, the basal segments of the palpi light brown, the apical segments dark brown. Antennæ with the basal segment brown, the remainder of the antennæ dull yellow. Head brown with a thick light grey bloom.

Thoracic dorsum light yellow, the præscutum with four black marks, a pair on either side of the middle line about midlength of the sclerite, contiguous on their inner faces; a larger mark on the sides of the sclerite near the end of the suture; scutum with a very large rounded mark on each lobe; scutellum with the caudal margin narrowly brown; postnotum with two pale brown rounded markings behind, one on either side of the median line, but separated from one another. Pleuræ yellowish white. Halteres pale, knob a little darker. Legs with the coxæ and trochanters pale yellow,

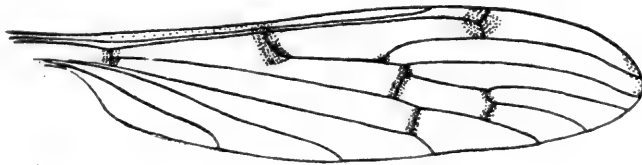


Fig. 10.—*Libnotes picta*.

femora light yellow, the tip narrowly dark brown; tibiae dull yellow, the tip narrowly dark brown, tarsal segments 1 and 2 dull yellow, the tips narrowly darker, segments 3 to 5 brown. Wings hyaline with small brown marks as follows: a large rectangular blotch at the origin of R_5 , a rounded stigmal spot, narrow seams along the cord and along the outer end of cell $1st M_2$, the tip of the wing is narrowly infuscated, base of the wing in the vicinity of the arculus clouded with brown; veins yellow, brown inside the markings on the membrane. Venation as in figure.

Abdomen dull light yellow.

Habitat.—Island of Guam, Ladrões.

Holotype, ♂, Guam, Ladrões, D. T. Fulloway, coll. No. 1226.

By means of Osten Sacken's key to the species of this genus (Berl. Ent. Zeit., Vol. XXXI, pt. 2, p. 182, 183), *L. picta* would

run down to the first group of species, but runs out by its hyaline wings with spots. By de Meijere's key (Tijd. voor Ent., vol. 54, p. 33, 34) it would run down to *L. notata* Wulp, a much larger insect with entirely different body-coloration.

Genus *Molophilus* Curtis.

1833. *Molophilus* Curtis; Brit. Ent., p. 444.

***Molophilus sirius*, sp. n.** (Fig. 11.)

Body coloration dark brown; hypopygium of the male with two pairs of chitinized appendages which are finely denticulate at the tip.

Male.—Length 3.5 mm.; wing, 5.4 mm.

Female.—Length 4.8 mm.; wing, 5.5 mm.

Rostrum and palpi dark brown. Antennæ broken. Head brownish grey, the occiput paler behind.

Pronotum and anterior margin of the mesonotal præscutum pale whitish yellow, remainder of the præscutum brown, the space before the pseudosutural foveæ yellow, the foveæ and tuberculate pits dark brown; lobes of the scutum dark brown; scutellum and postnotum brown. Pleuræ brown. Halteres with the knobs very large, elongate, stem brown, knobs paler. Legs with the coxæ and trochanters dull dark yellow, remainder broken. Wings hyaline or nearly so, the veins rather pale with abundant long dark brown hairs. Venation as in the figure.

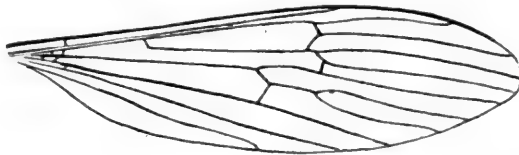


Fig. 11.—*Molophilus sirius*.

Abdomen dark brown, the valves of the ovipositor brownish yellow. Male hypopygium with the ventral-lying pleural appendages fleshy, long, slender and finger-like, clothed with long hairs; underneath these fleshy lobes are a pair of chitinized hooks, straight basally, curved ventrad and inward at their tips and on the under face with several small teeth. Dorsad of these are a pair of shorter chitinized appendages, almost straight, the dorsal face near the tip with minute teeth. Dorsal lobes, short, rounded at tip, flat,

clothed outwardly with long pale hairs, on the inner or ventral face with numerous black chitinized points.

Habitat.—Phillippine Islands.

Holotype, ♂, Phillippine Islands, July. Labelled "F. Casey, Wash. Thru Miss Ludlow."

Allotype, ♀, topotypic.

Genus *Mongoma* Westwood.

1881. *Mongoma* Westwood; Trans. Ent. Soc. Lond., p. 364.

***Mongoma guamensis*, sp. n.**

Fragillima group; colour dark brown; no white on the legs.

Male.—Length 6.8 mm.; wing, 7.1 mm.

Rostrum and palpi yellowish brown. Antennæ brownish yellow, the flagellar segments elongate, brown, clothed with abundant pale hairs. Head grey.

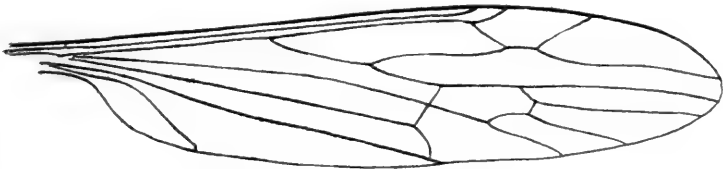


Fig. 12.—*Mongoma guamensis*.

Thoracic dorsum light brown, the pleuræ lighter coloured, more yellowish, especially ventrally. Halteres light brownish yellow, the knobs darker. Legs with the coxae and trochanters dull yellow, femora dark brown, paler at the base, tibiae dark brown, tarsi much paler, almost yellow. Wings hyaline, the stigma indistinct; veins dark brown. Venation as in figure.

Abdominal tergites brownish grey; sternites more yellowish.

Habitat.—Island of Guam, Ladrões.

Holotype. ♂, Guam, Ladrões, D. T. Fulloway coll. No. 1385.

This species differs from all of the related regional species of the *fragillima* group by the lack of white on the legs, *pennipes* O.S., *tenera* O. S., and *pallidiventris* Brun. having the tarsi snowy-white. *M. cariniceps* End. from Sumatra is a very different insect from any of these species and is easily separated by its large size and orange colour. *M. albipennis* Meij. from Java is larger than *guamensis* and has the wings and veins whitish.

INQUILINE BUMBLE-BEES IN BRITISH COLUMBIA.

BY F. W. L. SLADEN, APICULTURIST, CENTRAL EXPERIMENTAL FARM,
OTTAWA.

Having been informed by Mr. R. C. Treherne of a nest of bumble-bees in his garden at the foot of the mountain at Agassiz, B. C., I dug it up on July 7, 1914. The nest was found at about 18 inches from the surface. It contained an old queen of *Bombus flavifrons* and about half a dozen workers of the same species; also the well-preserved body of a female of *Psithyrus insularis* Sm., and several unopened cocoons, out of one of which I extracted a male, nearly ready to hatch, of *Psithyrus consultus* Frank. The occurrence of *Psithyrus* in this nest is of considerable interest, for Franklin said in his recent monograph of the Bombidæ of North America (Trans. Am. Ent. Soc. XXXV, page 448), "There is not yet a single new world account of a *Psithyrus* having been found in a bumble-bee's nest."

Moreover, several noteworthy conclusions are indicated.

Corroboration of a new and highly convincing kind is given to the already well-founded belief (id., page 458), that *consultus* is the male of *insularis*, for the female *insularis* was in all probability the mother of the male *consultus*. It may be remarked that the name *insularis* has priority.

Second, *Ps. insularis* is evidently parasitic upon *B. flavifrons* in British Columbia. In Eastern Canada (*insularis* is common at Ottawa) it must prey upon some other species of *Bombus*, for *flavifrons* is not found in the east. Probably, however, it lives with several species in both regions.

Third, *Ps. insularis* does not apparently kill the *Bombus* queen, as I have found *Ps. vestalis* and *rupestris* do in England ("The Humble Bee," page 60), but both females seem to live together in the nest, laying eggs. (The death of the *insularis* female was evidently due to age or accident.) This seems to be in accord with Hoffer's observations on *Psithyrus campestris*, the Old World representative of *insularis*. He found *Ps. campestris* living on good terms with its hosts, *B. agrorum* and *helferanus*, both queens producing young (Die Schmarotzerhummeln Steirmarks, page 101).

A NEW APHID FROM FLORIDA.

BY GEORGE G. AINSLIE, WASHINGTON, D. C.

Carolinaia cyperi, n. sp.

Alate viviparous female—General colour black. Head, thorax and abdomen shining black, the latter with a greenish tinge in strong light. Eyes dark red, almost black. Antennæ black, appearing brownish in strong light, shorter than body, reaching beyond middle of abdomen, situated on very flat frontal tubercles, 6-segmented. Antennal segment VI with basal portion less than half as long as spur and shorter than IV, III about two-thirds as long as spur, five to seven, generally six, large round sensoria in a row on III, the usual ones at tip of IV and at base of spur. Rostrum dusky yellow, short, reaching just beyond first coxæ. Wings hyaline with strong black veins, stigma dusky, articulation greenish, venation of fore wings regular, hind wings with but one cross vein. Legs dusky yellow, tarsi and distal extremities of femora and tibiæ black. Cornicles dusky yellow, sometimes with reddish tinge, robust, swollen on inner side, largest about two-thirds out from base, with a sharp constriction and a flaring ring at tip which is turned slightly outward, carried closely appressed to the body pointing toward the cauda. Cauda dusky yellow, conical, retracted in life.

Measurements—Length of body 1.40 mm., width .65 mm. Length of antennal segments: I .071 mm., II .053 mm., III .212-.265, aver. .245 mm., IV .141-.177, aver. .157 mm., V .159-.194, aver. .177 mm., VI base, .123-.159, aver. .147 mm., spur, .335-.406, aver. .378 mm. (averages from ten antennæ). Total length 1.213 mm. Wings, fore wing, length 2.29 mm., width .84 mm., hind wing, length 1.21 mm., width .33 mm., total wing expanse 5.15 mm. Cornicle, length .212 mm., width .053 mm. Cauda, length .106 mm.

Apterous viviparous female—General colour black with a sepia tinge and shining with a metallic lustre. Surface of head, thorax and abdomen minutely rugose or shagreened. Body flattened, turtle-shaped, with lateral margins prominent and often furrowed. Antennæ 6-segmented, I, II, V and VI dark with yellowish tinge, III and IV paler, the articulation between III and IV though

sometimes not complete is always indicated, a single sensorium near tip of IV and the usual group at base of spur. Legs dusky yellow, tarsi and distal extremities of femora of second and third pairs darker. Cornicles and cauda as in alate form, the former closely appressed to the abdomen in life.

Measurements—Length of body 1.63 mm., width .93 mm. Length of antennal segments, I .07 mm., II .05 mm., III .14-.176, aver. .16 mm., IV .088-.124, aver. .10 mm., V .106-.124, aver. .12 mm., VI base .088-.106, aver. .10 mm., spur .212-.247, aver. .23 mm., total length .839 mm. Cornicles, length .265 mm. Cauda, length .088 mm.

Pupa—Head, thorax and abdomen dark mottled green. Antennæ dusky yellow at base, shading to almost black at tip. Eyes dark red. Wing pads pale yellow with greenish tinge. Legs pale yellow. Cornicles as in alate form, though more robust. Cauda not apparent. Length of body 1.26 mm., width .79 mm.

The young are pale yellow or greenish when born and gradually darken as they approach maturity.

The species agrees well with Wilson's definition of the genus, except that the apterous forms have indistinctly 6-segmented antennæ instead of 5-segmented as he gives it. The division between III and IV is plainly indicated in all the specimens I have seen and in many is complete.

This aphid was first found at Lakeland, Florida, in November, 1912. Further observations were made during the following winter and during the winter of 1913-14. Specimens were sent to Mr. J. J. Davis and Mr. J. T. Monell, both of whom pronounced it a new species of *Carolinaia*. I am indebted to them and especially to Mr. J. J. Davis for assistance in the preparation of this paper.

The species appears to be rather generally distributed throughout Florida, for it has been taken at a number of places throughout the state and as far north as Gainesville. *Cyperus esculentus*, which in its wild form is the pestiferous nut-grass of the south and in cultivation is known as the chufa, is its only observed food plant. It thrives on chufa in cages and colonizes it readily when available in the field. Other species of *Cyperus* growing in close proximity to infested plants of *esculentus* were examined repeatedly, but the aphid was never found on them.

Notwithstanding its dark colour, it is a very inconspicuous species, for it lives only on the under side of the leaves, where it forms large colonies, the apterous adults lying in a single regular row on each side of the midrib with the small forms crowded in among them. It is surprising how many can exist in this way on the lower side of one leaf. No matter how crowded they may be on the under surface, they never feed on the upper surface, and the leaves seem never to show the slightest effect of their presence. The alate forms are very seldom found in the larger colonies, for they leave the group as soon as matured to establish new ones on uninfested plants.

It has not been followed throughout an entire season. When first found in November the colonies, then rather small, consisted of apterous adults, young, and an occasional alate form. In January almost every plant in the field bore large colonies, but winged adults were very scarce. When, however, some of the infested plants were transferred to a cage, winged forms appeared at once, indicating that they had been developing, but leaving the parent colony as soon as mature. The large colonies persisted in the field and became very abundant until about the middle of March, when predaceous enemies began to make serious inroads upon them. Previous to this the weather, while not freezing, had been cool enough to suppress most insect activity. From this time on the colonies grew smaller and more scattered, for Coccinellids and Syrphids became so numerous that no colony long remained unmolested. Small scattering colonies were still present at the time of my last observations late in May. No sexes have been found, and it is most likely that the species can winter exposed on its food plant in any normal season. In evidence of this, I have just received a letter from Mr. R. N. Wilson from Gainesville, Florida, dated November 27, 1914, in which he states that a recent cold snap froze the nut-grass back to the ground, and that the aphids are not numerous, but at the same time he sent a good supply of them taken in the open. How they fare in summer, when the unshaded sand is heated to 130 to 150 degrees F. by the sun, I have not had opportunity to observe.

Coccinella sanguinea and *Baccha clavata* were the most common of the predaceous enemies though other species of Coccinellids

and Syrphids were present in smaller numbers. Numbers of parasites were reared from the larvæ and pupæ of these predators, among them several undescribed species of Hymenoptera. Internal parasites were not in evidence, and only a few aphids killed by them were seen. Possibly in summer they are more efficient. Aside from insect enemies, the most serious foe of the nut-grass aphid is the hard dashing rain, which becomes more frequent in May and June. The fine sand is driven against the lower surface of the leaves with such force by the splashing rain-drops that most of the aphids are beaten off or killed, and after two or three such showers it is often difficult to find more than a few scattered individuals.

Records of a few individuals more closely observed follow. On January 20 a migrant taken from the field was put on a potted nut-grass plant. While the plant remained fresh apterous adults developed, and by January 31 a number of these were producing young. February 2 the original migrant was still producing young, but the plant had begun to deteriorate. February 11 the plant was practically dead, killed by a larva of *Bactra lanceolana*, so the few aphids remaining were transferred to a fresh plant. February 19 alate forms began to appear, and between that date and April 7, when the plant finally died from neglect, 181 winged forms were removed, practically all that were produced during that period having developed wings.

An alate vivipara maturing January 22 was placed on a caged plant. Up to March 6, when she disappeared, she had given birth to 51 young at the rate of one, two or three per day.

THE SYMMETRY OF INSECTS.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

All insects are bilaterally symmetrical, or, in other words, the two lateral halves of an insect are alike, and symmetry can be defined as a pleasing equality of parts. Bilateral symmetry is sometimes known as horizontal dual symmetry, inasmuch as bilaterally symmetrical objects are usually oriented from a middle point or portion and exploited by equal movements of the eyes to the right and to the left, which is the natural method. As a result,

March, 1915

the aesthetic value of dual symmetry is greater in the horizontal than in the vertical.

In addition, other forms of symmetry can be found in insects, due to the arrangement of wings, venation and colour patterns. In fact, aesthetic appreciation of insects is due to many factors, among which are symmetry, proportion, intensity and arrangement of colours and experience and familiarity with the insects in question.

In the Lepidoptera horizontal dual symmetry is quite common, but in addition the lateral halves of many members possess radiating symmetry by reason of radiating wings and veins. The repetition of certain designs or colour spots arranged in curves or lines can be called running symmetry, and at times rotating symmetry is found, as, for example, the circular spots of *Automeris io*. In a few instances lepidopterous insects are exploited by movements of the eyes above and below the horizontal line formed by the posterior edges of the first pair of wings. In many individual butterflies and moths nearly all of the above forms of symmetry can be found, and when such a multiplicity occurs the insect assumes a complexity, which may or may not, according to one's training, be viewed with æsthetic pleasure.

Members of the Diptera possess in the main horizontal dual symmetry, and at times radiating symmetry of the wing veins. Many of the Hymenoptera present radiating symmetry due to their narrow wings radiating from the thorax, although all four elements are not equal. In mounted specimens the arrangement of the legs also tends to induce divergent radiating exploitation.

In the Orthoptera the expanded hind wings of the Acridiidae contain intense radiating elements, and many of the Odonata possess a four-fold radiating symmetry due to the radiation of their narrow equal wings. In the majority of the Orthoptera and Hemiptera dual symmetry in the horizontal is most apparent. While some members are exploited in different ways, very few of such movements induce what is known as æsthetic pleasure.

Many of the Coleoptera, in addition to possessing horizontal dual symmetry, which is not very apparent at times, also exhibit proportion or a pleasing inequality of parts shown in the proportion between the length and width of the insect. To many persons

the rectangle is more pleasing than the square because of its variety. For example, the Coccinellidæ are not as pleasing as to form as the Elateridæ. Symmetry at times becomes monotonous. Some members of this order are exploited horizontally from the vertical line formed by the inner edges of the wing covers and others, vertically above and below the upper edge of the abdomen or markings on the abdomen, while still others will impress one at the first only with their pleasing or displeasing inequality of parts.

Some of the Odonata also exhibit a pleasing inequality of parts, especially those which are T-shaped when spread.

Aesthetic pleasure depends in part upon certain habitual methods of orientation and exploitation, such as the movement of the eyes and attention upwards which is preferred to a movement downwards, a movement from the eyes of left to right, which is preferred to the opposite movement, and proportion, which is more pleasing in some cases than symmetry. As mentioned before, symmetry and proportion are only two of the many factors contributing to the total result known as æsthetic appreciation of insects.

THE CADDIS-FLIES (TRICHOPTERA) OF JAPAN.—II.

BY WARO NAKAHARA, TOKYO, JAPAN.

(Continued from Vol. XLV, p. 327.)

Family Limnophilidæ.

Of this family I recognize six genera as occurring in Japan, viz., *Glyphotælius*, *Nemotaulius*, *Grammotaulius*, *Limnophilus*, *Nothopsyche*, and *Moropsyche*.

Genus *Glyphotælius* Steph.

1. *Glyphotælius admorsus* MacLachlan.

Glyphotælius admorsus MacLachlan—Trans. Ent. Soc. Lond. (3) V, p. 250 (1866); Hagen, Verh. zool.-bot. Ges. Wien, XXIII, p. 446 (1873); Matsumura, Thous. Ins. Jap., I, p. 167, pl. XII, fig. 4, ♂ (1904); Ulmer, Cat. Coll. Selys, VI, p. 16, figs. 24 and 25, pl. I, fig. 4 (1907); Ulmer, Deutch. Ent. Zeit., p. 340 (1908).

Habitat—Hondo (Gifu, Okayama, Tokyo, Inokashira, near Tokyo, Osaka, Teganuma, etc.); Kiushin (Yanagawa, Prov. Chikugo).

Time of appearance—April to June.

2. *Glyphotælius miyakei*, sp. nov.

Head lurid reddish brown, covered with minute whitish hairs; vertex blackish; narrowly yellowish around eye; palpi fuscous. Antenna fuscous, some terminal joints suffused with yellow. Eye shiny black.

Pronotum covered with whitish hairs, divided in the middle by a longitudinal line. Mesothorax fuscous. Metathorax somewhat yellowish.

Legs yellowish, tibia II and tarsi of all legs more or less suffused with fuscous; spines black or fuscous black; spurs yellow.

Fore-wing tinged with brownish yellow, rather strongly produced at apex and sinuated at apical margin; apical half of the wing slightly clouded with greyish; hyaline oblique band in the discal area of the wing entirely wanting; a few black stripes and dots along cubital and anal veins; pterostigma quite indistinct; hind marginal area of the wing not marked with special colour.

Hind-wing hyaline, colourless, excepting the apical area and pterostigma, which are slightly tinged with yellowish; venation yellowish.

Abdomen dark brown above, somewhat paler on ventral side. In the male the 9th abdominal segment is produced at its posterior margin into a triangular portion, the edge of which is directed downwards and beset with few soft hairs; superior appendage small, piceous, and subquadrate; inferior appendage very large, not parted in the middle by an impressed line; penis very long, suddenly dilated a little before its apex, with a hairy accessory process on each side.

Length of body 13 mm.; fore-wing 20 mm.; hind-wing 16 mm.

Type—A single male obtained at Matsuyama, Prov. Iyo, Shikoku, in my collection.

This species is respectfully dedicated to Dr. T. Miyake, at whose suggestion and through whose kindness I was able to take up the study of Japanese caddis-flies.

This species is very closely allied to *G. admorsus*, but can be distinguished by the markings of the fore-wing and the structure of the male genitalia.

Genus *Nemotaulius* Banks.3. *Nemotaulius brevilinea* (MacLachlan).

Grammotaulius brevilinea MacLachlan, Journ. Linn. Soc. Lond., Zool., XI, p. 107, pl. II, fig. 1, ♀ (1871); Hagen, Verh. zool.-bot. Ges. Wien., XXIII, p. 453 (1873); MacLachlan, Rev. Syn. Trichopt. Europ. Fauna, p. 34 (1894); Matsumura, Thous. Ins. Jap., I, p. 169, pl. XII, fig. 7, ♀ (1904).

Nemotaulius brevilinea Banks, Proc. Entom. Soc. Wash., VII, p. 107 (1906); Ulmer, Genera Insectorum, Trichoptera, p. 40 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Glyphotaelius subsinuatus Ulmer, Notes Lyden Mus., XXVIII, p. 5, figs. 5, 6, ♂ (1906); Ulmer, Gen. Ins., Trichopt., p. 40 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

MacLachlan's original description of this species is sufficiently precise, except in that his types were females. There is no doubt in my mind that the form described by Ulmer under the name of *Glyphotaelius subsinuatus* is the male of this species.

Habitat—Hondo (Gifu, Kangawa, Yokohama, Tsuchiura, Teganuma, Kyoto, etc.); Hokkaido (Sapporo); Shikoku (Matsuyama).

— Possibly of general distribution in Japan.

Time of appearance—April to June.

Genus *Grammotaulius* Kolenati.4. *Grammotaulius ornatus*, sp. nov.

Head reddish brown, covered with hairs of pale yellow; a rather deeply impressed longitudinal line on vertex; narrowly pale yellow around eye; maxillary and labial palpi fulvous brown, apical joint of the latter blackish; antenna yellowish, with rather indistinct brownish annulations.

Prothorax reddish brown with a median impressed line above; covered with minute pale yellow hairs; beset with long fuscous hairs on both sides. Mesothorax fuscous black; median part of notum reddish brown, furnished with minute tubercles and hairs; tegulae brown, beset with long blackish hairs. Metathorax entirely dark brown. Legs yellowish; spurs and spines fuscous black.

Fore-wing semi-hyaline, slightly tinged with brownish yellow; an oblique broad hyaline band in discal area, both sides of the

band marked with large fuscous spots, several small fuscous spots in the area between radius and its sector; a large hyaline mark, with a few fuscous spots in, at the outside of discal cell; apical marginal area rather irregularly marked with fuscous.

Hind-wing hyaline and nearly colourless, slightly tinged with yellowish at apex.

Abdomen fuscous black, hind margin of most segments somewhat paler. Female with two slender, hairy processes at the apex of the abdomen.

Male unknown.

Length of body 13 mm.; fore-wing 16 mm.; hind-wing 14 mm.

The type is a single female in my collection. It was captured by Mr. Arakawa at Uwajima, Prov. Iyo, Shikoku, in May, 1913.

Genus *Limnophilus* Leach.

5. *Limnophilus correptus* MacLachlan.

Limnophilus correptus MacLachlan, Rev. Syn. Trichopt. Eur. Fauna. Suppl. II, p. 18, pl. LIII, fig. 3 (1880); MacLachlan, First add. Suppl., p. 5 (1884); Matsumura, Thous. Ins. Jap., I, p. 171, pl. XII, fig. 10, ♀ (1904); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Limnophilus borealis Ulmer, Cat. Coll. Zool. Selys, VI (1), p. 17, figs. 26, 27 (1907), nec Zetterstedt.

(?) *Limnophilus borealis* Ulmer, Deutch. Ent. Zeit., p. 341 (1908). The Japanese form recorded by Ulmer as *L. borealis* can not be that species. He could not have examined a specimen in good condition, or he would never have considered the form identical with *borealis*, from which it is in reality quite distinct.

The wing-markings of this species vary to a remarkable extent.

Habitat—Hokkaido (Sapporo, Hokodate); Shikoku (Uwajima, prov. Iyo). Outside of Japan—China, Amurland.

Time of appearance—Unknown.

6. *Limnophilus fuscovittatus* Matsumura.

Limnophilus fuscovittatus Matsumura, Thous. Ins. Jap., I, p. 171, pl. XII, fig. 13, ♀ (1904); Matsumura, Syst. Ent. (Konchu bunruigaku), I, p. 190 (1907).

Limnophilus subfuscus Ulmer—Cat. Coll. Zool. Selys, VI (1), p. 20, figs. 32-35 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

The *L. subfuscus* described by Ulmer is apparently identical with *L. fuscovittatus*, which was overlooked by him. The original description of this species, which is not a bad one and is accompanied by a figure, cannot be considered unrecognizable, though written in the Japanese language, for the latter is certainly not to be regarded as unintelligible by the workers of the western world. I was therefore compelled to make *subfuscus* a synonym of *fuscovittatus*.

Habitat—Hondo (Tokyo and Gifu).

Time of appearance—October, April—It possibly passes winter in the imago state.

7. *Limnophilus affinis* Curtis.

Limnophilus affinis Curtis, Phil. Mag., IV, p. 123 (1834).

Limnophilus stigmaticus Kolenati var. (?) *affinis* Walker, Cat. Brit. Mus. Neuropt., I, p. 27 (1852).

Limnophilus affinis MacLachlan, Rev. Syn. Trichopt. Europ. Fauna, p. 82, pl. IX, fig. 8 (1875); Matsumura, Thous. Ins. Jap., I, p. 170, pl. XII, fig. 9, ♀ (1904); Matsumura, Journ. Coll. Agr. Tohoku Imp. Univ., IV, p. 16 (1911).

Several specimens from Sapporo (H. Okamoto coll.), Gifu (S. Yamamura coll.), Uwajima, Prov. Iyo (Arakawa coll.) are in my collection. I have compared these with others from Europe (I am indebted to Mr. E. Petersen for several European specimens of this species) without discovering any difference that appears to be specific. The Japanese form is somewhat larger and occasionally has an oblique hyaline band on the disk of the forewing.

Distribution—Japan, Saghalien, Siberia, Europe.

Time of appearance—March and April.

8. *Limnophilus amurensis* Ulmer.

Limnophilus amurensis Ulmer—Stett. Ent. Zeit., Jg. 66, p. 8, taf. I, figs. 4 and 5 (1905); Ulmer, Cat. Coll. Zool. Selys, VI (1), p. 19, figs. 28, 29, taf. I, fig. 5 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Habitat—Hokkaido (Sapporo). Amurland.

Time of appearance—Unknown.

9. ***Limnophilus ornatus*** Banks (?).

Limnophilus ornatus (?) Ulmer, Cat. Coll. Zool. Selys, VI (1) p. 20, figs. 30, 31, taf. I, fig. 6 (1907); Ulmer, Deutch. Ent. Zeit., ip. 341 (1908), nec Banks.

This species is unknown to me. Ulmer recorded two female specimens from Hokkaido ("Yerse"), saying, "Die beiden Stücke stimmen gut, wie das auch meiner Figur auf Tafel I zeigt, mit der Beschreibung von Banks überein; die Appendices præanales eines amerikanischen Exemplares, das mir von C. Betten gesandt wurde (det. N. Banks) sind allerdings an der Basis etwas breiter und schwach medianwärts statt lateralwärts gekrümmt; . . ."

In any case it is very interesting to know that the same or a very closely allied species occur in such widely separated localities as North America and Hokkaido.

Genus *Nothopsyche* Banks.

10. ***Nothopsyche pallipes*** Banks.

Nothopsyche pallipes Banks, Proc. Ent. Soc. Wash., VII, p. 107, pl. III, fig. 1 (1906); Ulmer, Cat. Coll. Zool. Selys, VI (1) p. 29, figs. 48, 49 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Habitat—Hondo (Gifu, and Numata, Prov. Kozuke).

Time of appearance—October.

11. ***Nothopsyche ruficollis*** (Ulmer).

Chilostigma ruficolle Ulmer, Stett. Ent. Zeit., Jg. 66, p. 14, taf. I, figs. 12, 13 (1905).

Nothopsyche ruficolle Banks, Proc. Ent. Soc. Wash., VII, p. 107 (1906).

Nothopsyche ruficollis Ulmer, Cat. Coll. Zool. Selys, VI (1) p. 29, figs. 46, 47 (1907); Ulmer, Deutch. Ent. Zeit., p. 342 (1908).

Habitat—Hondo (Tokyo, Gifu, Numata). Shikoku (Uwajima, Matsayama). Kiushin (Yanagawa, Prov. Chikugo).

Time of appearance—August to November.

12. ***Nothopsyche longicornis***, sp. nov.

Head fuscous black; frons with long piceous hairs; maxillary palpus greyish black; antenna black, much longer than fore-wing.

Prothorax dark orange, beset with long fuscous hairs. Meso- and metathorax black or fuscous black. Legs blackish, with many black spines; spurs black.

Fore-wing broad, semi-hyaline, nearly uniformly smoky brown, somewhat suffused with yellowish in basal area; venation fuscous; discal cell very long, twice the length of the first apical cell. Hind-wing similar to the fore-wing, but the basal area not suffused with yellow; colour of the wing lightened in inner marginal area; venation darkish.

Abdomen dark brown, ochraceous toward apex; hind margin of each segment narrowly variegated with dark yellow. In the male the posterior margin of the 9th abdominal segment produced into a quadrangular prolongation in the middle; superior appendage ochraceous, stout, and broad; inferior appendage very long, stout, with the apex furnished with numerous spiny hairs; viewed from above, between the inferior appendages, are seen two slender yellowish processes.

Length of body 5—5.5 mm.; length of fore-wing 9 mm.; length of hind-wing 7 mm.

The type is a single male specimen captured by Mr. S. Yamamura at Minakuchi, Prov. Ohmi, on November 4, 1911.

This species is closely allied to *N. ruficollis*, but can at once be distinguished from the latter by the much smaller size. The structure of the male genitalia and a certain character in wing venation also afford unmistakable distinctive criteria between the two species.

Genus *Moropsyche* Banks.

13. *Moropsyche parvula* Banks.

Moropsyche parvula Banks, Proc. Ent. Soc. Wash., VII, p. 108, pl. III, figs. 3, 8 (1906); Ulmer, Deutch. Ent. Zeit., p. 342 (1908).

This species is unknown to me. I have not yet obtained a specimen, nor have I seen any in Japan.

Habitat—Kiushiu (Hikozan), according to Banks.

Time of appearance—March, according to Banks.

DESCRIPTION OF A NEW SEED CHALCID FROM
SPRUCE

BY S. A. ROHWER, BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

The following new species has been reared from the seeds of Engelmann spruce (*Picea engelmanni*), from the Sitka spruce (*Picea sitchensis*), and from Colorado blue spruce (*Picea parryana*). It has been reared from seeds collected in Beulah and Glenwood Springs, Colorado; while the types come from Crescent City, California. The material has all been reared by Mr. J. M. Miller.

Megastigmus piceæ, new species.

In Marcovitch's correction to Crosby's table (Can. Ent., 1914, Vol. XLVI, p. 438) the female runs to *laricis* Marcovitch, but may be separated from that species as follows:

Propodeum with a median carina; face all yellow and without many long black hairs; cheeks yellow; flagellum yellow beneath; femora pale.....*laricis* Marcovitch.

Propodeum with two short carinae basally; face with median brownish spot and with many long blackish hairs; cheeks black; flagellum black; femora black basally.....*piceæ* Rohwer.

The male differs from the descriptions of *lasiocarpæ* and *laricis* in a number of characters.

Female.—Length 2.5 mm.; length of the ovipositor 2 mm. Head finely rugulose with the lines radiating from the ocelli and from the mouth parts; postocellar line

one-fifth longer than the ocellular line; intraocellar line subequal with the ocelloccipital line; pronotum and mesonotum transversely aciculate, on the prescutum the aciculations are much finer anteriorly, and they are more pronounced posteriorly; axillae granular posteriorly; scutellum reticulate, anteriorly with a tendency towards striation;

stigmatal club as in Figure 1a. Black; palpi, mandibles, face below a line slightly above the bases of the antennae, scape and pedicel beneath, yellow; face medianly with longish, subcircular, brownish spot; legs yellow, with the following black or brownish markings:



Fig. 13.—*Megastigmus piceæ*,
stigmatal club.

Bases of the four anterior coxæ, the four anterior femora posteriorly and the posterior femora except apices; wings hyaline, venation brownish.

Male.—Length 2 mm. Sculpture as in the female. Black; palpi, face below a line slightly above the bases of the antennæ, posterior orbits to the height of the yellow on the face, scape and pedicel beneath, spot on the pronotum laterally, spots on the abdomen laterally on tergites three and four, *yellow*; legs yellow, coloured as in the female except tibiæ and tarsi are slightly brownish.

Crescent City, California. Described from four females, one, type, and four males, one allotype, recorded under Bureau of Entomology Number Hopk. U. S. 10850j. Material collected by P. D. Sergeant and reared by J. M. Miller in April and May, 1914, from seeds of *Picea sitchensis*.

Type.—Cat. No. 19066, U. S. N. M.

THE RATE OF HATCH OF SCALE INSECT EGGS.

BY C. W. WOODWORTH, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

Scale insects, particularly those of the sub-family Lecaninæ, are among the most prolific insects, and evidently the normal death rate will be in the neighbourhood of 99.9%, since at least a thousand eggs is the normal reproduction and males are very rare in the two commonest species.

At what point in the life history the greater part of this reduction in numbers occurs has never been investigated fully, but we have now rather extensive data upon the rate of death before hatching.

A very large series of experiments was carried on last spring upon the effect of cyanide gas, and half the eggs from each insect experimented with were kept untreated as a check. Two hundred lots of a hundred insects each were in these experiments, and, estimating 500 untreated eggs in each, the data below gives the rate of hatch determined from observations on about 10,000,000 eggs.

These studies covered five species and twelve localities, Ontario and Santa Barbara in the South, and Anderson, about 500 miles to the north, give more than the average hatch, and the

same is true of Folsom and Merced in the center of the hot interior valley. Only at Aromas, in one series of black scale on olive and European Fruit Scale on apricot, is the percentage far below the normal, but the black scale on apricot, both there and at Watsonville a few miles away, the percentage of hatch is very high.

We are led to conclude that food plant or locality has very little to do with the rate of hatching which this year averaged 87.75% for the whole series.

SCALE	PLANT	LOCALITY	NO.	
			LOTS	HATCH
Black Scale	Apricot	Aromas	100	100 %
		Ontario	100	97 %
		Watsonville	100	76.8 %
	Grape Fruit	Santa Barbara	600	86.6 %
	Maytenus	Berkeley	100	96 %
	Olive	Aromas	100	53.6 %
	"	Folsom	300	81.1 %
	"	Merced	300	93.9 %
	Orange	Ontario	400	89.6 %
	Peach	Berkeley	300	73.2 %
Prune	San Jose	100	100 %	
	Lake County	100	100 %	
<i>Total</i>			2600	86.68%
European Fruit Scale	Apricot	Aromas	100	52.5 %
		San Jose	100	98.3 %
		Santa Barbara	100	97 %
	Prune	Santa Clara	400	95.4 %
		San Jose	3600	89.85%
		Lake County	2600	90.99%
	<i>Total</i>			14400	87.41%
Oak Scale	Oak	Berkeley	400	97.92%
Pine Scale	Pine	Berkeley	1200	95.17%
Peach Scale	Ivy	San Jose	1400	83.48%
<i>Grand Total</i>			20000	87.75%

University of California, December 31, 1914.

BOOK NOTICE.

INSECTS INJURIOUS TO THE HOUSEHOLD AND ANNOYING TO MAN.

By Glen W. Herrick, Professor of Economic Entomology, Cornell University, New York. The McMillan Company. 470 pages, price \$1.75.

Few persons realize to what extent our homes are liable to attacks by insects, though everyone may complain of those that are directly annoying to him personally. It will be somewhat of a surprise, therefore, to the average reader to learn from this book how many and how varied are the numbers and modes of attack of what may be termed domestic insects. The first hundred and fifty pages of the book are filled with the life histories and methods of control of House and Stable Flies, Mosquitoes, Bedbugs, Cockroaches and Fleas. Ants and their activities and invasions are next dealt with; then follow chapters on insects injurious to clothes and carpets, to cereals and preserved fruits, to meats, cheese and condiments; human parasites, annoying pests of man, some troublesome invaders, wood-boring insects and a chapter on insects that are poisonous and objects of dread, concluding with instructions for fumigating. The book is illustrated with 152 cuts and eight plates.

The writer has had occasion to refer to this work when replying to the enquiries of correspondents and has found it most convenient for the purpose, especially where one wishes to learn the well-tested methods of control. The lists of references to economic literature at the end of each chapter are also very useful. Those who are in charge of the entomological departments of Experiment Stations, and who are, therefore, constantly applied to for information and advice respecting insects of all kinds, will find this book a most convenient manual of reference. The ordinary householder may fail to appreciate it until his property or comfort is seriously attacked by one or more minute insect foes; when such troubles arise he will find all the information he requires in clear and plain language and full directions for waging a successful warfare against the invading enemy.

C. J. S. B.

The Canadian Entomologist.

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No. 4

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 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*, *hispidabris*, 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.,

April, 1915

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 tibiae 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 PAPAPEMA 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 dipteran, 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.

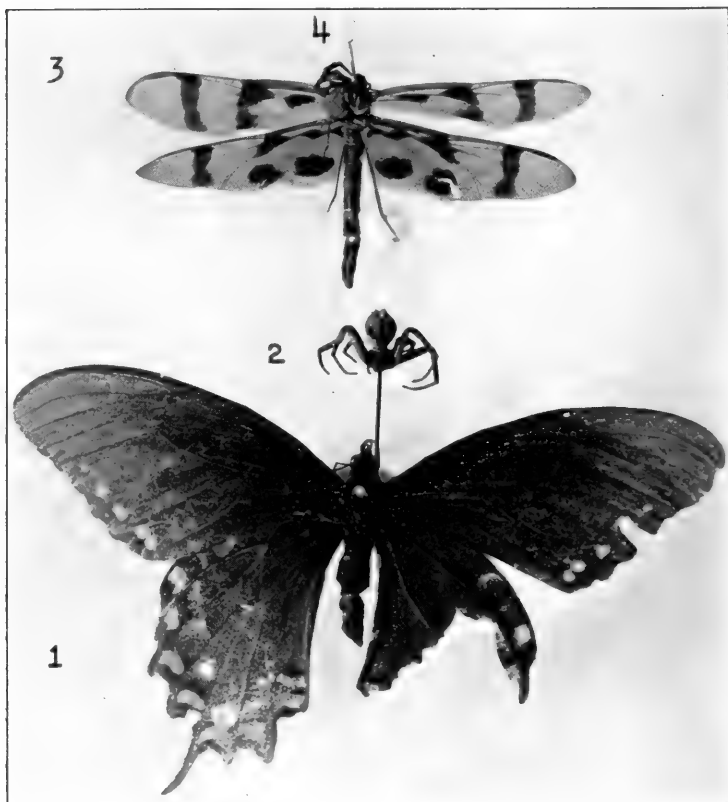
The species seems closest superficially to *marginidens* Gn.,

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 distributed 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.
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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 *Therio-plectes* 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

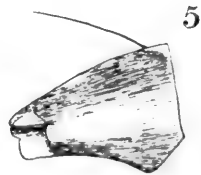
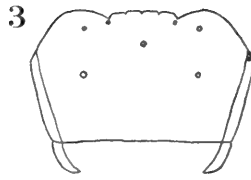
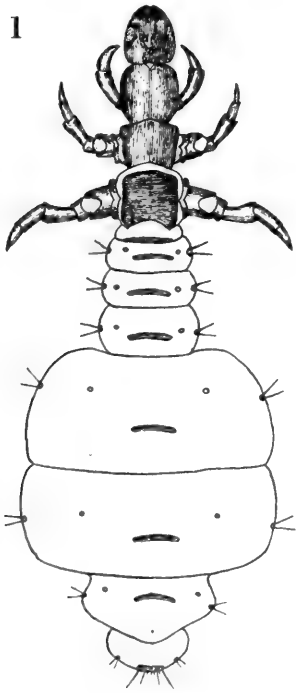
*Contribution from the Limnological Laboratory of the Department of Entomology in Cornell University.

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 $2\frac{1}{2}$ —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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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 $3\frac{1}{2}$ 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—*Ithytrichia 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 *crisifera*.

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 (Sansou.) 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 (Sansou). 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 (Sansou). 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 *funebri* 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 Mæschler'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 (Sansón). 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 (Sansón). 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 shallows. 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.-Schaff. It was described from Wisconsin. *Inops* came from Kittery Point, Maine.

658. **Nycterothæta 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 willow 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 willow 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 *Helica 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 brassicae** 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 *Hemercampa 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.

H. B. WEISS, New Brunswick, N. J.

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 aspidistrae* on aspidistra from Belgium; *Chrysomphalus aonidium* 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.

HARRY B. WEISS, New Brunswick, N.J.

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POPULAR AND ECONOMIC ENTOMOLOGY.

SOME OF THE BENEFITS FROM SPRAYING WITH ARSENATES IN THE APPLE ORCHARDS OF NOVA SCOTIA.*

BY GEO. E. SANDERS, FIELD OFFICER,
Entomological Branch, Dominion Department of Agriculture.

During the seasons of 1912 and 1913 an experiment was conducted by the local laboratory of the Entomological Branch to determine the extent of benefit from each of the four sprays then applied to the orchards of the Annapolis Valley in controlling the three most important groups of biting insects, namely, the Bud-moths, the Fruit Worms and the Codling Moth.

The orchard under experiment was six to seven years old, standard trees forty feet apart, with Wagner fillers eight feet two inches apart, and when taken was moderately infested with Bud-moths, heavily infested with Fruit Worms and moderately infested with Codling Moth. The results throughout were taken on Wagners. Ten acres of orchard were used, divided into plots of 10-12 acres each.

The composition of the spray used was commercial lime and sulphur, one to thirty-five, and Swift's acid paste lead arsenate, five pounds to one hundred gallons; it was applied with a hand pump. The first application was made when the buds were bursting, as soon as the first Bud-moth started eating its way into the bud, to be referred to as spray 1. The second was applied from two to three days before the blossoms opened, to be referred to as spray 2. The third was applied immediately after the blossoms fell, to be referred to as spray 3, and the fourth was applied two weeks later, to be referred to as spray 4.

The infestation of Bud-moths in the buds in the unsprayed checks at the end of the experiment was 59.56 per 100 buds, while

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

in the plots receiving spray 2 and 3 together they averaged 22.1 per 100 buds, or the number of Bud-moths was reduced by 60.75 per cent.

The infestation of Fruit Worms at the end of the first season in the checks (unsprayed) was 12.44 injured apples per 100 picked, while in the plots receiving spray 2 and 3 together there were 4.33 injured apples per 100 picked, or the injury by Fruit Worms was reduced by 65.19 per cent. The second season, with a much lighter infestation throughout the orchard, the benefit was 63.56 per cent. reduction in Fruit Worm injury.

The Codling Moth infested 4.54 per cent. of the apples in the checks in 1913. It was found that spray 2 gave 71.3 per cent. reduction in injury. Spray 3 gave 89.2 per cent. reduction, and spray 4 gave 65.6 per cent. reduction. From the fact that the Codling Moth is, as a rule, an insect of minor importance in Nova Scotia, and that it is largely controlled by sprays other than the regular Codling Moth spray, the Nova Scotia apple growers are free to advance or retard by two or three days the first spray after the blossoms, as may be advantageous to them in controlling any other pest, with practically no reduction in benefit to Codling Moth.

The injury done by the three insects under observation was divided into two classes; the first, reduction in the set of fruit, and the second, injury to the picked fruit.

Effect of Bud-moth in Reducing Set

In the Experimental orchard 59.56 per cent. of the blossom buds in the checks contained Bud-moth. Counts of 1000 blossom clusters infested with Bud-moth showed 305 apples set, while 1000 blossom clusters free from Bud-moth on the same trees set 1205 apples. In other words, the reduction in set in the blossoms infested is 75 per cent., or in the checks where the infestation was 59.56 per cent. the reduction in set was approximately 45 per cent. By the use of spray 2 and 3 we reduced the number of Bud-moths by 60.75 per cent., so instead of growing 55 apples where 100 would have set if no Bud-moth had been present, we increased the set to 82, or an increase in set of 49.09 per cent.

Effect of Fruit Worm in Reducing Set.

In the check plots we found 12.44 per cent. of the picked fruit showing Fruit Worm injury. Observations during June showed that 72.48 per cent. of the young fruits injured by Fruit Worms drop to the ground before maturity. So the number of apples which fell in the checks was 32.75 per cent. of the total set on 67.28 apples were grown where 100 would have grown if no Fruit Worms had been present. Spray 2 and 3 reduced this injury by 65.19 per cent. and so increased the set from 67.28 apples to 88.61 apples or an increase in set of 31.7 per cent.

TABLE SHOWING INCREASE IN SET DUE TO BUD-MOTH AND FRUIT WORM CONTROL.

Due to	Per cent. drop due to insect injury.	Per cent. set in unsprayed plots	Per cent. benefit by spraying in controlling insects.	Per cent. set when sprayed.	Per cent. increase in set due to insect control.
Fruit Worm....	32.72	67.28	65.19	88.61	31.7
Bud-moth.....	45.	55.	60.75	82.	49.09
Total increase in set.....					80.79%

Or where in the treated plots we grew 100 apples in the untreated plots we grew 55 apples.

Bud-moth Injury to the Picked Fruit

In estimating Bud-moth injury to the picked fruit, the counts in the various plots varied greatly, depending on the crop, size of the leaves, etc., so that no accurate idea of control beyond the general benefit in reducing Bud-moth could be gathered. The whole twelve plots averaged 44.7 per cent. Bud-moth infestation in the buds, while 9.5 per cent. of the total crop of apples had leaves tied up to them, the surface showing injury by the young larvæ. A total injury of about one apple to every five buds injured in the spring. All apples injured by Bud-moths under the present interpretation of the Fruit Marks Act are packed as No. 3's or "culls," the injury being properly classed as "causing material waste."

Fruit Worm Injury to the Picked Fruit

In the check plots the total Fruit Worm injury was 12.44 per cent. of the picked fruit. Of these 39.5 per cent., or 4.97 per cent. of the total, were so damaged as to be fit only for No. 3's or culls.

In many cases the injury is much greater than this, a larger proportion of those injured being classed as No. 3's and culls.

Codling Moth Injury to the Picked Fruit.

In the check plots the Codling Moth injury was 4.54 per cent., while in the plots receiving spray 3 the injury averaged 5 per cent. Both calyx and side injury were present, and the injury predominating.

TABLE SHOWING INJURY TO THE PICKED FRUIT.

Due to	Per cent. total injury to picked fruit.	Per cent. injury serious enough to throw apples into No. 3's and culls.	Per cent. serious injury in sprayed plots.	Per cent. reduction in injury by spraying before and after the blossoms.	Per cent. increase in marketable apples due to spraying
Bud-moth.....	9.5	9.5	3.8	60.75	5.7
Fruit Worm....	12.44	4.97	1.74	65.19	3.23
Codling Moth..	4.54	4.54	.5	89.2	4.04
Total increase in marketable apples.....					12.97%

Economic Results.

Apples are seldom worth less than \$1.00 per barrel on the trees in Nova Scotia. For every 100 barrels grown by proper spraying in orchards similarly situated to the one in which we experimented, 45 barrels of the picked fruit in every 100 and 12.97 per cent. more Nos. 1 and 2; among those grown may be attributed directly to the control of Fruit Worms, Bud-moths and Codling Moth by spraying. The results obtained were practically from two sprayings, one from one to three days before the blossoms, and one directly after the blossoms. Spray 4 gives some results when applied alone in the control of Fruit Worms, Bud-moths and Codling Moth; but when spray 2 and 3 are applied, the additional benefit of the later spray becomes so small as to be scarcely noticeable.

Cost of Spraying

The cost in Nova Scotia varies, but, on the average, five cents per barrel per application more than covers the cost; reckoning the dilute mixture of lime and sulphur and lead arsenate at one cent per gallon and the cost of the application at one and one-half cents per gallon and two gallons per barrel per application. For two applications of spray mixture costing ten dollars per 100 barrels we had in return 45 barrels more of apples and 12.97 barrels more Nos. 1 and 2 to the hundred due to insect control alone. We did

not reckon any benefit from black spot control, which is even a more important problem, leaving that to the plant pathologists. We conducted the experiment to show that when the weather is fine and black spot not present that spray is not wasted on trees, but that a man pays for his entire four or five applications of spray which the plant pathologists recommend to keep black spot off the various varieties in Nova Scotia from two to three times over by controlling three groups of insects: the Fruit worms, the Bud-moths and the Codling Moth, which are present in every orchard and in every year in the Annapolis Valley, often in greater quantities than in our experimental orchard.

JUNE COLLECTING IN MAINE.—(COLEOPTERA).

BY C. A. FROST, FRAMINGHAM, MASS.

June 17th, 1912, found me in the pleasant little village of South Paris, Maine, which is situated on the Little Androscoggin River in the County of Oxford, formerly famous for its bears. The general elevation of the village is about 350 feet above sea level, and the highest point near there is Streaked Mountain about 1700 feet.

This was the second season I had been able to collect in this place, and as I had confined my investigations to the higher land and the hills in 1910, this year I collected along the river and devoted considerable time to the numerous lumber yards in the village. The most remarkable collecting I have ever experienced was enjoyed in the yard of the Mason Manufacturing Company, which contained huge piles of white pine boards and rapidly diminishing tiers of short logs, mostly white and red (Norway) pine. There were also long piles of slabs, the composition of which showed that spruce, fir, hemlock, and several species of hard woods were used in the establishment.

Between the river and the yard on the east is a thick stand of young white pines, which extends also a short distance on the north side and forms an enclosed angle into which the afternoon sun beats with tropical fury. In this corner the logs, the tree trunks, along the edge of the woods, a pile of empty packing cases, and the sides of several small buildings, provided resting places for hundreds of wood-boring Coleoptera. *Chalcophora virginiensis* and

Monohammus scutellatus buzzed from one resting place to another, and the sweating workmen addressed them in unique, if somewhat lurid, phrases when the huge insects struck them in the face or scratched an erratic course across the back of their neck. In this yard I bottled 160 of the former and 265 of the latter species, most of them being taken on two of the warmest afternoons of the week. *Chalcophora fortis* was taken once on a board pile and *liberta* several times in company with *virginiensis*.

All the specimens of *Dicerca chrysea* seemed to have congregated on the trunk of a sickly white pine at the edge of the woods, where I secured eleven of them. Many of them were so high up that I was forced to stand on a pile of logs and dislodge them with a long pine branch. Those that missed the net in their fall were found clinging to projecting sticks or to the base of the tree, which they must have reached by spreading their wings just before striking the ground. I have noticed this neat bit of parachute work by *Dicerca divaricata* after vainly searching for them on the ground. This species and *punctulata* were taken on the trunk of a maple tree at the south end of the yard. The single specimen of the latter species is my only record for Maine.

Chrysobothris scabripennis was common on the pine logs and *dentipes* became a nuisance as its quick flight distracted the attention from more desirable species. *C. harrisi* was seen four times and, remarkable enough to record, not a specimen escaped.

One *Buprestis impediia* was taken from a pine trunk so close to the ground that it nearly escaped observation. The remains of *B. consularis* were discovered under a board and by careful patching a presentable specimen was secured; then by running melted paraffine into the body cavity it was made strong enough to pin. Many rare specimens might be saved if care is taken in transporting damaged insects from the field and a little ingenuity exercised in repairing them. It is also a good plan to pick up any dead, even though imperfect, specimens and reserve for future examination unless they are well-known forms. I have not forgotten the lesson I once received, for the result brought me an almost perfect specimen of one of my rarest New England Cerambycidae. I was tramping through a thick forest growth of hardwood, interspersed with huge hemlocks, that clothed the ruggedness of

a Maine hillside in the town of Wales, when I caught a gleam of emerald in a small patch of freshly washed out earth on which a wandering sunbeam for a moment rested. I picked up the specimen and carelessly threw it in to the alcohol bottle, thinking it a new record for *Gaurotes cyanipennis*, for I had never seen it in Maine. Some weeks later, when I came to examine it, I found it was *Anthophilax malachiticus*.

The most conspicuous—that is, after they were once seen—of the *Elateridæ* were *Alaus oculus* and *myops*, which were taken on the board piles with *Agriotes stabilis* (also taken on raspberry flowers) and *Elater semicinctus*. *Corymbites cruciatus* was taken only once flying in the yard.

When the shadows began to lengthen, the air was filled with minute flying forms—*Scolytidæ*, *Staphylinidæ*, *Lathridiidæ* and many others whose family names have not yet been noted.

On the second day after my arrival, a small sand-bar at the edge of the river attracted my attention, and before I was aware of it, an hour had passed. Here I secured a single *Elaphrus riparius*, my first record for New England, although I have seen several from the Lake of the Clouds, Mt. Washington, N. H. By scooping up water and throwing it over the mud and sand, numbers of *Bembidium*, *Staphylinidæ*, and a few *Omophron americanum*, and *Heterocerus tristis*, were taken.

On another day, when the sun had become obscured and a cold wind had driven all the lumber-loving species to cover, I spent two or three hours throwing water with an abandoned basin upon the stony beach that marks the fording place of an old Indian trail. Here several species of *Bembidium*, *Tachys scitulus*, *Hypnoideus exiguus* a larger species of *Hypnoideus*, *Apristus subsulcatus*, *Omophron tessellatum*, and many species of *Staphylinidæ* were driven out of their hiding places and captured as they scurried about. When the basin failed me and more water came through the bottom than out the top, I turned my attention again to the slab piles and stray bits of lumber. Here I found *Dinoderus substriatus* (?) boring into the strips of bark that clung to small bits of pine slabs. A fine specimen of *Ditylus caruleus* encouraged me to handle over a cord or so of pitchy pine and silvery hemlock, without further success, except a few well-known *Histeridæ* and *Cucujidæ*.

It was here that I secured my second New England record (first one at Wales, Me.) of *Geotrupes semiopacus*, which was boring in the earth beneath excrement. A sluggish *Chalcophora fortis* that was waiting on the end of a log for the sun to appear again, fell over backwards to escape my menacing fingers and landed in the waiting net.

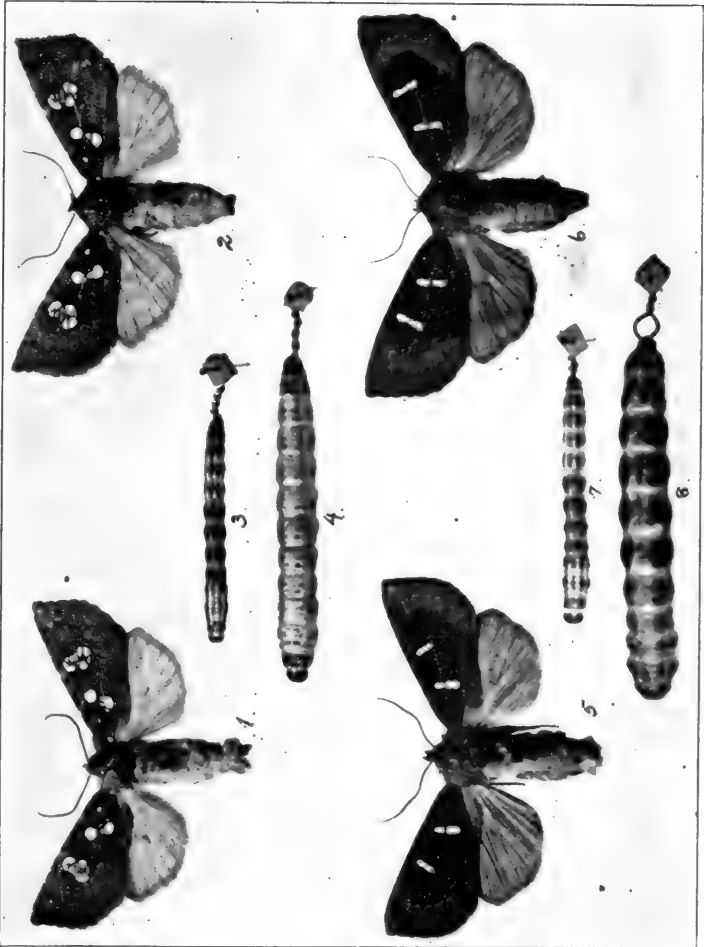
Near here, on a sunny day, I swept two *Agrilus crinicornis* from the leaves of the red raspberry. This genus does not seem to be abundant in Main , where I have collected. I have once found *A. bilineatus* in numbers on red oak leaves and logs, and at another time captured a good series of *pensus* on the leaves of *Ostrya*. This species was also taken in small number, by beating *Alnus incana* after sunset. A single specimen of the rare *lateralis* was taken at the same time at Wales, Me. A very few specimens of *obsoletoguttatus* have been taken on oak and scattering individuals of *politus* are occasionally seen.

Among the other species taken in this locality were the following: *Schizogenius amphibius*, *Amara erraticus*, *Rhizophagus approximatus* (?) *Lathridius liratus*, *Tyrus humeralis*, *Connophron fossiger*, *Xantholinus cephalus*, *Conosoma littoreum* and *knoxii*, *Gronevus* (*Corylophus*) *truncatus*, *Ernobius luteipennis*, *Annobium notatum*, *Ptilinus ruficornis*, *Cænocara scymnoides*, and *Anthicus ephippium*.

A week is a most deplorably short space of time for an entomologist to explore the possibilities of a new region, and yet, with all the fields and forests before me, I return again and again to the sun-baked piles of logs and slabs, fascinated with the thought that just ahead there is another rarity. The noon hour passes into oblivion, and the faintly stirring memory of an early breakfast vanishes with the capture of a handsome *Buprestis*. The rays of the afternoon sun come slanting down between the pines and I say to myself, "Just once more around the piles," but the six o'clock mill whistles find me amid the flying bark-beetles and the falling dusk sends me reluctant toward the supper table.

To the entomologist there comes anticipation—and the mind conjures up a beautiful country swarming with unknown forms; realization—and the nature student is delighted with the never-failing unexpected; retrospection—and time has softened the harshness, effaced the petty annoyances, and magnified all that





PAPAPEMA FURCATA (1-4) AND
PAPAPEMA SPECIOSISSIMA (5-8)
(See Page 143)

was joyous and beautiful. And as I sit with open box before me and listen to the sleet driven from out the winter darkness against the window panes, I dream of June vacation days—the scent of spruce and fir arises and I gaze across the logs through shimmering heat waves to the cool shadows of the clustering pines.

NEW LIFE HISTORIES IN PAPAIPEMA SM.
(LEPIDOPTERA.)

BY HENRY BIRD, RYE, N. Y.

(Continued from p. 115).

***Papaipema speciosissima* G & R.**

A thirteen-year search for the larva of this species, one of the few eastern ones remaining unknown, culminated successfully in 1913. By reason of its fine coloration and large size the species was well known as a moth, even though but few examples ever found a way into collection. At the time of the description in 1868 (Trans. Am. Ent. Soc., Vol. I, 342), Grote and Robinson relate receiving their type from Seekonk, a suburb of Providence, R. I., and an accompanying figure made its individuality clear. Thirty years later Prof. J. B. Smith found "perhaps a dozen female examples" in the aggregate of the principal American collections which he perused when writing monographically of the genus. While known to be generally scattered over the north-eastern United States, most of the examples coming to light of late years bore the label of northern New Jersey. As the establishment of the preferred food-plant through a painstaking search has brought out a bearing of primitive conditions on the result, it may be helpful to relate details.

It was conceded the larva would have a boring habit, its large size would indicate the occupation of some stocky stem or root, so this problem of isolating the food-plant was the first question, and one beset by certain ecological features. So long ago as 1900 the writer visited the type locality in hopes of meeting some plant peculiar to that section which might furnish a clue to the desideratum. Obviously, one way of getting an idea of a likely plant for investigation would be to visit a number of places where the

moth had occurred, compare the floral conditions, and note the suitable plant forms common to such stations. Working on these lines many stations from Montreal, Can., to Wilmington, Del., were visited, but the results led nowhere. What did appear was that the great semi-tidal marsh westward of Jersey City and Hoboken, N. J., yearly gave up a few of the moths, and made it apparent an established colony must be flourishing in these fastnesses. The flora of this region is of the usual luxuriance of an ancient marsh, though modified by a considerable salinity in its lower reaches. Very conspicuous are a number of giant grasses, *Phragmites phragmites*, *Spartina cynosuroides*, *Zizania aquatica*, and others, which are capable and fit to serve as food-plants. For many years we laboured under the impression that some of these grasses must be the answer to the riddle. A number of large herbaceous species also occur and the field for investigation was a large one. From a contemplative viewpoint this habitat offers much to be desired. Many of the floral conditions here have seen little change in the last piling up of centuries, certain sections remaining doubtless in their pre-Columbian verdancy, and we should, theoretically at least, find our larva easily. But the proximity to so great a population has produced much artificiality and the region is interspersed by numerous railroads that are responsible for frequent burnings. The principal hinderance to a thorough search, however, is the fact that the territory is wet to submergence except during very droughty times.

Our meeting with the larva of *P. inquesita* in a Cryptogam, in 1898, made us early mindful of the ferns, though the food-plants of the genus centre principally among the Composites. Light dawned in 1912 when *P. stenocelis* proves a fern feeder, for *inquesita*, *stenocelis* and *speciosissima* are a trio aloof from the allies, and it becomes clear we must now also look for the latter in a fern. But what fern was peculiar to the Jersey Meadows? Early in 1913 we found a young borer at work in *Aspidium*, at Rye, but the instance did not reflect a normal operation for our desideratum. Latterly, Mr. Otto Buchholz, of Elizabeth, N. J., had rendered assistance in the Jersey Meadow hunt, being close by the field, and keen, through a wide experience and with a skill rarely equalled, for detective work of this nature. Upon being advised

the search had narrowed down to the ferns, with usual acumen, he soon located the great colony of the Meadows. It developed the common *Osmundas* are the ones chosen, both *O. regalis* and *O. cinnamomea* being infested. Whether *O. claytoniana* is also bored did not develop, since that species did not occur here, being a denizen of dryer places. While it is a surprise this common fern proves the food-plant so long sought, *Osmunda regalis* being the favourite, and that negative results had followed its examination in hundreds of cases previously, the prominent feature is the localized colony encountered, with the evidence of its probable antiquity. From twenty years' observation on the growth of *Osmunda* under our windows, we do not hesitate to state that most of these individual plants represent fifty years development at least. The gnarled, ruminating root-stocks are elevated 50 to 60 cm. above the level of the quaking morass, in the effort to get above the water and from the nature of the yearly accumulations, and show the borings of preceding generations.

The presence of the larva in *O. regalis* is not easily noted. There is no wilting or drying of a conspicuous frond as happens with the other fern borers. The newly emerged larva enters a miniature stipe whose uncoiled, tender tip has sprung up but three or four centimeters, and in a few days has tunnelled down into the root-stock. This dies, it is true, and is some evidence, but a peculiarity with this fern in this locality seems to be that many more fronds start than eventually mature, what appears to be a fungous blight nipping some in their tender incipiency. Further, a dipterous larva bores these young stipes and causes them to die, so that we find two other similar results produced at the same time in the plant, as is occasioned by the working of *speciosissima*. As the larval period lengthens, the frass thrown out is the only indication, and this is not in the usual well-formed pellets, but a rusty-brown, mud-like deposit. Even this sign is hard to detect for the fruiting fronds send down their brown inflorescence, which, with the chaff-like scales from the stipes sprinkle the root-stock and help to smother the meagre clues. So the apprehension of this larva is not as easy as with most others, and the surprise greater, when, at maturity, one of these old roots is cleft open, disclosing

a pair often of great pink larvæ which have their whereabouts hidden to such a remarkable degree.

The last week of May can be assigned as the date of general emergence from the over-wintering egg, and maturity is reached about Aug. 1. It did not develop that there was the usual amount of parasitism from the smaller hymenoptera that work so assiduously against most of the allies about the fourth instar, and only *Ceromasia myoidæa* seemed to assail the last stages, but this Tachinid was a prevalent check.

The following brief tabulation, except for the first instar, may sufficiently place the larva:

Stage II.—Generically typical, of the group with dark purplish-brown girdle which is not crossed by the white lines; head shows side line; tubercles well developed but not large, blackish, IVa absent on joint ten. Head and cephalic shield concolorous, dorsal and subdorsal lines whitish and broken at girdle.

Stage III.—Colour unchanged, tubercles not prominent, except on joint eleven III and IIIa are fused into a large plate greater than the spiracle and the latter somewhat larger than the anterior ones, and on twelve I and II are of the usual prominence.

Stage IV.—Head has lost dark line at ocelli, is chestnut brown; the cephalic shield is as wide as head, yellow, margined laterally with a black border; lines white and conspicuous, the girdle becomes a shade paler; tubercles the same.

Stage V.—Colour changes to a pinker tone, otherwise similar; the fused III and IIIa on eleven remain the largest of the lateral plates, which on the whole are small.

Penultimate Stage.—Colour is pronounced pink, the translucence at the sutures giving a ringed appearance, the white lines are nearly lost except the dorsal on the thoracic joints; tubercles and spiracles black, the former reduced; III and IIIa have separated on joint eleven.

Maturity.—A robust larva with prominent brown head, cephalic and anal plates, the tubercles except I and II on joint twelve inconspicuous; IVa has never developed on joint ten, and on eleven III and IIIa still more separated, the former the largest lateral plate; IV never gains its usual prominence as occurs with

most other congeners. The colour is a pale pinkish hue, and with the large size is productive of an individuality pronounced with this species. Length, when full grown, 50 mm.; breadth, 7 mm.

The gallery is abandoned for pupation, dates Aug. 1 to 15; emergence of forty specimens range Sept. 1 to 28. The pupa is correspondingly robust, the anal extremity armed with two curved hooks. Length 28, breadth 8 mm.

The larval characters further accentuate the relationship with *inquæsita* and *stenocelis*. Like these species, the slightly enlarged posterior spiracle indicates these larvae have had a super-abundance of moisture to contend against, and is a modification that is yet needed.

Papaipema furcata Sm.

The larva of this species seems to have been first encountered by Mr. Jacob Doll in the vicinity of New York City, but the general habitat is that of the central Mississippi valley. It bores the terminal twigs of Ash, and an instance of economic record against the species is cited by Prof. Washburn in his State Report as entomologist of Minnesota for 1907-08. The mature larva is there described, and a case of damage to nursery stock noted, with suggested remedy for such chance occurrences. My own searchings for this borer from Pittsburg, Pa., eastward have born negative results. Recently the species has been found as a larva in some numbers, by the Chicago collectors, particularly Messrs. A. Kwiat and E. Beer, and I am indebted to the former for these further details of the life history as well as a fine series of larval and perfect specimens.

The larval period extends from May 15 to July 30, considering early emergencies and tardy maturities. The soft, newly grown tip is entered at the base of one of the terminal leaves and the larva works in this portion for a short time. They then leave their burrow here and go back and enter the harder, last season's growth, usually a short distance below the point of the wintering bud. Why they do not continue their first gallery down into the old wood is not clear, for a considerable pith exists in both. However, the move to a new burrow in harder wood seems very general.

Three species of Ash were found infested, *Fraxinus nigra*, *F. americana*, and *F. pennsylvanica*. At maturity the burrow is vacated and pupation occurs in the ground. The larva probably falls to the ground, for such borers at maturity are clumsy and cannot cling well to vertical surfaces. An indication of its early presence exists in the withered leaf at point of entry, with an exudation of frass at the orifice; later when in the harder wood, it is less easily noticed. The larva belongs to that group in the table wherein the lines are broken centrally, but the species considered in its entirety is very distinct.

Stage I.—Markings indistinct, the three anterior and last segments of lighter colour, middle brownish; lines not indicated, tubercles show slightly, blackish; cervical and anal plates prominent; duration of stage assumed to be five days.

Stage II.—Generic characters in evidence, dorsal and subdorsal lines prominent and pure white, they are broken at and undicated on the first four abdominal segments in general terms, though the break is not exactly at the sutures, these middle segments appear as a girdle in deep purple brown; on joint ten there is indication of tubercle IVa, but the chitinization is not heavy and is concolorous; anal plate of much prominence, shining black. cervical shield much lighter, tubercles black.

Stages III, IV, V.—Appearance similar, the head shining chestnut brown, but lacks the usual black, oblique line at the ocelli; on joint ten IVa is a well emphasized plate.

Stage VI.—The colour fades, the brown tone remaining to the middle girdle, all tubercles and plates retain their prominence, blackly marked, excepting the cervical shield, which is the tone of the head, a yellowish brown, and edged at the side with a black border.

Maturity.—We have now a rather stout larva averaging 40 mm. in length and 6 mm. in breadth; the head is yellowish brown, width 2.8 mm., the colour a whitish translucence throughout, the longitudinal lines lost; the black tubercles and spiracles stand out strongly, of the former special reference should point to joint two, where an elongate plate occurs anterior to Ia and Ib, the fused Xa and Xb apparently; Ia, Ib, IIa show as mere dots, IIb, III

and IV larger, the two latter being greater than a spiracle; on joint ten IVa is as large as IV, and I and II are more quadrately placed than occurs anteriorly; on twelve these are especially large and almost confluent; anal and its preceding plates black, and form a heavy armature to the posterior extremity.

This instance of a black anal plate becomes a specific feature paralleled only with *cerussata*. The larval period seems about sixty days.

The pupa is of the stout, active form normal to the group, with a period of about thirty days. The dates for emergence in a series of fifty-five specimens are Aug. 26 to Sept. 5.

The male genitalic modifications, noted already by Smith, might be suggestive of departures with the female structures to meet some special requirement in placing the egg, but other than a slightly longer ovipositor, there seems no change from the prevalent type. This modification exists in the peculiar two pronged clasper, which is unique absolutely. The eggs which are placed in September hibernate and are likely deposited near the extremity of the branches so the emerging larva may be near the food supply. Parasitism has not been observed so far. The sap beetle, *Ips quadriguttatus*, occurred numerously in the deserted galleries.

EXPLANATION OF PLATE IV.

Fig. 1—*Papaipea furcata*, male.

Fig. 2—*Papaipea furcata*, female.

Fig. 3—*Papaipea furcata*, larva, stage IV.

Fig. 4—*Papaipea furcata*, larva, mature.

Fig. 5—*Papaipea speciosissima*, male.

Fig. 6—*Papaipea speciosissima*, female.

Fig. 7—*Papaipea speciosissima*, larva, stage IV.

Fig. 8—*Papaipea speciosissima*, larva, mature.

NOTES ON SOME TROPIC REACTIONS OF MACRO- DACTYLUS SUBSPINOSUS FAB.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

During the summer of 1914, while investigating a "rose chafer" complaint in southern New Jersey, a long wait for a train, an abundance of beetles and favourable surroundings tempted me to test the action of this insect in the field under different conditions of light and temperature.

A comparatively cool, shady woods, where the temperature was 75 degrees F., a tree in the open under the shade of which the temperature was 84 degrees F. and a dead leafless tree in the bright sunlight where the temperature was 89 degrees F., constituted all the apparatus at my disposal. Forty-five beetles were collected while feeding and copulating and three batches of fifteen each were liberated one at a time at the base of a tree in each of the surroundings described above. The following table gives the distances (vertical) covered by each beetle.

Shade, Temp. 75 F.		Shade, Temp. 84 F.		Sunlight, Temp. 89 F.	
Beetle	Distance covered	Beetle	Distance covered	Beetle	Distance covered
1.....	0 ft. 2 in.	1.....	0 ft. 2 in.	1.....	1 ft. 0 in.
2.....	6 " 0 "	2.....	0 " 4 "	2.....	0 " 11 "
3.....	3 " 0 "	3.....	0 " 6 "	3.....	0 " 3 "
4.....	1 " 6 "	4.....	0 " 1 "	4.....	0 " 10 "
5.....	5 " 0 "	5.....	0 " 2 "	5.....	1 " 0 "
6.....	1 " 0 "	6.....	0 " 5 "	6.....	0 " 2 "
7.....	0 " 8 "	7.....	0 " 2 "	7.....	0 " 6 "
8.....	2 " 0 "	8.....	0 " 3 "	8.....	0 " 4 "
9.....	1 " 0 "	9.....	0 " 4 "	9.....	0 " 6 "
10.....	0 " 6 "	10.....	4 " 0 "	10.....	0 " 2 "
11.....	1 " 0 "	11.....	0 " 3 "	11.....	0 " 8 "
12.....	0 " 6 "	12.....	0 " 4 "	12.....	0 " 2 "
13.....	0 " 4 "	13.....	0 " 3 "	13.....	0 " 3 "
14.....	0 " 6 "	14.....	0 " 1 "	14.....	0 " 2 "
15.....	2 " 0 "	15.....	0 " 6 "	15.....	0 " 4 "
Totals.....	22 ft. 38 in.	Totals.....	4 ft. 46 in.	Totals.....	2 ft. 63 in.
Averages.....	20.1 "	Averages.....	6.2 "	Averages.....	5.8 "

At a shade temperature of 75 degrees F., the average distance covered was 20.1 inches. At a shade temperature of 84 degrees F., the average distance was 6.2 inches, and in the sunlight, with the temperature five degrees higher, the average distance was 5.8 inches. It thus appears that thermotropism and phototropism either together or alone were responsible for the quicker escape of the insects into the air and the lessened distances covered.

A NEW GENUS OF TACHINIDÆ FROM THE CANADIAN NORTHWEST.*

BY HARRISON E. SMITH,

U. S. Dept. Agriculture, Cereal and Forage Insect Investigations.

Saskatchewania, new genus.

Proboscis long, slender, about two times as long as the dorso-ventral diameter of the head: Labella not well developed. Palpi small, well developed. Head slightly broader than the thorax. Facial plate with broad, highly raised, distinct median carina. Facial ridges bare. Eyes bare. Antennæ inserted near a line drawn through the middle of the eye, descending but slightly below the middle of the face. Parafrontals bare outside of the frontal row. Frontal bristles not descending below base of antennæ. Ocellar bristles weak, proclinate. Orbital bristles absent in each sex. Diameter of head at the vibrissæ as long as at the base of antennæ. Abdomen not bearing the usual macrochætæ. Tip of apical cell ending at the extreme wing tip. Apical cell closed, long petiolate, the petiole as long or slightly longer than the posterior cross-vein. Posterior end of the hind cross-vein nearer to the small cross-vein, than to the margin of the wing. Fourth longitudinal vein, beyond the bend, with a short distinct stump.

Type of the Genus—*Saskatchewania canadensis*, new species.

Saskatchewania canadensis, new species.

Black, densely brassy-gray pollinose. Length 5-6 mm. Frontal vitta bright opaque, brownish black, slightly concave. At narrowest part somewhat wider than the parafrontals at the same point. Front at narrowest part not more than two times as wide as the distance between the posterior ocelli. Ocellar triangle and sides of front grayish pollinose. Head as viewed from the side projects but little in front of the eye. Parafacials grayish pollinose with a strong brassy tinge; about one-fifth as wide as the median depression. Cheeks covered with black bristly hairs, gradually simulating macrochætæ on the anterior margins. About one-fifth to one-fourth as wide as the eye height. Transverse impression of face well defined, concave, piceous. Antennæ black, the first joint scarcely discernible, brownish black. Second and third joints opaque black, the third joint not over two times as

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long as the second. Arista thickened on less than the basal half, the penultimate joint as broad or broader than long. Antennal fovea deeply concave. Median facial carina on its upper surface convex, as broad as the third antennal joint at its greatest width. Vibrissæ cruciate, situated on a level with the front edge of the oval margin, one or two weak bristly hairs above each. Proboscis shining black, once geniculate. Palpi black, slightly thickened at the tip. Occiput, except the epicephalon, covered with numerous short bristly black hairs.

Thorax black, brassy-gray pollinose with four distinct subshining brownish black vittæ, the outer vittæ considerably wider than the two median. Bearing three dorso-central bristles (the anterior two, sometimes very weak), and two distinct sternopleural bristles. Scutellum rather small, broader at the base, gradually narrowing to a rounded point apically. Bearing a pair of long basal and a single pair of long apical, marginal scutellar bristles. Median discal scutellar bristles weak.

Abdomen black, brassy-gray pollinose with a distinct median brownish black vitta. Clothed with numerous long sub-erect bristly hairs, which are somewhat stouter in the male. Hypopygium in the male black, pollinose, bearing black bristly hairs, protruding forward beneath the venter. In the female shining black, distended outward, a narrow deep median hollow groove on the dorsum. The outer margin thickly beset with rather long, flattened, pointed spines, directed upwardly.

Legs black, faintly pollinose. Knees reddish. Middle tibiæ each bearing a single short bristle on the outside below the middle. Hind tibiæ with a few short bristles on the outer margin. Last joint of front tarsi slightly longer than the tarsal claws. Pulvilli whitish.

Wings hyaline with a yellowish tinge at the base. First and third longitudinal veins not bristly. Posterior cross-vein straight. Bend of fourth longitudinal vein right angular, beyond bend approaching the third longitudinal vein in a straight line. Last section of the fifth longitudinal vein much shorter than the preceding section. Calypteres whitish, with a yellowish tinge along the borders.

Habitat—Saskatchewan, Canada.

Described from two males and four females collected June, August, and September, 1907, at Farwell Creek, South Saskatchewan, Canada. This genus is named in honour of the Saskatchewan region, a very rich collecting ground in the Canadian northwest.

Holotype—One male, Cat. No. 19213, U. S. N. M.

Allotype—One female, Cat. No. 19213, U. S. N. M.

Paratypes—One female in collection of the Boston Society of Natural History; one female in collection of the Massachusetts Agricultural College and a specimen of each sex in author's collection.

GEOMETRID NOTES—NEW SPECIES AND VARIETIES.

BY L. W. SWETT, BOSTON, MASS.

Stamnodes blackmorei, n. sp.

Expanse 21-27 mm. Palpi very short, head dark brown, antennæ mottled brown and white. Thorax and abdomen fuscous, of about the same colour as in *Diastictis inceptaria*. Wings full and rounded, the general colour fawn brown, as in *inceptaria*. The insect at first sight looks like *gibbicostata* Walk., to which it is closely allied. Fore-wings form base to outer two-thirds clear fuscous, except at costa, where they are heavily shaded with brown. About one-fourth out from body the costa is intersected by a white dash and about the middle there is another white dash, followed by a large brownish patch, which extends to the median vein. Beyond this is a broad white band running from costa, at a slight angle, to median vein; then curving inward toward the body and almost disappearing as it nears the inner margin. Bordering this white line at costa is a very dark brown and black patch, sometimes square, sometimes elongated. It is very distinct on all specimens, and is edged outwardly with yellow, followed by two white spots on edge of costa, then a black dot at almost apex of wing. Fringe light brown, with black checks at ends of veins, heavily shaded with dark fuscous from outer to inner margin. Discal dots absent, or, if present, too small to be apparent. Hind wings of same colour as fore wings. Viewed from beneath, the difference between this species and *gibbicostata* is most apparent. Fore-wings beneath darker than above with a rosy hue, the brown markings on the costa above being replaced by reddish beneath. There are the same white spots to the extra-discal band, and the

black spot shows beneath as small and linear. The extra-discal line is quite angled beneath and has a pointed instead of a rounded projection, but the line fades out as it approaches the inner margin. Beyond the extra-discal white line is a large square reddish-brown patch, followed by a whitish ashen patch, which extends to tip of wing, and is marked with two minute points on costa. Beneath this ashen patch the wing is rosy along outer border to inner margin. Hind-wing, from base to white discal dash, clear, with a rosy flush. In *gibbicostata* the same space is heavily striated. In one specimen there is a white extra-discal band curving across the wing; in the others it shows only on inner and outer margins. On the inner margin the white extra-discal line is shaded with a large rosy-brown patch. There is another patch at junction of veins 6 and 7, below outer margin. The outer border is rose-shaded, this colour sometimes running into the checkered fringe.

This geometer can be distinguished from allied species by the conspicuous costal patch above, shaded with red beneath, and the rosy shading of the entire fore-wing. On the hind-wings the two widely-separated rosy-brown patches, white discal dash and extra-discal line separate it from *albiapicata* Grossb. The most distinctive feature is the clear central space extending to the discal dot, which has only a rosy line and lacks striations. I think this species, when once seen, can hardly be confused with any other.

Mr. Blackmore tells me this species is very rare, and even the older collectors, like Mr. Hanham, have seen only one or two individuals. I take pleasure in naming this pretty species after my friend Mr. Blackmore, who has done such valuable collecting in the vicinity of Victoria.

Type—1 ♂, Victoria, B. C., July 3, 1914, from E. H. Blackmore, in my collection.

Paratypes—8 ♂, Victoria, July 2-27, 1913, and 1914, E. H. Blackmore; six in his collection, two in mine (No. 264 and No. 305).

***Petrophora defensaria* var. *mephistaria* nov.**

Expanse 20 mm. Head and body light grey. Fore-wings flesh-coloured and almost immaculate, except for the solid black median band. There are traces of a faint, slightly angled, basal band below the costa, followed by a clear whitish, ashen or flesh-coloured space, extending to the wide, black, median band. Inner

margin of central black band curving slightly outward below costa, then running almost straight to inner margin. Outer margin of band running almost straight to median vein, where there is a deep sinus, then running suddenly outward in a sharp projection, curving back and running straight to inner margin. Beyond this the wing is almost clear, except for a few faint double dots on the veins. Just below apex of wing is a dark dash and a large black spot and on the costa, near the apex, are two black dashes. Fringe ashen with black dots at ends of veins. Hind wings light ashen, with a small, black discal spot, beyond which are five faint wavy brown lines curving across the wing, two being very near together beyond the discal dot. These lines are most apparent on the inner margin. Fore-wings beneath darker than above with the black median band showing through. There is a slight reddish cast near apex of wing and a slight clouding. Black discal spot distinct. Hind-wings crossed by five irregular extra-discal lines, the first three very close together and appearing as dots on the veins. There are traces of two faint lines near the outer margin.

This is a distinct variety and is very striking. The intense, solid, black band crossing the wing will separate it from any others, but the general appearance, except for the band, is much like normal *defensaria*.

Type—♂, Victoria, B. C., Jan. 9. 1909, from Mr. A. J. Croker. Paratype ♂, Ladysmith, B. C., Feb. 3, 1906, from Mr. C. Livingston. Also 1 ♂ from Victoria in Mr. Blackmore's collection. The specimen from Mr. Livingston was received by me through the kindness of Mr. Wolley Dod.

Hydriomena grandis Hulst. var. **saawichata** nov.

Expanse 23-25 mm. Palpi short and slender. Head black, thorax and abdomen dark ashen grey. Fore-wings light rusty brown with a large black basal patch, the exterior line running out from costa to mesial vein. Just below this it forms a projecting almost rectangular point, then running obliquely to inner margin. Beyond this basal patch to the broad central band the wing is rust brown, almost devoid of markings, except two faint parallel rusty streaks in the centre of the space. The intradiscal line runs irregularly across the wing as in *grandis*. The central band is jet black with no inside lines, but the black discal streak is

very noticeable. The extra-discal line is bordered externally with white, like the intra-discal line, but the extra-discal band runs exactly as in typical *grandis*. Beyond the extra-discal line the wing is light rust-red to the outer margin, except for the row of white spots, shaded exteriorly with black, which run from costa to inner margin. At veins 5 and 6 there are two, sometimes three, elongated black streaks and below there is a large silvery-white patch. The fringe is light brown with basal line and intervenular black dots arranged in pairs. Hind-wings light ashen with spots on the veins forming an indistinct extra-discal line. There are traces of two fine reddish hair-lines running parallel across the wings. Fringe light brown with double spots at margin. Fore-wings beneath smoky brown, the black central band showing through faintly, and a dark brownish band near outer margin. Hind-wings darker than above with black discal dot more conspicuous. There is an irregular black extra-discal band with dots on the veins. Beyond this, towards outer margin, are two irregular, parallel, red lines crossing the wings.

This variety is very striking and does not resemble typical *grandis* closely, the latter having the central band fawn brown, as is also the outer border of the fore-wings, and the central band is composed of double extra and intra-discal wavy lines.

I am not sure that this is not a distinct species, but, realizing the great variability of the *Hydriomenas*, I prefer to treat it as a variety of *grandis*. I have placed this species and the variety temporarily in the genus *Hydriomena*, which seems to be a resting place for mixed genera, until these can be separated more satisfactorily by a study of their habits and genitalia. Such species of *Hydriomena* as *autumnalis*, *fuscata* and allied forms, constitute a natural group, distinct in markings and in life histories, but no satisfactory separation of the species has yet been made upon a structural basis.

The present variety was discovered by my friend Mr. E. H. Blackmore, who called my attention to its distinctness from typical *grandis*, and suggested the name *saawichata*. I have never seen it in any other collection, and he assures me it is rare.

Type ♂, Victoria, B. C., May 28, 1914; E. H. Blackmore.

Type ♀, Victoria, B. C., May 5, 1914; E. H. Blackmore.

Paratypes 1 ♂, 4 ♀, Victoria, B. C., May 28 to June 20, 1914; all in Mr. Blackmore's collection.

A FOSSIL FUNGUS-GNAT.

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

Some time ago Miss Olive M. Braden collected a number of fossils in the Miocene shales of Florissant, Colorado, and through the kindness of Mr. A. E. Holch, of the Cripple Creek High School, I was enabled to examine the series and identify the species. Miss Braden very kindly gave to the University of Colorado Museum several species new to our collection, the most interesting being a fungus-gnat, described below. It is remarkable to find such fragile insects excellently preserved, and to note that they are entirely of the same type, in many instances, as their modern representatives. In a million years or so, some of the Mycetophilidæ appear to have remained without evolutionary progress, except to the extent of slightly modifying or shifting minor specific characters.

***Mycetophila bradenæ*, n. sp.**

Length about 6 mm.; general appearance and structure exactly as in the living *M. punctata* Meigen, but anterior tibial spurs longer. Antennæ cylindrical about 1.5 mm. long, joints about as broad as long; wings brownish, not spotted, venation quite normal for the genus; abdomen with alternating light and dark bands; hind tibiæ with two rows of long dark spines, as in *M. punctata*, about 320 microns long; anterior tibiæ about 990 microns long, with spur 660. The following wing measurements are in microns: End of subcosta (on radius) to origin of radial sector, 660; length of radio-medial cross-vein, 225; branching of cubitus basad of level of lower end of radio-medial cross-vein, 160; branching of media from lower end of radio-medial cross-vein, 145.

This is the first genuine *Mycetophila* found fossil in America. Scudder's *M. occultata*, from White River, Colorado, is said to have the legs unarmed, and not very long, and the venation cannot be clearly made out. It is evidently not a true *Mycetophila*. In Europe *Mycetophila* is known by a number of species from Baltic Amber, of Oligocene age.

PODISMA FRIGIDA BOH. IN ALASKA.

BY A. N. CAUDELL, BUREAU OF ENTOMOLOGY,
U. S. Dept. of Agriculture, Washington, D. C.

Among a number of miscellaneous insects recently received by the United States National Museum from the International Boundary Survey were two species of Acrididæ collected by J. M. Jessup in the extreme northeastern part of Alaska. The labels on these specimens read as follows: "International Boundary, Alaska, J. M. Jessup. Lat. 69° 20 N., Long. 141° W. 8-VIII-12." Of the two species of Orthoptera received there were fifteen specimens, one male and three female specimens of *Gomphocerus clavatus* Thom. and five male and six female specimens of a short winged grasshopper, which is determined as *Podisma frigida* Boh. While this record of *P. frigida* from Alaska is of interest, being the first reported occurrence of this European species in the New World, it is in no way remarkable, being but an eastward extension of the known distribution.

Podisma frigida was described from Norway, and has been reported from various points in northern Europe and Asia and from the mountains of Switzerland. Material of both sexes from Norway and Switzerland is in the National Museum collection, having been received from Saussure, who was quite surely responsible for the determination. Noticeable variation exists in this material from these two regions, but direct comparison of the Alaskan material with the specimens from Norway shows scarcely any taxonomic divergence. As the Alaskan specimens exhibit no tangible structural differences from material from Norway, the typical region of *frigida*, it has seemed wise to determine them as that species.

Of the known North American species of *Podisma*, the *nubicola* of Scudder is the most nearly allied to *frigida*. Here, however, as usual throughout the Melanopli, the genital structures of the male furnish excellent diagnostic characters. Thus in *frigida* the subgenital plate of the male is apically conical and noticeably elevated above the lateral margins and the cerci are about three times as long as the median width, while in *nubicola* the subgenital plate is more truncate apically and barely elevated above the lateral margins and the cerci are not, or barely, more than twice as long as the median width.

NOTES ON THE CAUSE OF THE BLUE COLORATION
OF THE BLUE LYCÆNIDS.

BY H. M. SIMMS, MONTREAL.

The question has recently been raised by certain entomologists whether the blue tint of the blue species of the genus *Lycæna* and its allied genera is actually due to blue pigment or dye in the scales of the upper surface of the wings, or whether it is due to a kind of "construction" similar perhaps to the apparent construction of a green tint on the under surface of the wings of certain species of the genus *Euchloe*. The latter, as is well known, on examination by a microscope, is found to be caused not by a field of green scales, but by one of black and yellowish scales intimately mixed in approximately equal quantities. I do not think that it has ever been suggested that the blue colour of the *Lycænids* is produced by an exactly similar *mixing* of scales of two distinct colours, but it has been suggested that the blue tint is due to the superposition of a layer of white, practically transparent scales over a layer of dark-brown or blackish scales, and that the blue effect is in reality either an illusion as in the case of the *Euchloid* green tints, or else a phenomenon of interference of light, analogous, perhaps, to the production of the rainbow tints between two reflecting surfaces very close together and separated by a transparent medium, these being known as "Newton's Rings." They are familiar to all in the bright colours visible on the surface of soap bubbles as well as the bright tints seen on the surface of stagnant water, or on the fine film of oil covering the surface of oily water and at times in puddles of automobile oil on roads. Now it can, I think, be clearly shown that this latter suggestion is not the correct explanation of the present case. The colours of "Newton's Rings" depend upon the angle from which they are viewed, as well as upon the distance between the surfaces. If one looks at stagnant water from different angles, it will be seen that the colour at any one point varies according to the angle, and if the blue colour were due to any such cause as those which produce "Newton's Rings," the colour should pass right through the spectrum from red to violet or vice versa, as the angle of sight was shifted. But not only is this not the case, but if the wing of a blue butterfly is placed between two strips of glass and subjected to pressure, thus changing the distance between the two surfaces of any one scale and also between the two layers

of scales, it will be found that there is no corresponding change of colour, thus showing that the colour is not due to interference of the light reflected from the surfaces in question.

On the other hand, an examination by means of the microscope reveals the fact that the light and dark scales are not mixed, as are the yellow and black scales of the *Euchloids*, and hence the blue colour is not due to the *mixing* of two other tints. The scales are arranged in two layers, the top one consisting of the whitish transparent scales, and the lower one of dark opaque scales of a dark-brown or black. In male specimens there are also a vast number of small sexual scales known as "androconia" or "plumules," but these do not contribute towards the coloration, and need not be considered here. There are left for consideration three possible explanations of the blue effect produced by this arrangement of the scales.

1.—By diffraction of light from the finely striated upper surface of the top layer of scales in the same way that colours are produced when white light is reflected from the finely ruled mirrors of a diffraction spectroscop. This theory is untenable, however, since the colour would have to range from red to violet, according to the angle of view, and at any one point would only give rise to such colours in a line at right angles to the striations and not in one parallel to them. The effect of diffraction is, however, seen in those species of *Lepidoptera* which display "sheen." This not only varies according to the angle, but at any one point becomes totally invisible when looked at from a point in line with the striations. This sheen, however, is an additional source of colour, and is quite independent of the general tint of the insect.

2.—As an optical illusion due to seeing the dark layer of scales through a whitish transparent upper layer. This explanation will be considered together with the 3rd and last, namely, that it is due to internal colouring matter in the upper scales. It has been held that this latter explanation cannot be correct, because when loosely scattered scales from the blue surface are examined by means of a microscope with transmitted light, the blue effect totally disappears and we see only an equal number of dark brown or blackish scales and yellowish transparent ones, which are sometimes nearly colourless. This, however, is not a valid objection, since many colouring matters appear of a totally different colour

by transmitted light. Gold leaf appears yellow by reflected light, and green by transmitted light. A solution of chlorophyll in alcohol appears a beautiful green colour by transmitted light, but blood-red by strong reflected light. Aniline dyes show this property also, and hence it is quite possible that if there is colouring matter in the scales, that it may also show complimentary colours when viewed by reflected and transmitted light. Now, the light scales always appear more or less distinctly yellow by transmitted light, and yellow is complimentary to blue. If now such an assemblage of loose and scattered scales be viewed by a microscope with reflected illumination and against a dark or quite black background, it will be at once seen, provided the illuminating light is white or nearly so, that the light scales are strongly tinted with blue and often are *very* blue. The dark ones on the contrary remain dark and show practically no colour except occasional metallic flashes tinted either blue, green or red. Hence we see here that the light transparent scales have undoubtedly the power to appear blue quite independently of whether they are superimposed on the dark ones. If they are now examined against a white background, such as a piece of white paper, they still appear bluish, but are much paler in colour owing to their transparency. If they are further observed against backgrounds of different colours, red, green, yellow, orange, violet or blue, they always appear distinctly blue, although the background may be seen through them, thus complicating the apparent colour. Against a neutral background or a dark-brown one such as dark-brown paper they appear as blue as when viewed in their natural positions on the wing. Furthermore, when two of these blue scales overlap the density of the blue is very much increased, and in the natural positions they occupy on the wing there is a great deal of such overlapping. Again, it will be noticed that the blue scales taken from the wings of very pale or silvery blue butterflies, such as *Lycæna argiolus*, or *pseudargiolus*, appear very pale blue when isolated and examined by reflected light, and are practically invisible against a background of white paper. With transmitted light they appear very pale yellow. Similar scales taken from butterflies of a more intense blue, such as *Lycæna bellargus*, appear darker blue by reflected light, and much darker yellow by transmitted light, which is easily and obviously explainable on

the hypothesis that the colour is due to pigment or dye, but is not explainable if the colour were due to the superposition of white transparent scales on a background of black or dark-brown ones. Finally, further light may perhaps be thrown on the subject by actually analysing the colours as they are emitted from the wing, by means of the spectroscope. To do this I improvised a small spectroscope attachment to an old and low-power microscope in my possession. When I examined the wings of white butterflies or moths, the whole spectrum was clearly visible. When I examined the red portions of such butterflies as *Vanessa atalanta*, *Parnassius apollo*, the under wing of a *Catocala* or the red spots on a *Zygænid*, the red portion of the band remained brilliant, but the yellow and green was greatly weakened and the rest was practically invisible. Orange and reddish-brown butterflies, such as the *Argynnids* or *Chrysophanus hypophleas*, gave strong red and orange bands, weaker yellow and the rest of the spectrum was very much weakened, but nevertheless contributed something to the total effect. When I examined the wings of *L. pseudargiolus*, I found the green, blue and violet strong, as I expected, but there was some red and yellow present also, but weak. The intensely blue wing of *L. bellargus*, however, gave brilliant green and blue bands, rather weaker violet and very weak red-yellow and orange. When it is considered that these experiments were made with the light of an incandescent gas burner, the results are not surprising. Such light is known to be deficient in the blue and violet rays, but are strong in the yellow and red rays, although, of course, the entire spectrum is clearly visible. Again, the presence of red in every case is, I think, partly due to total reflection from the metallic surfaces of the scales at angular points and from the glass itself which covers the wing in those cases where a slide was made for the purpose of examination. Also it is notoriously difficult to produce artificially a green or blue colour free from red, though it is easy to produce red free from blue and green, and this difficulty may also be felt by nature in preparing the natural tints of insects. In any case the strongly-marked blue end of the spectrum and the much-weakened red end show clearly that the scales themselves are inherently blue, in that the total colour emitted by the wing is actually blue and is not a mixture of rays from a brown or black surface seen through a white transparent layer, which

from some unknown reason produces a blue sensation in the eye.

To sum up briefly, it appears to me that there is very little evidence in favour of any theory except the old and hitherto unquestioned one, that the blue colour of these butterflies is due to internal colouring matter, probably a dye of some sort, since, as far as I know, pigments, properly so called, do not show complementary colours when seen by transmitted and reflected lights. The presence of the dark background is probably for the purpose of cutting out all transmitted light which might give a yellow tinge to the blue, and to hide the variegated pattern of the underside, which otherwise, owing to the transparency of the blue scales, would be visible through them and finally to give a greater depth to what would otherwise be an extremely pale tint.

(Read before Montreal Branch Ent. Soc. of Ont., Feb. 20, 1915.)

FIELD NOTES AND QUESTIONS.

NEW JERSEY NURSERY INSECTS FOR 1914.

The following is a list of the commoner species found in New Jersey nurseries. Most of them are confined to ornamental stock, inasmuch as this class of plants occupies 2400 acres out of an acreage of 2600 for all the nurseries, the remaining 200 being planted to fruit stock, bush berries and strawberries.

Aspidiotus perniciosus Comst. Light infestations on left over fruit stock, mountain ash, hawthorn, currants, gooseberries, *Cornus sanguinea*, *Aronia arbutifolia*, Chinese privet, standard privet, *Spirea sorbifolia*, snowberry.

Lepidosaphes ulmi Linn. Increasing in importance and numbers. Does far more damage than the San José Scale. Found principally on lilacs, poplars and willows.

Gossyparia spuria Mod. on elm. *Chionaspis euonymi* Comst. on euonymus. *Aspidiotus forbesi* Johns. on cherry. *Pissodes strobi* Peck. more abundant than usual in white pine.

Scolytus rugulosus Ratz. common in left-over and neglected peach and cherry stock. *Cryptorhynchus lapathi* L. in poplars and willows. *Agrilus viridis* Linn. var. *fagi* Ratz. fairly abundant in *Rosa rugosa*. *Agrilus sinuatus* Oliv. in pear, scarce.

Galerucella luteola Mull. on elms. *Cyllene robiniae* Forst. in locust. *Melasoma scripta* Linn. present in small numbers on poplars and willows. *Podosesia syringæ* Harr. in lilacs. *Macro-*

noctua onusta Grt. very abundant, doing considerable damage to iris in many parts of the state. *Zeuzera pyrina* Linn. noted in lilacs, shade trees, pear and apple stock in northern New Jersey nurseries. *Hyphantria cunea* Dru. fairly common on all kinds of trees and shrubs. *Certomia catalpa* Bois. on catalpa. *Vanessa antiopa* L. on Lombardy poplars and elms. *Thyridopteryx ephemeraeformis* Steph. on spruce, arbor vitæ, lilac, maple and deciduous cypress. *Pteronus ribesi* Scop. on currants and gooseberries. *Vespa crabro* L. and allied species stripping bark from various plants, especially lilacs. *Leptobyrza explanata* Heid. on rhododendrons. *Trioza tripunctata* Fitch. on blackberries in southern New Jersey nurseries. *Eriophyes pyri* Pgst. on pear. *Eriophyes quadripedes* Shimer. common on silver maple. *Aphis forbesi* Weed on strawberry roots in southern New Jersey nurseries, scarce. *Chermes abietis* Linn. scarce, on spruce in northern New Jersey. *Aphis mali* Fabr. very abundant the past season; did considerable injury to apple stock. *Schizoneura lanigera* Hausm. on apple.

Tetranychus bimaculatus Harv. on evergreens, shade trees.

HARRY B. WEISS, New Brunswick, N.J

BOOK REVIEWS.

MEDICAL ENTOMOLOGY.

"Handbook of Medical Entomology." By W. A. Riley, Ph.D., and O. A. Johannsen, Ph.D., IX, 348 pp., 172 figs. Comstock Publishing Co., Ithaca, N. Y. Price, \$2.00.

This volume is the outgrowth, we are told, "of a course of lectures along the lines of insect transmission and dissemination of diseases of man given by the senior author in the Department of Entomology of Cornell University during the past six years." It is intended "to afford a general survey of the field and primarily to put the student of medicine and entomology in touch with the discoveries and theories which underlie some of the most important work in preventive medicine. At the same time the older phases of the subject—the consideration of poisonous and parasitic forms—have not been ignored."

The authors do not expect that the book will meet the needs of the specialist, that is not its purpose, which is to serve as a book of reference to physicians, sanitarians, working entomologists and

teachers. The admitted purpose of the book prevents us from making certain criticisms that we might otherwise feel disposed to offer regarding the treatment of the subject. As a work of reference for the entomologist and sanitarian who is not a specialist on the subject, the book will prove to be very useful, as it contains the kind of information not hitherto collected in so convenient a form by previous treatises on the subject. The contents are made easily accessible by a full index.

In treating the various groups of insects and diseases, the authors summarise the historical facts and experimental work, and describe the diseases, the methods of transmission and eradica-tive measures, thus presenting in a convenient form the essentials of the subject. A fairly extensive bibliography enables the student, if he has access to the literature, to pursue the subject further, should he wish to do so, although the memoirs of the authors quoted are not always given in the bibliography, which is only intended as an avenue to the more specialized fields.

The authors are inclined, we think, to assume from time to time too great a knowledge of medical terminology on the part of the non-medical student or reader; a difficulty that might be obviated by means of a glossary.

While the book deals with species from all countries and will therefore be of use to a wider constituency than that of North America, in the selection of typical forms the choice has naturally been made from those occurring on this continent. The synoptic tables given at the end of the book, together with the figures, will prove of great assistance to students, as also the notes given from time to time in regard to securing material. The illustrations also greatly add to the value of the book as they are representative in character.

The omission on page 216 of the name of Bruce in connection with the origin of the idea that the Sleeping Sickness trypanosome is carried by *Glossina palpalis* should be corrected, for to him belongs the chief credit of this discovery. On page 215 "Bugosa" should be Busoga. The authors are to be congratulated on having a publisher who not only produces a well-printed book, but enables them to include in the text an abstract of a paper published in the month previous to the publication of their book! It is a book

that is sure to appeal to a large circle of readers; it is reasonable in price, and will, we hope, assist in swelling the increasing body of investigators now devoting their attention to a branch of entomology that was so long neglected.

C. G. H.

MONOGRAPH OF THE BOMBYCINE MOTHS OF NORTH AMERICA—Including their transformations and origin of the larval markings and armature. Part III, Families Ceratocampidæ, Saturniidæ, Hemileucidæ and Brahmæidæ. By the late Alpheus Spring Packard. Edited by Theodore D. A. Cockerell. Vol. XII, First Memoir, National Academy of Sciences, Washington, D. C., 516 pages, 4to., 113 plates, 34 of which, depicting larvæ, are coloured.

This sumptuous volume contains the remainder of Dr. Packard's work on the Bombycine Moths, two other parts having been published some years ago. At the time of his death in 1905, the author left a large amount of material which he had prepared with a view to the completion of his monograph; though necessarily incomplete, the great value of this material rendered it highly desirable that it should be made available, and thus the present publication was brought about. It is in great measure due to Prof. Cockerell that the undertaking has been so satisfactorily accomplished. The species described are by no means confined to North American forms, but have been drawn from various parts of the globe, as the author evidently had in view the preparation of a complete monograph of the Saturnioid Moths of the world.

THE AUSTRALIAN ZOOLOGIST.—The Royal Zoological Society of New South Wales has begun the publication of a magazine, of which the first part has been received. It is edited by Mr. Allan R. McCulloch, and printed at Sydney. The number contains 36 pages, large octavo and four plates. The contents include papers on Australian birds and bird sanctuaries, fish, the photograph and description of a live chimpanzee, and the following papers on entomological subjects: The Mallophaga as a possible clue to Bird Phylogeny; A Monograph of the genus *Tisiphone* (butterflies), and A New Victorian Araneiad.

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POPULAR AND ECONOMIC ENTOMOLOGY.

SOME MANITOBAN WATER BEETLES

BY J. B. WALLIS, WINNIPEG, MAN.

Entomologists in Manitoba have as yet given but little attention to the aquatic Coleoptera, so that our list of these interesting insects is but a short one. Mr. Norman Criddle, of Aweme, has done some work among them, and I, too, have given such time as could be spared—unfortunately all too little—so that our captures comprise practically all the local records. Some seven species of *Halipidæ*, fifty of *Dytiscidæ*, seven of *Gyrinidæ*, seventeen of *Hydrophilidæ*, and but two or three of *Parnidæ* is but a poor list for a Province containing such a variety of water formations as Manitoba.

A few years ago there was a most charming crescent-shaped slough situated in Elmwood, and only a half mile from my home in Winnipeg. When I first knew it, it was perfectly wild, hardly a house on that side of the river within a mile. To get to it from St. John's, Winnipeg, one had to go by boat across the river or else about four miles round by street-car and then walk a mile.

But it was well worth the journey. On the south-east side of the slough, in the hollow of the crescent, was a rise crad to the water's edge with poplar and oak mixed with many of our prettiest flowering shrubs—Saskatoon plum, hawthorn, tree cranberry and others. What a paradise for the nature-lover it was on a sunny morning in late May! As one strolled quietly through the wood many of our most beautiful birds were sure to be seen or heard. Here a flash of gold and the rich note of a Baltimore Oriole, there the black, white and rose of the Rose-breasted Grosbeak; down among the willows by the water the Myrtle Warblers are busy; in the slough itself the cry of a Grebe or Coot or perhaps the booming of a bittern.

And the water itself! How it reflected every one of Nature's moods. Now frowning as a cloud passes over the sun; now smiling back when the sun smiles down through a rift; now rippling in glee as the gentle breeze kisses it. But more than all, how mysterious it is! As one stands and looks down into its depths, one can understand why the Greeks peopled the water with Naiads. It would not be a very great surprise if a dragon *did* suddenly arise from the cool water and sally forth to find its dinner!

Indeed, though the day of the fiery dragon is long since gone, there are many fearsome beasts below the calm surface, each as terrible in its way as the dragon of St. George. Come and look down through this opening in the weeds. Now see! There is a dragon for you! That creature, about an inch long and a quarter wide, grayish-white in colour, with the huge pair of jaws, is a water tiger, and well deserves his name. No insect or tadpole into which he can sink those jaws is safe from him, and his appetite is similar to Oliver Twist's, except that he always wants more. Some day he will be a big, black, shining beetle. Look again! Do you see that creature on the dead vegetation at the bottom? It moves very very slowly now. Does it not remind you of a cat stalking a mouse? Well, it *is* stalking something—some tiny creature that is near to it. When within range, an extraordinary "jaw" is suddenly shot out and—our dragon goes off feeling a little more comfortable! By-and-by that ungraceful creature will be a glittering dragon-fly and will charm us with its fairy-like movements and appearance.

It was in that slough that, with a beginner's luck, I took several rare beetles. With an enthusiasm worthy of success I went over to it early in April. It was so cold that the net would stiffen with frost when out of the water and the sheltered parts of the pond were masked with ice. Looking over my records, it is surprising how many are for 13.IV and 15.IV. They include a species of *Laccophilus* to which Mr. C. H. Roberts, of New York, has given a manuscript name, and two specimens of *Hydroporus oblongus* Steph. Of the former I have since taken but one specimen; of the latter, none.

In the first week of May, in the same slough, two more prizes turned up: *Hydroporus rufinasus* Mann and *Agabus clavatus* Lec.

After many, many hours searching *rufinasus* has failed to re-appear, and but two *clavatus* several years apart.

That slough has, alas! now disappeared, and in its stead are long streets of ugly houses.

Another haunt of mine has lost most of its charm from being drained. That is Boundary Creek, not far from Winnipeg Beach. Less than two hours' run from Winnipeg, it was a delightful hunting ground to spend a Saturday at. Early in June it was at its best. In swampy ground near it were clumps of iris, and in shady spots clouds of marsh marigolds. On rising ground to the east were flowering shrubs, oak and poplar, and everywhere some flower or leaf doing its best to be beautiful.

And how insect life abounded! The air was fairly full of dragon-flies—some of them, such as *Leucorrhinia borealis* and *Somatochlora macrotona*, quite rare ones. Butterflies and a few day-flying moths were hovering over the meadow, while on the surface of the water "striders" were darting here and there and "whirligigs" were madly deserving their name.

It was in the clear, slow moving water of this Creek that I took *Polydotes tortulosus* Robts., and down near the old single plank bridge—now gone—one specimen of a new Gyrinid, to which Mr. Roberts assigned a manuscript name. He had one other specimen, and the two matched exactly. It differs from all other species of *Gyrinus* that I have seen by its shape, which is much longer in proportion to its width than usual; in fact, it looks as if it had been "pinched." Since then I have taken hundreds, and casually examined thousands of this genus in the hope of finding more of my friend, but with no success, nor has search for *tortulosus* been better rewarded.

When hunting for water beetles, a very strong net ring must be used and a short bag of stout cotton or similar material. A good-sized square of cotton on which to dump your catch of mud, leaves and weeds is a necessity, as you can then pick out prizes at your leisure and allow anything not required to escape. Some species are very lively and jump around in vigorous effort to escape; others feign death and do not move for minutes. *Parnids* are often found in rapid-running streams, and the following method suggested to me by Mr. Roberts is a good way of hunting them.

Anchor your dumping cloth across stream in shallow water. Stir up the stones, commencing several yards up and working down. Take your cloth to the bank and pick off your catch as the *Parnids* cling to the surface of the material.

Where to hunt is a difficult matter to suggest. In Winnipeg a number of species, especially *Dytiscus*, come freely to light. Rivers, excepting under stones in rapids and among weeds in back waters, are usually unproductive. Slow moving, weedy creeks or muddy weedy ponds are usually good ground, but one occasionally most unexpectedly comes across species in numbers. Several years ago I had hunted for hours in some water near Selkirk with the poorest of success. Just about giving up in despair, I waded across a shallow bay in which not a weed could be seen. Making a stroke almost without thinking, I brought up my net swarming with a species of *Haliplus* new to me, which turned out to be the rather rare *borealis*. Since then *borealis* has turned up in several places near here, but always in ones or twos. In general, try in shallow water rather than deep, and in warm spots rather than in cool shades.

We have several interesting species of *Haliplidæ* in Manitoba. These include three of Mr. Roberts' new species: *H. subguttatus*, *H. strigatus* and *H. tortulosus*. Two others are *H. borealis* and *H. cribrarius*.

Among our more interesting *Dytiscidæ* is a species of *Laccophilus*, to which Mr. Roberts has given a manuscript name. It is very near *mexicanus* Aubé. Its haunt appears to be muddy sloughs in early spring. Then there is *Deronectes depressus* Fab. = *brevis*, according to Mr. Roberts, which is not uncommon in Sturgeon Creek near here. *Hydroporus vittatus* Lec. is a charming little striped species which, so far as I know, is represented from Manitoba by but one specimen taken in an eddy in Sturgeon Creek. The stream was much swollen by rains, so probably poor little *vittatus* had been swept down from some comfortable marsh. At any rate, it appeared to be alone, as patient dredging failed to secure more.

Our two common species of *Ilybius*, *angustior* Gyll. and *confusus* Aubé are both fairly common at electric light in June, as is

also *Ilybiosoma bifarius* Kby. They are all also taken by dredging in muddy, weedy situations.

So far, I have never succeeded in finding any of our species of *Agabus* at all commonly in their real homes. One spring several species were quite plentiful in ditches connecting with the streams running into the Red River. The water was very high, and apparently beetles which had passed the winter in the river were on their way, together with a number of fish, to find a suitable summer resort. At any rate, many of these slow-running ditches were swarming with beetles. I took several hundreds, most of which went to Mr. Roberts.

Of *Rhantus* we take *notatus* Fab. commonly both at electric light and in muddy ponds; *bistriatus* Bergst. and *tostus* Lec. are much less frequently met with. *Binotatus* Harr. has been taken by Mr. Criddle, who also records *Colymbetes strigatus* Lec. The common *Colymbetes* with me is *sculptilis* Harr., which often swarms at electric light. Mr. Roberts tells me that *rugipennis* Sharp. is a good species, and divided mine for me, but I don't know just on what characters, and my eye is not sufficiently trained at present to detect the differences.

Dytiscus is fairly well represented in Manitoba, as we certainly take six species. *Circumcinctus* Ahr. easily distinguished by the yellow circle around its eyes, is our commonest species, with *sublimbatus* Lec. running it pretty close. Both come to light in thousands. *Fasciventris* Say., *hybridus* Aubé., *dauricus* Gebl. and *harrisii* Kby. are all rather rare, especially the two former. An interesting point about our *dauricus* is that the specimens taken in Winnipeg at light all are small, while several taken at Winnipeg Beach, fifty miles away, are nearly double the size. Possibly the larvæ of Winnipeg specimens live in the Red River and fail to secure sufficient food.

Our rarest *Graphoderes* is *liberus* Say. and *fasciatocollis* Harr. is almost equally so. We take *perplexus* and *elatus* Sharp. more frequently than *fasciatocollis*. I believe Mr. Roberts considers these all good species, and indeed even I could separate them! Our commonest species is *occidentalis* Horn., which comes freely to the lights. It is also by no means uncommon in weedy ponds.

The list of our *Hydrophilidæ* is both short and unsatisfactory; the latter because so many species are in doubt. Our two largest species, *Hydrophilus triangularis* Say. and *Hydrocharis obtusatus* Say., are common at light, and the latter is frequently taken by dredging. Two or three species of *Helophorus* and *Hydrochus* may be found in every slough or ditch among weeds or decaying vegetation. Strangely enough, however, I have never taken *Helophorus tuberculatus* Gyll. except on the wing.

Berosus striatus Say., *Philhydrus bifidus* Lec. and *hamiltoni* are all common, one or more of these species appearing in almost every wet situation.

In conclusion, I should like to express my gratitude to Mr. C. H. Roberts, Mr. Chas. Liebeck and Dr. H. C. Fall for the generous and ready assistance they have given me by identifying my material.

THE RE-DISCOVERY OF AGRION INTERROGATUM, SELYS.

BY E. M. WALKER, TORONTO.

In the "Synopsis des Agrionines" (Bull. Acad. Royale Belg. (2) XLI, 1876, p. 1254) Selys described *Agrion interrogatum* from a single female taken in "Saskatchewan, Hudson Bay Territory." The description is a translation from Hagen's manuscript and the type specimen is in the Hagen collection at the Museum of Comparative Zoology, Cambridge, Mass.

Since this description was published, 39 years ago, this species has not been noted, and there seemed but little possibility of its ever being recognized with certainty from the description, as the latter was based upon a single female, the last seven abdominal segments of which were missing.

During a trip to the Pacific Coast, in 1913, I spent two days at Nipigon, Ont., and here I captured a pair *in coitu* of an entirely unfamiliar *Cænagrion* (= *Agrion* Auctt.) and soon afterwards I took another female. These were all I saw of this species until the following year, when I came across it again at Spruce Brook, near the west coast of Newfoundland. They were very scarce and I succeeded in taking only four males in all.

A comparison of my female specimens with the description of *interrogatum* shows conclusively that they belong to this species, for the description, as far as it goes, is quite detailed, and the colour-pattern distinct enough to be unmistakable. As this description, however, was based upon an imperfect specimen, and as the male was hitherto unknown, I have prepared the following descriptions of both sexes.

Male—Face, including anterior margin of frons to base of antennæ, greenish; postclypeus and a heavy line at base of labrum black; postocular spots bluish, of moderate size, pyriform or subtriangular, the inner angles acute; a narrow blue occipital margin, which may be interrupted; underside of head black, with a rather broad, yellow, ocular margin; basal part of maxillæ piceous, labium pale yellowish.

Prothorax black, margined in front and behind with bluish, pleura with 3 or 4 irregular blue spots just above the fore-coxæ; hind margin broadly curved or subobtusangulate, moderately elevated except at the median line. Thorax bronze-black with azure blue markings. Antehumeral bands divided into an anterior, stripe and a posterior spot, the former slightly incurved in front, broader in the middle than half the mid-dorsal black stripe, the anterior ends truncate and slightly expanded, posterior ends abruptly rounded; the posterior spot rounded or oblong. Sides of thorax with a blue spot above each coxa and two large blue areas separated at the second suture by a heavy black line which is widened just behind the stigma and again at the upper end. The anterior blue area is partly divided above by a short black line, is excavated antero-ventrally and has three postero-ventral concavities, the middle and upper ones corresponding to the expansions of the black sutural line. Venter pale bluish, the sutures and the space between the middle and posterior legs heavily marked with black, and a heavy black band behind the posterior legs continuous caudad with the stem of a median Y-shaped spot. Legs bronze-black, the inner half of the femora and the outer half of the tibiæ pale greenish.

Abdomen bronze-black, marked with azure-blue, as follows:

Segment 1 blue, dorsum with a transverse black spot occupying the basal third or two-fifths, narrowly continuous on the

sides with a large angular or V-shaped black spot, the anterior limb of which is oblique, the posterior limb transverse. Venter pale with a dark ventral spot, more or less whitish-pruinose.

Segment 2 blue with a very broad oblong black patch on each side, their truncate anterior ends narrowly separated from, or united with, a black spot in the antero-ventral angle, their posterior ends connected across the dorsum, behind middle of segment, by a narrower black band, and prolonged ventro-caudad into a narrow streak which joins the apical transverse black band. Accessory genitalia piceous, the anterior hamuli with pallid margins.

Segment 3 blue; a long black streak on each side, close to the tergal margin, extending cephalad nearly to the base and united behind across dorsum by a basal black band, which is prolonged cephalad on the median line into a slender tapering streak. There is a black spot at the antero-ventral angle and a blue spot close to the postero-ventral angle. Venter black.

Segment 4: The black distal area covers about three-fifths of the segment, separated from the tergal margin by a narrow pale streak and prolonged cephalad on each side into a tapering submarginal streak which nearly reaches base of segment. There is a black dot near the antero-ventral angle and a small blue spot at the postero-ventral angle. Venter black.

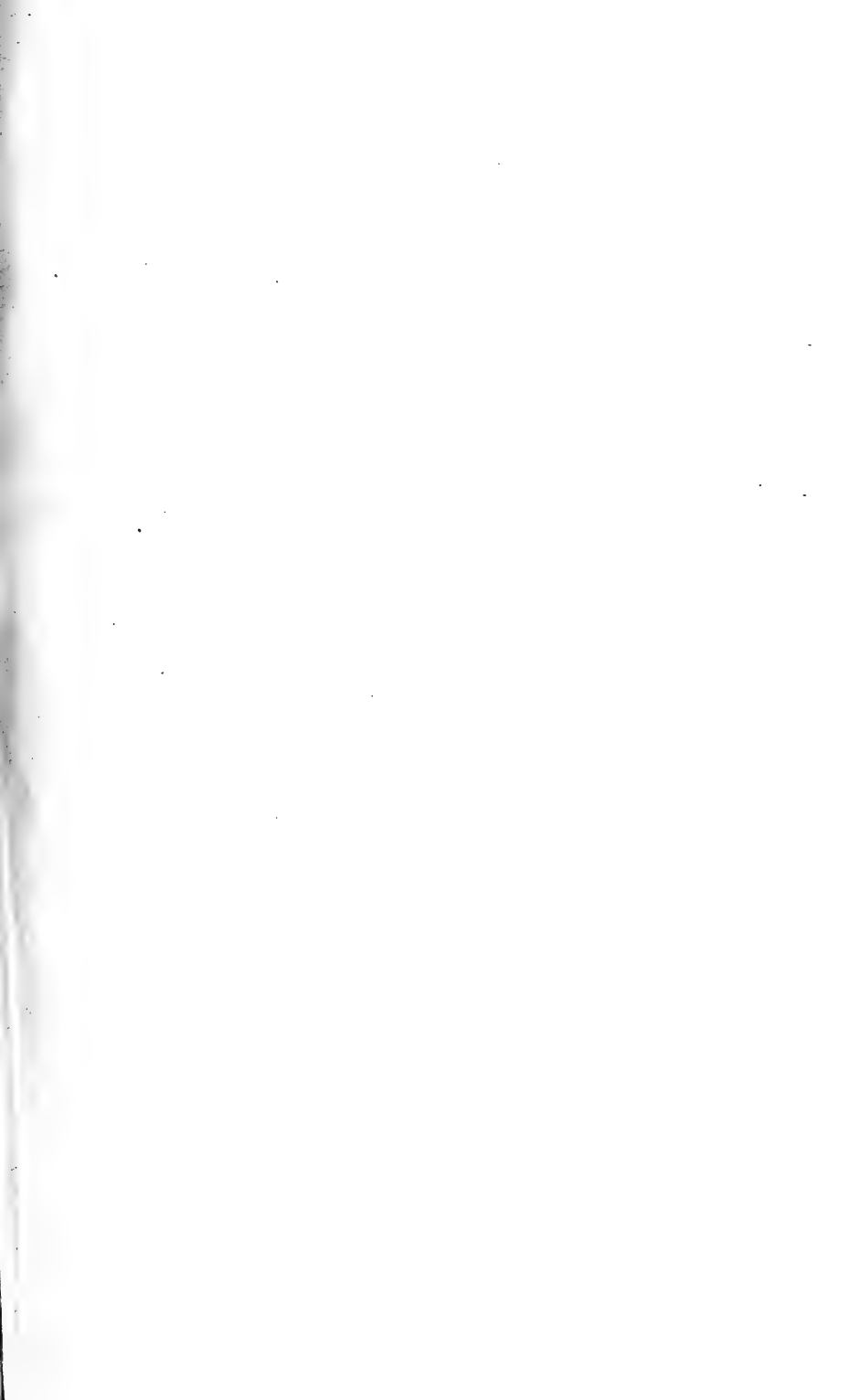
Segments 5 and 6 black, the blue reduced to a basal ring occupying two-sevenths (seg. 5) or one-fifth (seg. 6) of the dorsum, and a lateral margin, in which broken indications of a black lateral streak may be present; a black dot at the antero-ventral angle. Venter black.

Segment 7 black with a narrow basal and a broader apical blue ring connected by a rather broad marginal band, which generally encloses an irregular black streak, though the latter may be united with the black of the dorsum.

Segments 8 and 9 blue, each with a black lateral dot; segment 9 also with a pair of black dorsal dots.

Segment 10 black above, blue beneath and on the sides.

Wings—Postcubitals of front-wings 10, sometimes 9; of hind-wing 8, occasionally 9. M_2 in front-wing arising opposite the





1



2



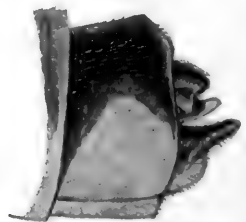
3



4



5



6

CÆNAGRION INTERROGATUM (SELYS).

fourth postcubital or between the fourth and fifth; the hind-wing between the third and fourth, generally near the fourth; pterostigma covering less than one cell, dark sooty brown with a narrow pale margin.

Appendages—Superior appendages bifid, the upper part short, stout, piceous, separated by a constriction from the lower part, which is somewhat longer and in profile more slender, terminating in a pale tubercle. In dorsal view the upper part has the form of a stout incurved hook, the pale tubercle is continued along the mesial surface nearly to the base and has a slightly concave inner edge bearing a minute sub-basal tubercle. Beneath it the appendage is produced into a slender recurved and incurved hook-like process.

Inferior appendages consisting of an outer piceous and an inner pale portion. The piceous part consists of a broad sub-triangular base and a slender apical process directed somewhat upwards, incurved at the tip, and projecting beyond the pale portion, which appears beneath it in profile view, and is mesially concave.

Female—The pale markings of one of the females are blue, of the other salmon-coloured. The former was taken *in coitu* with the single male from the same locality. The colours of the other female had apparently not quite matured and are evidently faded.

The markings of the head and thorax are similar to those of the male with the following slight differences: Postocular spots somewhat larger and rounder, transverse occipital line somewhat broader, pale lateral spots of prothorax slightly larger, tending to merge together; long portion of antehumeral bands straight and not widened in front. In the specimen taken *in coitu* the anterior pale area on the sides of the thorax is divided into two by an extension of the black line which arises at base of front wing. (Pl. V, fig. 4.)

The abdomen is marked as follows:—

Segment 1—Similar to the male, but with transverse dorsal black spot occupying anterior half of segment, lateral spot divided.

Segment 2—A median dorsal black spot, consisting of a narrower anterior part, which is continued cephalad as a narrow line, and a much broader transverse posterior part, connected behind with an apical ring. There is also a black lateral streak, extending the entire length of the segment close to the tergal margin and widened posteriorly

Segments 3 to 6—Bronze-black above, with a pale basal ring; the black area occupies the dorsal half of the segment and is more or less widened, especially on seg. 3, near the hind margin, where it is narrowly connected with a black submarginal lateral streak extending the entire length of the segment, widening at point of contact with the black dorsal area. A small pale spot is thus enclosed behind this point of contact. The pale basal ring is of about the same width on segments 3 to 5, narrowing somewhat on seg. 6.

Segment 7—Similar, but the pale basal ring still narrower, a very narrow pale apical ring and the lateral streak not quite meeting the dorsal black area except at the apical black ring.

Segment 8—Basal two-thirds to four-fifths black above, apical portion pale, continuous with the pale colour of the sides, in which a long black streak is enclosed.

Segment 9—Basal two-thirds of dorsum with a black sub-quadrate spot, sides pale with a blackish patch.

Segment 10 and appendages wholly pale.

Sternites of segs. 1 and 2 pale, black-margined; all of the other segments, except apical margin of 8, black. Ovipositor pale.

In one of the females there are 10 postcubitals in each front-wing and 8 in each hind-wing; in the other there are 10 postcubitals in one front-wing, 11 in the other, and 9 in each hind-wing. In both specimens vein M_2 arises just before the fifth postcubital in the front-wings and just before the fourth postcubital in the hind-wings.

Length of body, ♂ 28-30 mm., ♀ 31-33 mm.; abdomen ♂ 22.5-25 mm., ♀ 25-26 mm.; hind-wing, ♂ 16.7-17.8 mm., ♀ 19.5-19.75 mm. The Nipigon male measures about the same as the largest male from Newfoundland, but is distinctly more slender than any of the Newfoundland specimens. A similar difference

is seen in other species of dragonflies and is apparently dependent upon climatic conditions.* There are no other differences worthy of note, except possibly the somewhat shorter interruption of the antehumeral thoracic bands, the posterior spots being more elongate and less rounded.

Selys placed *A. interrogatum* doubtfully as a race of the palæarctic *A. concinnum*, with the following statement concerning its differential characters (l. c., p. 1254).

“1° Les taches postoculaires un peu dentelées en arrière;

“2° Les raies antéhumérales interrompues en point d'exclamation.

“3° La tache basale carrée du 2e segment non prolongée jusqu'au bout, et la bande dorsale des 2e et 3e amincie en avant.”

I have not seen *concinnum*, but from a comparison of my specimens of *interrogatum* with Selys' description, I think it improbable that the two forms are conspecific though evidently closely related. In *concinnum* the antehumeral bands are entire, but narrowed above, while in *interrogatum* they are sharply divided, but not narrowed. In the male of *concinnum* the transverse band on segment 2 is described as being connected by a stalk with the apical ring, while in *interrogatum* this connection is not present. Segments 3-5 are described as being black in the apical half, whereas in *interrogatum* the black area includes considerably less than half of segment 3, and more than two-thirds of segment 5. The apical blue area of segment 7 in *interrogatum* is not mentioned in the description of *concinnum* and instead of a black dot on the sides of segments 8 and 9 a black line is described as present. The description of the female does not reveal any differences not noted by Selys.

Hagen compares *interrogatum* with his so-called variety *servum* of *C. resolutum*. This is a form in which the antehumeral bands are divided, resembling an exclamation mark. It is the normal form in Newfoundland, but is hardly worthy of a varietal

*I have discussed this subject as it relates to the genus *Aeshna* in "The North American Dragonflies of the genus *Aeshna*" (Univ. Toronto Studies, Biol. Series, No. 11, pp. 25-29, 1912).

name. *Resolutum* is abundantly distinct from *interrogatum*, but is more closely related to it than is *C. angulatum*, the only other North American species of *Cænagrion*.

These three species of *Cænagrion* may be separated as follows:

- A. Venter of thorax wholly pale; abd. segs. without lateral black streaks close to the tergal margins; seg. 1 without lateral black markings (except a fine transverse line near apical margin).
- a. Underside of head black, with a broad yellowish ocular margin; without a pale occipital marginal line; seg. 2 in the male with a transverse black spot, not connected with the apical black ring; seg. 8 of female with a pale basal ring *angulatum* Walk.
- aa. Underside of head yellowish; a pale marginal occipital line; seg. 2 of male with a black dorsal spot connected by a stalk with the apical black ring; seg. 8 of female without a pale basal ring *resolutum* (Selys)
- AA. Venter of thorax with a transverse black band behind the posterior legs, connected with a Y-shaped spot; some of the abd. segs. with black lateral streaks close to the tergal margins; seg. 1 with an oblique or angular black lateral spot *interrogatum* (Selys)

The three specimens of *C. interrogatum* from Nipigon, Ont., were taken on June 19, 1913, from a marshy clearing on the shore of the Nipigon River. Three of the Newfoundland specimens were captured on July 27, 1914, in an open marsh at the mouth of a small trout stream emptying into a small lake. The other was taken on July 29 in a small reedy marsh, bordering a small lake, surrounded by dense woods. Both of these lakes are mere expansions of small streams, abounding with brook trout. Dragonflies were exceedingly scarce here, in spite of apparently favorable conditions. This was perhaps due to the great numbers of trout present.

EXPLANATION OF PLATE V.

Cænagrion interrogatum (Selys).

Fig. 1.—Male, dorsal view. Nipigon, Ont.

Fig. 2.—Male, lateral view. Spruce Brook, Newfoundland.

Fig. 3.—Female, dorsal view. Nipigon, Ont.

Fig. 4.—Female, lateral view. Nipigon, Ont.

Fig. 5.—Male, abdominal appendages, dorsal view. Spruce Brook, Newfoundland.

Fig. 6.—Male abdominal appendages lateral view. Spruce Brook, Newfoundland.

AN INSECT ENEMY OF THE FOUR-LINED LEAF-BUG (*PÆCILOCAPSUS LINEATUS* FABR.)

BY C. R. CROSBY AND ROBERT MATHESON, ITHACA, N.Y.

On July 26, 1913, while examining some stems of *Weigelia* containing the eggs of the four-lined leaf-bug we discovered that the lower end of many of the eggs had been eaten into and the contents extracted by a small hymenopterous larva. The larva burrows through the pith until it reaches a row of eggs and then

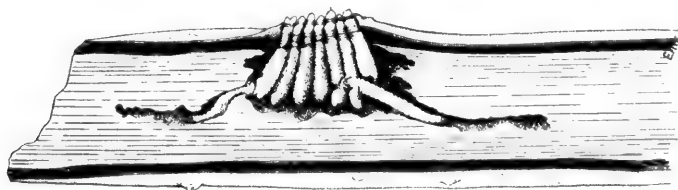


Fig. 14.—Larvæ of *C. ovisugosus* attacking eggs of the Four-lined Leaf-bug.

proceeds to destroy them one after another until three or four eggs have been eaten (Fig. 14). Frequently two larvæ may attack the same row of eggs working from opposite ends and thus destroy the entire egg mass. From an examination of a large number of egg masses in this clump of *Weigelia* about 50% were found to be attacked by this parasite.

The larvæ reach maturity before cold weather but do not pupate until the following spring. In order to secure adults we collected a large number of egg masses on February 28, 1914, and found the small larvæ snugly occupying cavities in the pith

near the eggs. Sometimes the larvæ retreat a short distance from the egg mass burrowing through the pith. These larvæ pupated about a week later and the adults emerged on March 23. This parasite is apparently undescribed. It is a chalcid and belongs to the genus *Cirrospilus*.

***Cirrospilus ovisugosus* sp. nov.**

Female—Length 1.84 mm. Head brown below with a faint bluish-metallic reflection in front and above. Thorax seen from above brilliant iridescent green, blue in certain lights. Prothorax on the sides and the prosternum similar in colour. Abdomen seen from above with metallic greenish reflections, becoming brownish in front, the greater part of the first segment straw colour.

Meso- and metapleura and coxæ dull brown, almost black. Remainder of the legs straw colour, nearly white. Under surface of abdomen brownish, pale at the base, with slight metallic reflections towards the tip.



Fig. 15.—*Cirrospilus ovisugosus*, male.

Antennæ straw-coloured to brownish. Scape slender, pedicel obconic, ring-joint minute. Funicle with three segments, the first the longest, the second and third subequal. Club pointed, indistinctly three-segmented.

Male—Length 1.4 mm. (Fig. 15). Head yellow, eyes and ocelli red. Thorax and legs similar to that of the female.

Abdomen with the first and nearly all of the second segments straw colour, the remainder dark brown with coppery metallic reflections.

Antennæ pale straw colour. The scape greatly enlarged,

narrowed at the base and broadening at the tip. It is about one-third the length of entire antenna. Pedicel obconic, as long as the first segment of the funicle. Ring joint minute. Funicle 4-segmented, the first slightly longer than the others, the second, third and fourth subequal. Club pointed, about one-half as long as the funicle, distinctly 3-segmented when seen in alcoholic specimens.

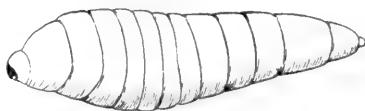


Fig. 16.—*C. ovisugosus*. larva.



Fig. 17.—*C. ovisugosus*. pupa.

Larva—Length 1.7 mm.; white with brownish jaws (See figure 16).

Pupa (newly transformed.)—Length 1.5 mm. Colour creamy white. At the base of the abdomen on the dorsal side is a large, oval, orange-coloured area extending on the thorax, apparently caused by the ingested food (Figure 17).

Described from 4 male and 1 female specimens, Ithaca, N.Y., March 23, 1913. Types in Cornell University Collection.

CARNIVOROUS HABITS OF *XYLINA BETHUNEI*; G. AND R.*

BY GEORGE E. SANDERS, B.S.A.,

Field Officer Entomological Branch, Bridgetown, Nova Scotia.

In working with *Xylina bethunei* G. & R. the most common fruit worm or apple worm in Nova Scotia at the Dominion Entomological Laboratory at Bridgetown, N. S., in 1913, it was found that the best place to collect 5th and 6th stage larvæ was in the leaves about the cocoons of *Malacosoma disstria*. On opening a few of these cocoons the pupa contained were in some cases found to be partly eaten. A rough opening having been partly eaten and partly stretched through the cocoon from $\frac{1}{3}$ to $\frac{3}{4}$ of the contained pupa had been devoured. Later on several larvæ were found in the act of eating into the cocoons or devouring the contained pupa. On July 8, 9, 10, 1913, 160 cocoons of *M. disstria* were collected from apple trees near the laboratory and 45 of

*Contribution from the Entomological Branch, Department of Agriculture, Ottawa, June, 1915

them or 28.12% were found to have been eaten into and destroyed by 5th and 6th stage *X. bethunei* larvæ. On July 12 and 13, of 1913, a collection of 201 *M. disstria* cocoons was made and 70 of them or 34.82% were found to be destroyed in the same manner. On July 12, 1913, 75 *Malacosoma americana* cocoons from apple at Deepbrook, N. S., were examined and 7 of them were found to have been destroyed by *X. bethunei* larvæ. In 1913 *X. bethunei* was no further advanced than *M. disstria* and so was a considerable factor in the control of the latter on apple. In 1914 *M. disstria* was almost as numerous as during the previous season, and was greatly retarded by the season, as were apple trees on which it was feeding. *X. bethunei* was not so numerous in 1914 as in 1913, and for some reason was not very much retarded by the season, consequently most of them had pupated before the *M. disstria* larvæ spun up their cocoons so the percentage killed by *X. bethunei* was much less than during the season of 1913. Of 217 cocoons of *M. disstria* collected from apple on July 17, 1914, only 13 or 5.99% were eaten by *X. bethunei*.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Forty-fifth Annual Report of the Entomological Society has just been issued by the Ontario Department of Agriculture, Toronto. The President's address is a valuable contribution to the history of applied entomology in Canada, by Provinces. The insects of the year (1914), both in Ontario and Quebec, are described by several observers, and valuable suggestions are given as to their control. Among the other practical papers presented are those dealing with "The Army Worm in 1914," Experiments with Poisoned Bait for Locust Control," "An Imported Red Spider Attacking Fruit Trees," and "Control of Forest and Shade Tree Insects of the Farm." The more purely literary contributions comprise a very discerning biographical sketch of the celebrated French entomologist, Jean Henri Fabre, and a chatty article on "Mountains and Hills." The Entomological Record for the year is, as usual, most complete and informing. The many illustrations are a valuable feature of the report, a copy of which will be sent to any entomologist upon application to the Department.—(Press Bulletin, Ont. Dept. of Agriculture.)

THE PUPAL INSTAR OF THE FRUIT-TREE LEAF-ROLLER (*ARCHIPS ARGYROSPILA*¹).

BY GLENN W. HERRICK AND R. W. LEIBY, ITHACA, N. Y.

For the past three years the fruit-tree leaf-roller has been exceedingly abundant in New York State and has caused serious losses to fruit growers. The senior author has given all the time that could be spared from his University duties to the fight against this pest, and during the spring of 1914 it was determined to prosecute the fight on a wider scale, according to plans that naturally grew out of the knowledge that had been gained in past seasons. Accordingly the junior author was established in a field laboratory in Western New York among orchards seriously infested. As a part of the work, it was determined to study certain phases of the life history of the leaf-roller that had not been satisfactorily cleared up before, and one of these points was that of the length of the pupal period. This had become especially desirable in view of the interesting data secured by Davidson in California.² In Bulletin 311 of the Cornell Station, written by the senior author, it was stated that the pupal instar under insectary conditions varied from nine to twelve days. This statement was based on a relatively small number of pupæ, whose actual instars were determined. It seemed desirable to observe a much larger number of the pupæ under as natural conditions as possible in order to obtain a more general average.

Large numbers of the larvæ, nearly full-grown, were placed in jars with an abundance of fresh food. These jars were in an open-air insectary and under normal conditions of temperature. Every morning about the same hour the jars were carefully examined and each newly-transformed larva removed. During the first part of the work each pupa was placed in a separate vial, with muslin over the top, and its record of transformation to the moth kept separate. Later, all of the pupæ gathered on any one morning were placed in a lantern globe, together with some leaves, and muslin was then tied over both ends of the globe. This arrangement gave a clear circulation of air and maintained probably nearly normal conditions of temperature and air drainage. As the moths emerged, each one was removed and the date recorded. The following table shows graphically the results of the study:-

1. Contribution from the Department of Entomology at Cornell University.

2. Jr. Ec. Ent., Vol. 6, p. 336.

PUPAL INSTAR OF *ARCHIPS ARGYROSPILA*.

Number of Specimens	Date of Pupation	Date of Adult Emergence	Length of Instar	Total Days
1	June 10	June 20	10 days	10
4	" 10	" 23	13 "	52
2	" 10	" 24	14 "	28
1	" 10	" 25	15 "	15
1	" 11	" 20	9 "	9
1	" 11	" 21	10 "	10
1	" 11	" 23	12 "	12
5	" 11	" 24	13 "	65
3	" 11	" 25	14 "	42
2	" 11	" 26	15 "	30
1	" 12	" 23	11 "	11
2	" 12	" 26	14 "	28
5	" 13	" 23	10 "	50
3	" 13	" 24	11 "	33
4	" 13	" 25	12 "	48
6	" 13	" 26	13 "	78
5	" 13	" 27	14 "	70
4	" 13	" 28	15 "	60
4	" 14	" 24	10 "	40
4	" 14	" 26	12 "	48
4	" 14	" 27	13 "	52
2	" 14	" 28	14 "	28
3	" 14	" 29	15 "	45
2	" 14	" 30	16 "	32
3	" 15	" 26	11 "	33
8	" 15	" 27	12 "	96
9	" 15	" 28	13 "	117
2	" 15	" 29	14 "	28
2	" 16	" 26	10 "	20
1	" 16	" 27	11 "	11
8	" 16	" 28	12 "	96
9	" 16	" 29	13 "	117
2	" 16	" 30	14 "	28
1	" 16	July 1	15 "	15
1	" 17	June 28	11 "	11
4	" 17	" 29	12 "	48
6	" 17	" 30	13 "	78
3	" 17	July 1	14 "	42
1	" 18	June 27	9 "	9
2	" 18	" 29	11 "	22
4	" 18	" 30	12 "	48
5	" 18	July 1	13 "	65
1	" 18	" 2	14 "	14
1	" 19	June 29	10 "	10
2	" 19	" 30	11 "	22
6	" 19	July 1	12 "	72
3	" 19	" 2	13 "	39
1	" 19	" 3	14 "	14
1	" 20	June 30	10 "	10
1	" 20	July 1	11 "	11
4	" 20	July 2	12 "	48
7	" 20	" 3	13 "	91
2	" 20	" 4	14 "	28
1	" 20	" 5	15 "	15
1	" 21	" 2	11 "	11
3	" 21	" 3	12 "	36
5	" 21	" 4	13 "	65
2	" 21	" 5	14 "	28
1	" 21	" 6	15 "	15
5	" 22	" 4	12 "	60
5	" 22	" 5	13 "	65
1	" 22	" 6	14 "	14
1	" 23	" 3	10 "	10
10	" 23	" 5	12 "	120
9	" 23	" 6	13 "	117
1	" 23	" 7	14 "	14
2	" 23	" 8	15 "	30
1	" 24	" 5	11 "	11
3	" 24	" 6	12 "	36
5	" 24	" 7	13 "	65
1	" 24	" 8	14 "	14
Total				
Pupae.....227				2865

Average Length of Pupal Instar, 12.6 days.

It will be seen from the table that 227 pupae were under observation and that the minimum length of the pupal instar was 9 days and the maximum length 16 days, while the average was 12.6 days.

During the first part of the investigation no data were kept on the sexes, but in the later stages of the observations determinations of sex were made in case of the last 155 individuals, of which 70 were females and 85 males. No data, however, were secured on the pupal instars of the two sexes separate from each other. The average of 12.6 days, therefore, is that of males and females combined in probably about the proportions shown by the foregoing figures concerning the last 155 individuals.

The maximum and minimum temperatures, obtained from the Weather Bureau at Rochester, N. Y., are given for each day covering the period of the experiment. Our own maximum and minimum thermometer was evidently placed in a position which did not give the normal temperatures, and we, therefore, took the records of the Rochester Observatory. Rochester is eighteen miles southeast of Hilton, where the field laboratory was situated, and the temperature conditions at the former city would probably fairly represent those obtaining at Hilton, although the altitude of Hilton is 284 feet, while that of Rochester is 523 feet. At any rate, they would be more representative than the temperatures recorded by our own thermometer under the apparently abnormal conditions in which it was placed.

The difference in the length of the pupal instar as recorded in California by Davidson and in New York as shown by the foregoing data is interesting. More data, however, on meteorological conditions in the two regions will be necessary before any very definite conclusions may be drawn.

TEMPERATURES FOR PERIOD OF EXPERIMENT*

June.....	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Maximum.....	84	83	74	73	65	70	62	76	84	75	64	66	70	84	92
Minimum.....	67	63	59	50	52	51	49	44	56	45	41	54	57	64	69
June.....	25	26	27	28	29	30	July 1	2	3	4	5	6	7	8	9
Maximum.....	84	79	73	81	64	74	73	71	73	80	79	79	80	85	82
Minimum.....	62	56	58	57	53	52	54	60	58	58	62	61	66	64	65

*From the Records of the Weather Bureau at Rochester, N. Y.

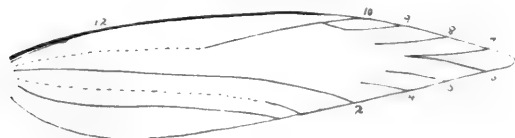
NEW GENERA AND SPECIES OF TINEINA.

BY ANNETTE F. BRAUN, CINCINNATI, O.

Several species of Tineid moths in the writer's collection belonging to genera apparently new are of considerable interest because of their phylogenetic significance or because they show relationship to isolated genera or groups of genera. The present paper includes the description of these genera, together with descriptions of a number of new species recently bred. The types are in the writer's collection.

Corythophora, new genus.

Face smooth; head elongate, with an erect tuft between the antennæ. Antennæ 4/5, basal segment enlarged and concave beneath to form an eye-cap, with pointed projecting flap of scales anteriorly. Labial palpi moderate, drooping, smooth-scaled. Maxillary palpi rudimentary.



First segment of anterior tarsi thickened with scales; posterior tibiæ hairy.



Fig. 18.—Venation of *Corythophora aurea*.

Fore wings elongate ovate, costa thickened for two-thirds its length; 1b simple, 3 absent, 6 and 7 connate, 9 and 10 arising near costa, 11 absent; transverse

vein absent between 2 and 9. Hind wings $\frac{2}{3}$, narrow, lanceolate, cilia 4; 3 absent, 5 and 6 stalked, transverse vein absent between 4 and 5. (Fig. 18).

Type—*Corythophora aurea*.

The relationship of this genus to *Leucoptera* Hb., *Crobylophora* Meyr., and *Proleucoptera* Busck., is suggested at once by the general appearance of the insect, and a study of all the characters substantiates this view. It is a much earlier form and undoubtedly indicates the stem from which the genera of this group have sprung.

although the genus in its present form has acquired a number of specialized characters.

The neuration of the fore wings in the three genera just mentioned can easily be derived from that of *Corythophora*. The absence of vein 11 is not significant, but is of recent disappearance, as it is virtually absent in one species of *Proleucoptera* while present in the other, and thus can not be considered as a character of importance. However, the fact that vein 4 is here present and occupying its normal position would suggest that a slightly different interpretation should be put upon the venation of *Proleucoptera*, viz., that vein 3 is absent and not 4, as stated by Mr. Busck in his characterization of that genus.

The derivation of the neuration of the hind wings of the younger genera from this type is not so obvious. However, the examination of the hind wing of *Proleucoptera smilaciella* Bsk. discloses a feature hitherto overlooked, which shows clearly its origin from the present genus. As shown in the accompanying figure (Fig. 2), veins 5 and 6 are stalked from the base and distinctly separate from 7 toward base, but almost anastomose with it along the middle of the wing, becoming separate again where they branch.

Its affinities with Tineid stock are at once apparent; in fact, its neuration closely approaches that of some of the Tineid genera. This furnishes strong confirmatory evidence of the descent of this group from the



Fig. 19.—Hind wing of *Proleucoptera smilaciella*

Tineidæ, from which it has been regarded as derived.

Corythophora aurea, n. sp.

Head and appendages very pale yellow, flap of scales on basal segment of antennæ somewhat deeper yellow.

Thorax pale yellow or white, patagia golden yellow. Fore wings golden yellow, deepening toward the apex, where the colour is deep orange. Costal margin from $1/5$ to just beyond the beginning of the cilia, and dorsal portion of the wing below the fold, pale yellow, fading almost to white on the extreme margins.

Legs pale yellowish white, except the anterior tibiae and tarsi, which are dark brown externally.

Expanse: 9-9.5 mm.

Two males, Cincinnati, O., July 13, and Balsam, N. C., July 22.

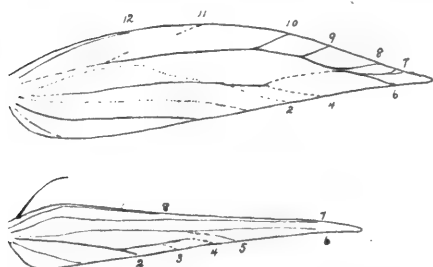


Fig. 20.—Venation of *Apophthisis pullata*

The erect tuft and position of the antennal flaps which project obliquely forward in the dead insect give this species a very striking appearance.

Apophthisis, new genus.

Head with appressed scales, antennae somewhat under 1, basal segment with

pecten. Labial palpi moderate, straight, drooping. Maxillary palpi rudimentary.

Posterior tibiae with a row of short projecting scales above.

Fore wings lanceolate, the margin from the inner angle to the apex is almost straight or slightly concave; 2 almost obsolete, 3 absent, 4 indistinct, from lower angle of the cell, 5 absent, 6 and 7* stalked, transverse vein indistinct between 4 and 6, 11 obsolete except at origin and near costa. Hind wings about $\frac{1}{2}$, lanceolate, cilia 5; 5 and 6 stalked. (Fig. 20).

Type: *Apophthisis pullata*.

A very peculiar genus, apparently most closely allied to *Stomphastis* Meyr., with which it agrees in some characters. The loss of vein 5 of the fore wings is a feature not found elsewhere in the *Gracilariadæ*, where modification usually results in the loss of vein 6.

In any group it is possible within certain limits to determine which veins are absent, if the primitive type of colour pattern is known. Elsewhere† it was shown that the tips of veins mark the extremities of unpigmented (white) fasciæ, separating the primitive transverse bands of colour. Thus, in *Lithocolletis*, the primitive colour pattern consists of a series of seven transverse bands, separ-

*In the specimen denuded, 7 is branched near the costa, as shown in the figure; this is probably an individual abnormality.

†Braun. Evolution of the colour Pattern in the Microlepidopterous Genus *Lithocolletis*, Jn. Acad. Nat. Sci. Phila., XVI, 105-167, 1914.

ated from one another by white fasciæ. The last of these bands crosses the tip of the wing. The costal extremity of the white fascia preceding it lies over the tip of vein 7, but there is no vein at its extremity on the termen. The extremities of the sixth band lie between veins 7 and 9 on the costa, and just beyond vein 5 on the termen. The white fascia preceding this band lies over the tip of 9 on the costa, and over the tip of 5 on the termen. This general type of colour pattern may be regarded as primitive not only for *Lithocolletis* alone, but for the entire family *Gracilariadæ*. In more ancestral forms, where all the veins are present, the tip of vein 6 occupies the position marked by the extremity of the last white fascia, that is it is almost opposite the tip of vein 7. This must be regarded as the normal position for vein 6 in this group. Therefore, in *Lithocolletis*, where no vein is present at the extremity of this fascia on the termen, we must regard vein 6 as the vein which is absent, as has been done in the more recent literature on the group.

In *Apophthisis*, the last vein to reach the termen before the apex occupies the normal position of vein 6. For this reason, vein 5 has been here regarded absent, in a group where it is, with this exception, uniformly present.

Apophthisis pullata, n. sp.

Head and palpi gray, antennæ gray with paler annulations. Fore wings clothed with sordid grayish white, fuscous-tipped scales, giving the wing in general a speckled gray appearance. An indistinct black streak in the fold from near base to one-third, a second shorter streak in the fold beyond it. The scales around the apex form an indistinct line in the gray cilia. Hind wings gray.

Legs gray; tibiæ tipped with white; tarsi annulate with white.

Expanse: 5.5-6 mm.

Two specimens, both males, near Cincinnati, O. The larva is a miner in leaves of buckthorn (*Rhamnus lanceolata* Pursh.) The mine lies deep in the leaf substance; linear at first, gradually broadening into an irregular blotch, 5 or 6 mm. wide, and occupying about one-fourth of the area of the leaf. The leaf retains its green colour, so that the mine is not plainly visible during the

early stages; in the later portions of the blotch, the substance of the leaf is consumed, rendering the mine distinct. Pupa outside the mine in broadly oval, flat, yellow cocoon spun in a fold of the leaf or in a crevice.

There are two generations a year. Mines may be found in early July and in October. The two imagos in my collection appeared July 25 and May 1 respectively.

The position of the imago at rest reminds one of a small species of *Ornix*.

Marmara auratella, n. sp.

Head and thorax dark brown, with a distinct bronzy lustre; face metallic gray. Labial palpi bronzy, third segment with the apical half whitish. Maxillary palpi with the last segment pale. Antennæ dark brown.

Fore wings bronzy brown, with an almost golden lustre under brilliant illumination. The markings are brilliant silvery white and are situated as follows: At the basal fourth a fascia nearly straight on its inner margin, but broadening outwardly below the fold; at the middle of the wing a somewhat oblique costal streak, and nearly opposite it, but a little farther back on the dorsal margin, an erect dorsal streak; at the apical third a triangular costal streak almost meeting the apex of a similar dorsal streak; just before the tip a narrow costal streak, nearly crossing the wing. Cilia dark brown, shining white opposite the apex. Hind wings dark brownish gray, cilia concolorous.

Legs dark brown, with broad silvery annulations. Abdomen beneath with segments silvery posteriorly.

Expanse: 6.5 mm.

Two specimens, Cincinnati, O., bred from long serpentine mines on stems of the cultivated form of *Rudbeckia laciniata* L., the "Golden Glow" of gardens. I have searched for the mines on the stems of the wild plants, both here and elsewhere, without success. The mine, which is very similar to that of *Marmara salictella* on willow, is usually situated toward the lower part of the stem. The larva mines just beneath the epidermis usually working downwards, although the mine crosses on itself many times.

At the time of pupation the larva departs widely from the well-known habits of all the other species of the genus. Previous to this time the mine has been placed just beneath the epidermis. At maturity the larva cuts through the epidermis and two layers of bark beneath it around the end of the mine and for a distance of 3 or 4 mm. on each side. This elongate flap of tissue which hangs with its free end downward is then bent into a fold which causes it to project beyond the contour of the stem. The cocoon is spun on the under side of the flap, so that its lower surface is visible if the flap is lifted up. At the anterior end of the cocoon a slit is cut in the lower layer of loosened bark and through this opening a passage lined with silk leads to the exterior, so that at emergence the pupa is thrust out between the two layers of loosened bark at the lower end of the flap. The pearly globules, so characteristic of the cocoons of the other species of the genus, are entirely absent in this instance. In other respects this species agrees with the characteristics of the genus.

There are two generations a year. The larvæ of the first generation pupate toward the end of July and produce imagos in early August. The larvæ of the second generation pupate in October, but the imagos do not appear until the first of the following June.

The imago is nearest to *M. arbutiella* Bsk.

Marmara apocynella, n. sp.

Head whitish on face, becoming distinctly yellowish on the vertex, with some fuscous scales behind. Palpi whitish, the second segment of the labial palpi tipped with black. Antennæ gray.

Fore wings black; a straight white fascia at basal fourth; an oblique fascia at the middle, a little angulated near the dorsum; at two-thirds, a triangular costal spot and opposite it a small inconspicuous dorsal spot; a white costal streak before the apex. Cilia white opposite the apex, elsewhere gray. Hind wings and cilia gray, tinged with yellow.

Legs black, annulate with white; first tarsal segment black with a white tip, remaining segments pure white with an occasional black spot near the tip. Abdomen black above, grayish beneath.

Expanse: 5 mm.

One specimen, bred from a long whitish serpentine mine on the stem of dogbane (*Apocynum cannabinum* L.). The larva leaves the mine to pupate, and spins the characteristic white cocoon ornamented with pearly globules. Mine collected near Cincinnati, July 3, at which time the larva was nearly full grown. Imago, July 21.

This species comes very close to *Marmara salicetella* Clem., from which it may be distinguished by the yellow head, more oblique median fascia and smaller size.

Cystioæcetes, new genus.

Head with appressed scales; ocelli present; tongue developed. Antennæ $\frac{2}{3}$, outer half very shortly bipectinate and ciliate in

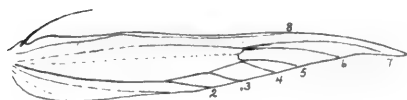
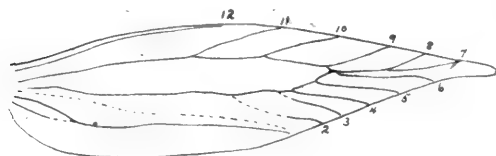


Fig. 21.—Venation of *Cystioæcetes nimbosus*.

both sexes, basal segment rather long, without pecten. Labial palpi long, recurved, second segment thickened with scales, terminal segment shorter, thickened with scales, apex acute. Maxillary palpi very short, appressed to tongue.

Posterior tibiae rough-haired above on the posterior half.

Fore wings with large tufts of raised scales; 1b furcate, 2 from three-fourths of cell, tubular only near the margin, 4 from angle, 6 out of base of stalk of 7+8, 11 from middle of cell. Hind wings $\frac{2}{5}$, narrow lanceolate, cilia 5; 2 - 4 nearly parallel, 4 and 5 connate, 5 and 6 parallel, 6 and 7 approximated at base. (Fig. 21).

Type: *Cystioæcetes nimbosus*.

This genus is closely related to *Chrysopeleia* Cham., which it very closely resembles in type of markings; the antennal and palpal characters are identical. In *Chrysopeleia* vein 2 of the fore wings is absent, and 6 is out of 7 beyond 8; the venation of the hind wings differs only in the staking of 6 and 7. It appears to bear some resemblance to some Australian genera in antennal structure and in neuration of the hind wings.

***Cystioecetes nimbosus*, n. sp.**

Head gray; scales on the under surface of the palpi becoming white-tipped towards the ends of the segments. Antennæ dark gray. Fore wings gray, microscopically speckled with whitish. Scale tufts almost black, the scales composing them tipped with white; a large tuft below fold at basal third, another below the middle of the costa; a smaller tuft on the dorsum a little behind the middle; a fourth small tuft at end of cell; two very small tufts on termen before apex. Hind wings and cilia gray.

Legs dark gray, tips of segments whitish.

Expanse: 10.5-12 mm.

Thirteen specimens, Mills College, Alameda Co., Cal., and Camp Baldy, San Bernardino Co., Cal., bred from larvæ on "Cascara" (*Rhamnus purshiana* DC.), an evergreen, and also on a similar deciduous species of *Rhamnus*.

The larva feeds within a large inflated gall-like chamber formed from the two halves of the leaf, which are closely appressed above, just below the margins of the leaf, and near each end. The leaf bulges between the lateral veins forming a series of pouches projecting from the large elongate chamber. (Fig. 22). The



Fig. 22.—Larval dwelling of
Cystioecetes nimbosus.

larva is pale grayish brown, with head and prothoracic shield shining pale brown. A small silken cocoon is spun, often just outside the larval habitation, where the sides of the leaf diverge, or between leaves on the bottom of the breeding jar.

***Antispila aurirubra*, n. sp.**

Head and palpi bronzy; antennæ dark brown. Thorax and fore wings very lustrous, colour varying, according to the direction of light from greenish golden to a brilliant reddish bronze. The latter colour predominates near the base and along the termen and around the apex of the wing. At one-third a narrow pale golden fascia, somewhat nearer base on the dorsum; at two-thirds a triangular costal spot, and a little nearer the base on the dorsum a similar dorsal spot, with its apex produced and pointing obliquely toward the middle of the costa. Cilia dark gray. Hind wings dark gray, purple toward the apex, with golden brown cilia.

Legs bronzy brown, hind tarsi tipped with pale yellow.

Expanse: 7-8 mm.

Two specimens, Fredalba, San Bernardino Co., Cal. Larva in brownish blotches in leaves of a species of *Cornus*. The completed case appears somewhat truncate at each end. Mines received, August 6; imagos emerged May 21 and 25.

More closely allied to *A. nyssæfoliella* than to any other species, but the more reddish colour and the more slender fascia will separate the two species.

Obrussa, new genus.

Head and face tufted. Antennæ $2/3$, simple in ♂, basal segment enlarged and concave beneath to form an eye-cap. Labial palpi well developed, porrected. Maxillary palpi long, filliform, folded. Tongue rudimentary.

Posterior tibiae with spines above; middle spurs above the middle of the tibiae.

Fore wings elongate ovate; 1b simple at base, 2 becoming obsolete shortly beyond transverse vein, which closes the cell before the middle of the wing, 3 and 4 absent, 5 and 6 stalked, the stalk out of 8, 7 to costa out of 8, 9 absent. Hind wings a little over $1/2$, cilia $2\frac{1}{2}$; 1c faintly visible, 3 and 4 absent, 6 absent, 5 and 7 stalked from before middle, cell open between 2 and 5. Frenulum of many spines. (Fig. 23).

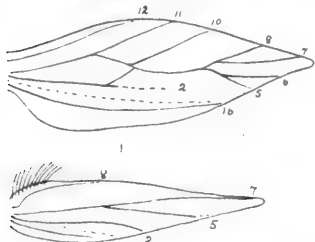


Fig. 23.—Venation of *Obrussa ochrifasciella*.

Type: *Obrussa ochrifasciella* Chambers (Can. Ent., V, 128, 1873.).

The genus seems to approach *Ectademia* Bsk. more closely than any of the other allied genera; from *Ectademia* it differs chiefly in the presence of vein 5 of the fore wings and in the position of the spurs of the hind tibiae, which are situated above instead of below the middle. *Obrussa* is relatively somewhat shorter and broader winged than either *Ectademia* or *Nepticula*.

In describing *Nepticula ochrifasciella*, Chambers probably had before him males only, which are uniformly smaller than females. and alone show the distinct ochreous under surface of the basal

half of the fore wings. A fuller description embracing both sexes is here given:

Palpi pale ochreous. Tuft on face and head reddish ochreous. Antennæ fuscous, eye-caps ochreous.

Thorax and basal third of the fore wings black, apical two-thirds tinged with brown. A broad pale ochreous fascia crosses the wing at the basal third. From base to outer edge of fascia on costa, and nearly to tornus on dorsum, the under side of the wing in the ♂ is ochreous; in the ♀, this area though paler is not definitely outlined. At two-thirds are some scattered paler scales, sometimes (in ♀) forming an indistinct line across the wing. Cilia around the apex and last row of scales at the extreme apex pale ochreous. Cilia elsewhere concolorous with the wing. Hind wings gray, cilia concolorous.

Legs dull ochreous, mixed with fuscous; outer surface of fore and middle tibiæ and tarsi dark brown.

Expanse: 6.5 mm. (♂); 7-8 mm. (♀).

I have always found this species resting on leaves of saplings in dense woods with sparse undergrowth. The specimens in my collection were taken May 30 to July 6; a single specimen is dated August 5. I have thus far no clue to its life history.

BOOK REVIEWS.

THE HOUSE-FLY. ITS STRUCTURE, HABITS, DEVELOPMENT, RELATION TO DISEASE AND CONTROL. By C. Gordon Hewitt, D.Sc., F.R.S.C., Dominion Entomologist, 382 pp., 105 figs., Cambridge, at the University Press, 1914. Price 15 shillings net.

It is unusual to find a book dealing with as wide variety of subjects as this one, that does not show some inequality of treatment when carefully analyzed. The author generally reveals the fact that he is more at home in some branches of the subject than in others. Of Dr. Hewitt's book this cannot be said. Whether he discusses questions of minute anatomy or parasitology, bacteriology or the practical problems concerned with public health, he shows a thoroughness of grasp and a clearness of diction only possessed by the master.

The present work is an outgrowth of Dr. Hewitt's admirable monograph on the House-fly, which first appeared in three parts

in the Quarterly Journal of Microscopical Science in 1907, 1908 and 1909, and was republished in book form, together with several appendices in 1910 by the Manchester University Press. This edition was very limited and was soon exhausted, and as much new material had been brought to light by subsequent investigators in various countries, the author deemed it necessary to prepare a completely new work, bringing the subject matter thoroughly up to date.

The book is divided into six parts as follows: Part 1—The Structure and Habits of the House-fly. Part 2—The Breeding Habits, Life History and Structure of the Larva. Part 3—The Natural Enemies and Parasites of the House-fly. Part 4—Other Species of Flies frequenting Houses. Part 5—The Relation of House-flies to Disease. Part 6—Control Measures.

Of the 27 chapters, those dealing with structural matters are but slightly modified from the author's original accounts of these subjects. All the others contain a large quantity of information not found in the earlier work. This is especially true of Part 5, in which six chapters are included, an entire chapter being devoted to "the carriage of typhoid fever by flies," and another to "the relation of flies to summer diarrhœa of infants." In these and the other chapters of Part 5 the enormous literature dealing with experimental investigations in the dissemination of bacterial diseases and parasitic worms by flies is very carefully and concisely summarized and will prove of great interest and value to physicians and public health officers.

Following Part 6 is a bibliography of 36 pages and two indices, an author's and a subject index.

This book will undoubtedly remain the chief source of information on the house-fly for many years to come and will rank as a classic for all time.

CANADIAN INSTITUTE: GENERAL INDEX TO PUBLICATIONS, 1852-1912. Compiled and edited by John Patterson, M.A. Honorary Secretary. University Press, Toronto, 1914. Price \$5.00.

Students of all branches of Science, Literature and Art throughout Canada owe a debt of gratitude to Mr. and Mrs. Patterson for having undertaken and completed in such admirable fashion the arduous task of indexing the long series of publications of the Canadian Institute, from 1852 to 1912, including all the volumes published by the Institute before it received the title of "Royal."

The publications of the Canadian Institute have appeared in four principal series: The Canadian Journal (1852-1855) The Canadian Journal of Science, Literature and History (new series) (1856-1878); The Proceedings of the Canadian Institute (1879-1890) and the Transactions of the Canadian Institute (1890-1912); and one minor series, The Proceedings of the Canadian Institute (new series) (1892-1904). The last has not been included in the general index, but a list of the papers under authors is given in an appendix.

These volumes contain a vast amount of information on almost all subjects relating to Canada and a general index has been hitherto much needed. The present work satisfies this need most completely, being the contents of every paper dealt with in a thorough and detailed manner. The principal entries are in bold-faced type, and indented under these are the entries of subordinate topics. For instance, Ontario appears in bold-faced type and under it are more than three pages of entries of subjects relating to the Province. Similarly we find references to genera of animals and plants in bold-faced type, followed by species in ordinary type. Cross references are necessarily frequent, but have been avoided as far as possible.

This work will be of considerable value to entomologists in Canada. During the first years of the Institute's history, when there were few magazines dealing with special branches of science, the Canadian Journal formed one of the chief means by which papers on such subjects could be published; hence we find quite a number of articles on botany, entomology, ornithology, etc., in the earlier volumes. These are at least of historic value and contain many records of importance to the faunistic student. By means of this excellent index they are readily accessible, and there will now be no excuse for their being ignored or overlooked by modern workers, as has sometimes been done in the past.

FOREST INSECTS OF SWEDEN.

Sveriges Skogsinsekter. By Ivar Trägårdh. VIII, 279 pp. 16 pls., 136 text figs. (Stockholm: Hugo Gebers.) 1914.

The comparative similarity of the forest conditions of Canada to those of Sweden gives this book a special interest to Canadian

entomologists. A number of forest insects are common to both countries. Our great regret is that, being written in the Swedish language, its contents will not be accessible to all who would wish to study it with care. The latter desire and the nature of its contents may, however, induce some to add another language to their vocabulary, for the excellence of its treatment would almost warrant such a venture.

After preliminary chapters on the characters and organization of insects, their development, and the general methods of control, the author takes the different orders, commencing with the Coleoptera, and describes those families and their members that are injurious to the forests, or useful as parasitic or predaceous enemies of forest insects. His treatment is somewhat along similar lines to that of Taschenberg in his "Praktische Insektenkunde." In the longest chapter, namely, the Coleoptera (Skalbagga), the following families are dealt with: Carabidæ, Staphylinidæ, Silphidæ, Histeridæ, Cantharidæ, Cleridæ, Elateridæ, Buprestidæ, Lymexylonidæ, Anobiidæ, Coccinellidæ, Cerambycidæ, Phytophaga, Curculionidæ, and Ipidæ, the last, of course, is treated the most extensively. The chief injurious species (or useful species as the case may be) in each family are considered individually and a description sufficient to enable the insect to be identified is given; the larvæ, habits and methods of control are also described in most cases. The excellent series of illustrations, largely original photographs, constitute a valuable feature of the volume. Where the insects are of serious importance, special attention is devoted to them, for example, the Nun Moth, *Lymantria monacha* L, whose introduction may we be spared, is given eleven pages; the Gipsy Moth hardly receives two pages!

A special chapter is devoted to gall-making insects and *Eriophyes*, and after a useful chapter on control measures, the book concludes with a table giving keys to the various insects according to the trees and parts of the trees they attack. We cannot say more than that we wish we had a similar work on our own forest insects. Perhaps the author will make his book more accessible to English-speaking readers by translating it some day, a task of which we know he is capable.

C. G. H.

The Canadian Entomologist.

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No. 7

POPULAR AND ECONOMIC ENTOMOLOGY, POISONED BAIT FOR CUTWORMS.

BY E. H. STRICKLAND,

Dominion Entomological Laboratory, Lethbridge, Alberta.

Experiments conducted at the Dominion Entomological Laboratory at Lethbridge, Alberta, during the past two years upon the control of *Porosagrotis orthogonia* and *Euxoa ochrogaster*, and again this Spring upon a species of *Chorizagrotis* have proved to us that shorts are far more valuable than bran as a bait for the purpose of poisoning.

In 1913, when experiments were first started, bran only was tried, and results were extremely disappointing, for it was seen that this material lost most of its attractiveness when dry. Under our semi-arid conditions it seems impossible to obtain a bran mixture that will remain sufficiently attractive after it has lost its moisture, some fifteen minutes after its application to the heated soil. In this connection it should be noted that we have no dew at night.

Numerous mixtures were given thorough, and repeated, trials under varying conditions, in which different quantities of salt, sugar, and various syrups were used as attractive-agents. In all cases 1-10 acre plots were treated at, or after, sundown, and they were examined once or twice during the three or four days following the date of application. The bran was applied at the rate of 100 lbs. per acre, but even with this amount never more than 26% of the worms were killed.

The following are a few typical results from about 40 observations:—

On Fall Wheat

100 lbs. Bran, 2 lbs. Sugar, 2 lbs. Paris Green, 2½ gallons Water. —20% dead.

100 lbs. Bran, 6 lbs. Sugar, 2 lbs. Paris Green, 2½ gallons Water.—10% dead.

100 lbs. Bran, 6 lbs. Salt, 2 lbs. Paris Green, 2½ gallons Water.
—10% dead.

On Spring Wheat

100 lbs. Bran, 1 gallon Molasses, 2 lbs. Paris Green, 2½ gallons Water.—26% dead.

100 lbs. Bran, 1 lb. Sugar, 2 lbs. Paris Green, 2½ gallons Water.
—0% dead.

Similar results were obtained when the baits were employed on oats and alfalfa.

Obviously, we could not recommend any of these to the farmers, for even had they been fairly successful an application of 100 lbs. per acre is too heavy to be practical on our large prairie fields.

From notes made in 1913 we drew the following conclusions:—

1. Cutworms in dry localities feed largely in order to obtain moisture, and dry bran is not sufficiently attractive to be fed upon extensively when their normal moist food is available.

2. One species (*P. orthogonia*) for which we were poisoning feeds almost exclusively below ground, and a surface application of poisoned bait is therefore mainly wasted.

3. Molasses gave more hopeful results than any other attractive agent used.

In 1914 we tried replacing the bran with shorts, and harrowing the bait in when *P. orthogonia* was the species present, and specialized upon the molasses mixtures. Results were most gratifying, and we found that in each case the improvement was marked.

In all cases comparative tests were made simultaneously, and the following are some of the results on Spring Wheat:—

A. Surface application.

100 lbs. Bran, 1 gallon Molasses, 2 lbs. Paris Green, 4 gallons Water.—26% dead.

50 lbs. Bran and 50 lbs. Shorts, 1 gallon Molasses, 2 lbs. Paris Green, 4 gallons Water.—43% dead.

100 lbs. Shorts, 1 gallon Molasses, 2 lbs. Paris Green, 4 gallons Water.—53% dead.

25 lbs. Bran and 25 lbs. Shorts, ½ gallon Molasses, 1 lb. Paris Green, 2 gallons Water.—36% dead.

50 lbs. Shorts, ½ gallon Molasses, 1 lb. Paris Green, 2 gallons Water.—64% dead.

B. Harrowed in immediately after application.

25 lbs. Bran and 25 lbs. Shorts, $\frac{1}{2}$ gallon Molasses, 1 lb. Paris Green, 4 gallons Water.—70% dead.

50 lbs. Shorts, $\frac{1}{2}$ gallon Molasses, 1 lb. Paris Green, 4 gallons Water.—80% dead.

Most of the experiments were repeated from three to ten times under varying conditions, and the relative killing values were in every case similar to those given above. A few experiments in which sugar was used showed a marked inferiority.

For *Euxoa ochrogaster* the unharrowed plots gave slightly better results than the harrowed, and it was observed that this species feeds more frequently above the ground than does *P. orthogonia*.

By experimenting with varying amounts of Paris Green, and sweetening substances, we arrived at the following formula as giving the best results: Shorts, 50 pounds; Molasses, $\frac{1}{2}$ gallon; Paris Green, 1 pound, and Water, $2\frac{1}{2}$ gallons.

This mixture costs from \$1 to \$1.25 per acre for the ingredients alone, but since cutworms begin to damage a field in nearly every case in small well-defined areas, from which they spread subsequently over far larger areas, prompt treatment as soon as damage is seen reduces the cost per acre of the area saved to a small figure.

The superiority of Shorts over Bran has been again established in the control of Army Cutworms (*Chorizagrotis* spp.), which invaded part of the Province early this year. Results from field experiments upon these species are rather uncertain, since the migratory habits are so pronounced. In specially constructed field cages definite results were obtained, and comparisons show that the value of poisoned Shorts is certain, while the application of poisoned Bran is of very doubtful benefit when judged from the aspect of cost and results. The cages were set out in a clean field of spring wheat, so that the 50 worms placed in each, though confined to nine square feet, were in every other respect under identical conditions with those experienced in nature.

Unfortunately the weather turned cold when we started these experiments, and has remained so ever since, so that our percentage killings are not quite so high as they might have been had feeding been more general. Little of the wheat was eaten.

The following are a few of the results selected from 18 experiments and comprise those in which Kansas Grasshopper mixture, and a modification of it in which Shorts were used, were compared:

Poison was applied at the rate of 20 lbs. per acre. Examinations were made 48 hours after application. This was necessary, since dead worms are eaten readily by those still alive.

Applied to moist soil, and moistened by a shower.

20 lbs. Bran, 2 quarts Molasses, 1 lb. Paris Green, 3 Oranges, 3½ gallons Water.—26% dead.

20 lbs. Shorts, 2 quarts Molasses, 1 lb. Paris Green, 3 Oranges, 1 gallon Water.—56% dead.

Applied dry two days after mixing.

20 lbs. Bran, 2 quarts Molasses, 1 lb. Paris Green, 3 Oranges, 3½ gallons Water.—24% dead.

20 lbs. Shorts, 2 quarts Molasses, 1 lb. Paris Green, 3 Oranges, 1 gallon Water.—76% dead.

In the second case the weather was warmer, and more normal.

We found that the fruit in these and other mixtures had a slight beneficial effect, though the killing was as good with the following mixture: Shorts, 50 lbs.; Molasses, 2 gallons; Paris Green, 1 lb., applied at the rate of 20 pounds per acre. In this case no water was used, and we find that the benefit derived from using Paris Green in greater quantities than one pound to fifty pounds of Shorts (or Bran) does not warrant the extra cost.

The only objection to Shorts is the difficulty of mixing, but if lots of not more than 50 pounds are mixed at a time, and the reduced quantity of water is added slowly during the mixing, the difficulty is minimized. Strangely enough, the greater the proportion of molasses to water the more readily the mixture is made.

From the above figures, which represent very few of the results obtained from our numerous experiments, all pointing to the same conclusions, it will be seen that we are having great difficulty in poisoning worms under our dry conditions, but by substituting bran with shorts the problem of control is brought nearer to solution, and since this modification has proved beneficial under a variety of conditions we believe that it will be found to be of value wherever poisoning is practised for the control of cutworms.

CHARACTERS SEPARATING THE SPECIES OF THE BEE GENUS *CÆLIOXYS* OCCURRING IN ONTARIO.

BY F. W. L. SLADEN,

Apiarist, Central Experimental Farm, Ottawa.

(The author has availed himself of a kind offer made by Prof. T. D. A. Cockerell to look over any tables of bees he had prepared. Prof. Cockerell's valuable notes are followed by his initials.)

MALES.

In all the following species the fore coxæ bear teeth:



C. ribis, ♀



C. alternata
♀

Fig. 24

1. *Second dorsal segment with a pair of transverse foveæ*, posterior to the transverse depression (interrupted or continuous) that crosses the segment. Tooth on either side of segment 5 well developed. 3.

No foveæ present, tooth on side of segment 5 rudimentary (apex of ventral segment 4 not emarginate) 2.

[No foveæ, place where they would be very densely covered with minute punctures; tooth on side of segment 5 fairly large. Tegulae bright apricot colour. (Indiana) . . . *immaculata* Ckll. (I suppose this might extend to Canada.—T. D. A. C.)]

2. *Transverse depression on segment 2 uninterrupted in middle*; segment 1 well clothed with long hair, abdomen comparatively finely and closely punctured; postgenae with large groove at lower end, the groove densely clothed with hair like rest of hind cheek. Apex of 4th ventral segment short, rounded; abdomen short and wide, *no carina on frons*, legs black. *ribis* Ckll. (*C. ribis kincaidii* Ckll., from Olympia, Wash., also runs here.—T. D. A. C.)

Transverse depression of segment 2 widely interrupted in middle; segment 1 clothed scantily, the hair very short and adpressed, abdomen coarsely and remotely punctured, *postgenae without groove*, apex of 4th ventral segment bispinose, abdomen elongate; *frons with Y-shaped carina*, the forks flattened

out, enclosing the middle ocellus. *alternata* Say
(= *texana* Cr.)

3. *Foveæ on segment 2 linear or very small, legs more or less red; teeth on sides of segment 5 large, rudimentary teeth on sides of segment 4. Apical margin of 4th ventral segment lamellate and minutely emarginate.* 4.

Foveæ comparatively large and wide (though often shallow), legs usually black, teeth on sides of segment 5 rather small, no trace of teeth on sides of segment 4. 7.

4. *Foveæ linear, each about $\frac{1}{2}$ mm. long, with a narrow impunctate margin completely surrounding it; (Good character!—T. D. A. C.); the hair on head and thorax rather longer, insect larger; length 8 to 10 mm.* *rufitarsus* Sm.

Foveæ rudimentary, not more than $\frac{1}{4}$ mm. long, sometimes minute, resembling a large puncture, hair on head and thorax rather shorter, insect smaller; length 7 to 9 mm. *octodentata* Say.

7. *Foveæ and the region anterior to it very closely punctured, the elevation posterior to it impunctate; transverse grooves on segments 2 to 4 widely interrupted in middle, apical felt bands on segments 1 to 4 wide at sides, on segment 1 widely interrupted in middle, on segments 2 to 4 very narrow across middle; segments 2 to 4 more coarsely and remotely punctured; punctures on mesonotum far enough apart to give it a slight shine; hair on base of segment 1 adpressed.* *lucrosa* Cr.

The anterior region of each fovea not closely punctured, the elevation posterior to it remotely punctured; transverse grooves on segments 2 to 4 uninterrupted in middle; apical felt bands on segments 1 to 4 less wide at sides, less narrow in middle, on segment 1 not interrupted in middle; segments 2 to 4 more finely and more closely punctured; mesonotum so closely punctured as to appear dull; hair on base of segment 1 upstanding. *moesta* Cr.

FEMALES:

1. *Last ventral segment with a small notch on each side near the tip.* 3.
Last ventral segment not notched. 2.

2. *Last ventral segment with apical portion narrowed to form a process about twice as long as wide and not more than one-third as wide as wider portion of segment; clypeus without basal depression, transverse depression on segment 2 uninterrupted, segment 1 well clothed with long hair, abdomen short and wide, comparatively finely and closely punctured, no longitudinal carina on frons.* *ribis* Ckll.

[*C. ribis kincaidii* Ckll. (Olympia, Wash.), runs here. It is larger than typical *ribis*, and has tawny hair on head and thorax. It will doubtless be found in B. C.—T. D. A. C.]

Last ventral segment with sides convex, tapering to blunt point with a fringe of fuscous hair, clypeus with a depression on each side of its upper margin, transverse depression on segment 2 widely interrupted in middle; segment 1 scantily clothed, hair very short and adpressed; abdomen elongate; segments 2 to 4 coarsely and remotely punctured; frons with Y-shaped carina with the central ocellus between its forks. *alternata* Say.

3. *Legs more or less red.* 4.

Legs not red; depressions on segments 2 and 3 always shallow, especially towards middle, where they are widely interrupted on segment 3; segments 1 to 5 more evenly and finely punctured. 6.

4. *Segment 6 $1\frac{1}{4}$ times as long as wide, slightly rounded at apex; depression on segments 2 and 3 narrow, deep and rugose, punctures on segments 1 to 5 large and close, an impunctate line immediately behind depressions on segments 2 and 3 and behind their vestiges on segments 4 and 5.* 5.

Segment 6 $1\frac{3}{4}$ times as long as wide, pointed at apex. *Cael. 11.*

(*C. deplanata*, which occurs in Washington State, would come in about here, but it has the 6th dorsal segment obtuse at apex—on looking at other specimens it seems variable and may be fairly pointed. The 6th segment is quite broad in *deplanata* seen from above, its width is about three-quarters its length.—T. D. A. C.)

5. *Sixth dorsal segment strongly angulated at sides so that its apical half is narrowed; larger insect; length up to 12 mm.* *rufilarsus* Sm.

Sixth dorsal segment not or only slightly angulated at sides, smaller insect; length up to 10 mm. *octodentata* Say.

6. *Transverse depression on segment 2 widely interrupted in middle*; apical felt bands on segments 2 to 4 wide at sides, very narrow across middle on segment 1, very wide and triangular at sides and widely interrupted in middle; punctures on segments 2 to 4 larger and less close; punctures on mesonotum far enough apart to give it a slight shine; hair on basal part of segment 1 adpressed; last dorsal segment about $1\frac{1}{4}$ times as long as wide; *tibial spurs more or less ferruginous*. . *lucrosa* Cr.
- Transverse depression on segment 2 not or scarcely interrupted in middle*; apical felt bands on segments 2 to 4 less wide at sides, less narrow in middle; on segment 1 much less wide at sides and uninterrupted in unrubbed specimens; punctures on segments 2 to 4 smaller and closer; mesonotum so closely punctured as to appear dull; hairs on basal part of segment 1 upstanding; last dorsal segment about twice as long as wide, *tibial spurs black*. *moesta* Cr.

A CONTRIBUTION TOWARDS THE TAXONOMY OF THE DELPHACIDÆ.

BY F. MUIR.

Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.

When working out some Malayan Delphacidæ the writer found it expedient to tabulate as many of the genera of the family as possible; unfortunately many of these genera are unknown to him except through the descriptions, which, in many instances, do not give characters necessary to locate them with accuracy. For this reason the present table has many defects, well recognized by the writer, but as it has been of great use to him he believes it will be of use to others, and for this reason alone he publishes it.

The Spur. As this organ is the characteristic feature of the family it is not surprising that its shape should be of taxonomic value; unfortunately many species have been described with only a mere reference to its existence. The writer is not aware of anyone making a primary use of it for dividing the family into divisions or subfamilies before Kir'kaldy, who was followed by Crawford.

The spine-like, subulate spur is the most primitive and some of its possessors show the more generalized form of tegmina. The solid cultrate spur with both surfaces convex (Delphacini, Section A) appears to be the next stage, which is followed by the inner surface becoming concave (Section B) and eventually laminate (Section C). Section A is of interest as, with the exception of *Proterosydne** with one Australian and one American species, all the genera at present known are Hawaiian. With the exception of three species off grasses and sedges which are placed in Kelesia, all the native Hawaiian Delphacidae belong to this section and are not attached to grasses. Swezey† has shown that *Nesodryas freycinetiæ* has but an apical tooth on the spur in first instar, those on the hind edge appearing at later instars. Section B contains six genera; of these, five, of which the habits are known, are attached to grasses. It is highly probable that further study will add several more to this section.

The antennæ. These organs come next to the spur for usefulness in taxonomic work; there appears to be but little specific variation and an absence of the sexual differences found in some of the other families of Fulgoroidea. The terete form is probably the more primitive, and the short basal joint more primitive than the longer basal joint.

The mesonotal carinæ. These are of great utility as they are always mentioned by describers and of their presence or absence there is little dispute.

The pronotal carinæ. Among some of the more difficult genera of section C of the Delphacini it is necessary not only to recognize the presence of these carinæ but also their shape and extension. Unless this is done it will be difficult to keep apart several genera containing different forms, and it will lead to the formation of one or more unwieldy genera of polymorphic character, whose species it will be more difficult to locate than are the present genera. This has been the case with Crawford's work on the north American forms and it will be still worse if the same methods are applied to the genera of the world.

It is generally possible to recognize two forms, those divergingly

*Crawford wrongly states this genus to be Hawaiian.

†Proc. Haw. Ent. Soc., II., 13.

curved posteriorly, or following, to a great extent, the contour of the hind margin of the eye, and which plainly do not reach the hind margin; and those which, although diverging posteriorly, are straight or convergingly curved, and meet the hind margin or approach it exceedingly closely.

Carination of head. In these we have the most unsatisfactory taxonomic characters, for in so many species they are obscured at the junction of vertex and face, and there is considerable variation in such characters as the furcation of the median frontal carinæ. In Homoptera such variation is common in all characters which undergo a great alteration at the last ecdysis*. In all nymphs of Delphacidæ with which the writer is acquainted there are two medio-longitudinal carinæ on the face which, in certain species amalgamate to a greater or lesser extent, the extent of amalgamation being variable. For this reason it has been necessary to place certain genera in two or three locations. With a wider knowledge of the species of certain genera, and their variations, than the writer possesses it is highly probable that more definite characterisation can be constructed.

Tibial spines of the hind legs have been used for taxonomic purposes, but they do not appear to be of great value for there is great specific variation; usually there is one at the base, one about middle and several at apex. It is possible that the proportional length of the first joint of hind tarsus and the absence or presence of one or two spines near the middle can be used more than they have been, also the proportional length of the front tibiæ.

For specific work it is absolutely necessary that the male genitalia be examined, and a use of it for generic distinction is possible in certain groups.

In the orismology the writer has used the term vertex as indicating that portion of the head, excluding the eyes, which can

*An extreme case of this nature is found in the Derbid genus *Zoraida* in which the face is only a narrow carina (composed of two carinæ more or less amalgamated) between the eyes; in the nymph the face is broad with two median carinæ well separated. In the adult the wide face still exists but is invaginated medio-longitudinally, the outer carinæ of the nymph forming the narrow face of the adult. This can be demonstrated by boiling a head of *Z. insulicola* (perhaps any other species) in caustic potash when the face will open. Several genera have been erected upon slightly widened faces (i.e. *Shirakia* and *Zoraidoides*) some of which are likely to be found to be imperfectly developed *Zoraida*.

be seen in a true dorsal view, irrespective of any carinæ which may appear to separate the vertex from frons. The term apex indicates the most anterior portion, considering the labrum as the most anterior of the dorsal portion of the head, irrespective of its deflexion.

With the increase in the number of known species and of our knowledge, it becomes necessary to divide and subdivide the groups of species included in the various sections of the Fulgorids; whether we consider the main divisions as families or subfamilies is a matter of personal opinion. Personally the writer thinks it is more natural and expedient to consider the Delphacids as a family, and the divisions as subfamilies. He holds the same opinion in regards to the Derbids, a group not so well defined as the Delphacids. It is more likely that future workers will follow Kirkaldy in this matter than those who wish to contain the whole of the Fulgorids (*sens lat.*) in one family.

The classification of this family, whatever arrangement we may use, shows parallel development and convergence. Arranged in the present order we see parallel development in carination of head and thorax, in lengthening and broadening of vertex and in the proportional length of joints of legs in each of the divisions. Another point clearly shown is the improbability of most or all of the characters used for taxonomic purposes being of vital importance to the individual or species. The spur is sometimes stated to be of use in jumping, but other Homoptera jump equally well without a spur; even if this argument be allowed can it be shown that one form of spur is superior to another?

The fact that a genus is included in the table does not imply that the writer considers it a good genus, there are several he considers it advisable to sink, but not without greater knowledge of the variation within the genera than he possesses at present.

The genera not located are:—*Calligypona*, placed by Ashanin after *Chlorionidea*, but not mentioned by Melichar in his Homoptera of middle Europe; *Epeurysa*, placed after *Eurysa* by Matsumura; *Dichoneura*, a South American genus which Crawford places, probably correctly, in the writer's Section B of the Delphacini; *Mestus*, the specimens marked *morio* (type species) that the author possesses do not agree with the original description; *Zuleika* placed by Distant near *Dicronotropis*.

The writer's knowledge of the genera is as follows:—

A. Examination of the type species:—

Aloha, *Anectopia*, *Asiraca*, *Bambusibatus*, *Belocera*, *Chlorionidea*, *Conomelus*, *Copicerus*, *Criomorphus*, *Delphacinus*, *Delphax*, *Dictyophorodelphax*, *Eoeuryrsa*, *Eurybregma*, *Euryrsa*, *Gelastodelphax*, *Haplodelphax*, *Kormus*, *Laccocera*, *Lanaphora*, *Liburnia*, *Magemelus*, *Melanesia*, *Metropis*, *Nesodryas*, *Nesorestias*, *Nesosydne*, *Nesothoe*, *Pentagramma*, *Perigrinus*, *Perimececera*, *Perkinsiella*, *Phyllodinus*, *Proterosydne*, *Pseudaræopus*, *Punana*, *Saccharosydne*, *Smicrotodelphax*, *Sogatopsis*, *Stenocranus*, *Stobaera* (?).

B. Examination of species other than the type:—

Chloriona, *Dicranotropis*, *Eumetopina*, *Kelisa*, *Pissonotus*, *Purohita*, *Sardia*, *Tropidocephala*, *Ugyops*.

C. From literature only:—

Achorotile, *Amblycotis*, *Bakerella*, *Bergias*, *Bostæra*, *Calligypona*, *Canyra*, *Dichoneura*, *Embolophora*, *Eodelphax*, *Epeuryrsa*, *Epibidis*, *Eucanyra*, *Euidella*, *Haplalomelus*, *Idiosemus*, *Idiosystatus*, *Ilburnia*, *Jassidæus*, *Kalpa*, *Liburniella*, *Leimonodite*, *Livatis*, *Macrotomella*, *Mulaxa*, *Meglamelanus*, *Micromasoria*, *Nesoplias*, *Nilaparvata*, *Ostama*, *Paranda*, *Platybrachys*, *Prokelisia*, *Pundaluoya*, *Rhinotettix*, *Sogata*, *Sparnia*, *Toya*, *Upachara Zuleika*.

The writer hopes to improve upon the present table when he is better acquainted with more of the genera, and for this reason he would be pleased to receive for examination or exchange any species in list C and the type species of list B.

The writer takes this opportunity to thank Dr. L. Melichar for the gift of many species representing most of the European genera upon which the classification of the family is chiefly based.

In using the table it will be necessary to run the genus down in each section, as we are ignorant of the characters employed in so many instances.

The writer regrets that he has not been able to procure specimens of any of Mr. Distant's Indian genera as he feels sure some are at present wrongly placed in his table, but the nature of the spur is not stated in any instance.

(To be continued).

THE BEE GENUS *THRINCHOSTOMA* IN INDIA.

BY F. W. L. SLADEN,

Apiarist, Central Experimental Farm, Ottawa.

(This paper was submitted to Prof. Cockerell in March, 1915, who kindly added the valuable notes given in brackets.—F.W.L.S.)

Prof. T. D. A. Cockerell's description, on pages 35 and 36 of Vol. XLV of the Canadian Entomologist, as a new species, of a male and female of this curious genus that I recently sent him in a box of bees, has led me to examine the remainder of my specimens.

I find that the male and female described by Prof. Cockerell belong to two different species, for, besides a male that agrees fairly well with his description of *T. sladeni*, there is a male of a different species that evidently is the true mate of a female I possess that agrees fairly well with Prof. Cockerell's description of the female of *T. sladeni*.

My supposed male of *T. sladeni* agrees with Prof. Cockerell's description of the male in having the head and thorax clothed with white hairs, the margin of the clypeus cream-coloured, the legs red-brown, with the various creamy-white markings described, and in minor details, but it carries at the base of the 5th ventral segment of the abdomen, on either side of the middle, a cluster of three-hooked spines. The spines are arranged in a transverse line, the inner spine is the longest and the outer one the shortest. This remarkable and important structure is not mentioned in Prof. Cockerell's description.

The male of the other species, for which I propose the name *T. assamensis*, has also a transverse row of erect hooked spines at the base of the 5th ventral segment, but they number eight instead of six and are nearly equidistant and of equal length. This male, agrees with the female of mine that I refer to this species, and also with the female described by Prof. Cockerell under *T. sladeni*, in every important detail that is not sexual. In addition, it possesses in common with my female another remarkable character not mentioned by Prof. Cockerell. The second transverse cubital nervure does not reach to the radial nervure. [It does in my female, however.—T. D. A. C.]

The figure of *Halictus wroughtoni* Cameron shown on page 432 of Bingham's Hymenoptera of India, Vol. I (Fauna of British

India, 1897), is that of a male *Thrinchostoma*, allowing for engraver's errors. But, unfortunately, Bingham's accompanying description, which is of the female, is meager. In the colouring of the clypeus and legs and the structure of the base of the propodeum it agrees with *T. sladeni*, but in the colouring of the wing nervures with *T. assamensis*.

[*Assamensis* appears to be near to *T. macrognathum* (Friese) from Java, which (σ) has "Clypeus gelbbraun jederseits an Rande mit schwarzer Beule." Head and thorax yellow-haired. "Beine gelblich, gelbbraun behaart." Long 9-10 mm.; φ not known.

Friese redescribes your Khasia Hills insect as *sladeni*, using same φ and σ forms as I had. (Tijdschrift voor Entomologie, LVII (1914), p. 27.) Friese makes a subgenus (of *Halictus*) *Rostratilapis* for *macrognathum* and *sladeni*.—T. D. A. C.]

***Thrinchostoma assamensis*,**
n. sp.

σ .—Length 13 mm. (head extended), expanse 21 mm. Head and thorax black, clothed with short pale fulvous hair; inner margins of the eyes concave; clypeus greatly extended, more so than in *T. sladeni*, clear yellow; supra-clypeal area piceous; malar space piceous, its extremity yellow; mandibles yellow, their tips piceous; labrum yellow; clypeus very shining, coarsely and remotely punctured; supra-clypeal space more closely and finely punctured; antennæ piceous; apex of scape paler; upper part of front finely and shallowly punctured, almost impunctate in the region of the ocelli; propodeum rounded

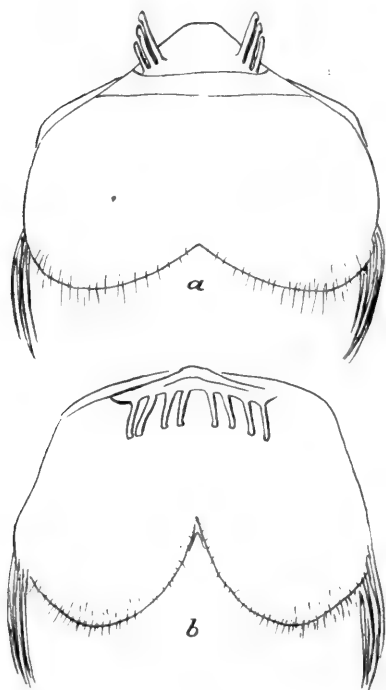


Fig. 25.—(See p. 215.)

impunctate in the region of the ocelli; propodeum rounded

longitudinally rugose at the base; tegulae testaceous. Wings hyaline, yellowish; nervures, stigma and hairs on wings pale testaceous; the first recurrent nervure joins the second submarginal cell before the end. Legs entirely testaceous-yellow; hind femora not much thickened, concave beneath; lobe on hind tibiae wider than in *T. sladeni*. Abdomen has the first segment testaceous blackened in the centre and on either side at the base; second segment testaceous, with a transverse black band not narrowed in the middle; remaining segment black; as in *T. sladeni*, broad apical bands of shining white hair are noticeable in some lights on segments 3 to 5; abdomen shining, the basal segment impunctate; the dull, closely-punctured area on either side of the 2nd segment near the middle, present in *T. sladeni*, is absent; beneath, segments 1 to 4 pale; segments 5 and 6 black; segment 5 bilobate (in *T. sladeni* it is merely emarginate), bearing at its base a transverse row of erect hooked spines, eight in number, equal in length and nearly equidistant

♀.—Described by Cockerell, Can. Ent., Vol. XLV, p. 36, under the name of *T. sladeni*.

Habitat: Khasia Hills, Assam, India.

EXPLANATION OF FIGURES.

a. *Thrinchostoma sladeni* Ckll., ♂, 5th ventral segment.

b. *Thrinchostoma assamensis*, n. sp., ♂, 5th ventral segment.

THE TYPE OF *DELPHAX* FABR. AND *LIBURNIA* STAL.

BY E. BERGROTH, TURTOLA, FINLAND.

In his recently published "Contribution Toward a Monograph of the Delphacidae of North and South America," Mr. D. L. Crawford discusses the use of the name *Delphax* by different authors, and correctly states that *Delphax crassicornis* Fabr. is the type of both *Delphax* Fabr. and *Aræopus* Spin., and that *Aræopus* consequently is a synonym of *Delphax*. He then proceeds to say: "In 1866 Stal (Hemipt. Africana, Vol. IV, p. 178) further complicated matters by restricting the name *Delphax* to *D. clavicornis*, which he erroneously supposed to be the type." In the cited place Stal does not at all speak of *Delphax*, but in the cited work and volume, p. 175, he expressly states: "*Delphax* Fabr., Stal = *Aræopus* Spin."

As *crassicornis* is the type of *Aræopus*, it is according to Stal clearly also the type of *Delphax*. *D. clavicornis* Fabr. is the type of *Asiraca* Latr., which Stal always called by its correct name; nowhere has he called this genus *Delphax*. Far from having "complicated matters," Stal was the first author who set down the correct type of *Delphax*. Crawford has apparently not seen Stal's Hem. Afr., and what he says seems to be based on wrong second-hand quotations in some obscure paper. He further states, probably relying on the wrong statements of Kirkaldy and Distant, that Stal used *Embolophora monoceros* Stal as the type of *Liburnia*. Had he known Stal's Hem. Afr., he would have seen that Stal maintained *Embolophora* as subgenerically or sectionally distinct from *Liburnia* proper. This fact is sufficient to preclude *monoceros* from the possibility of being considered the type of *Liburnia*. The type of the latter genus is *pellucida* Fabr., as pointed out by Van Duzee.

Crawford gives good descriptions, and in many cases detail-figures, of the American Delphacids known to him, citing only the names (with bibliographical references) of the other species, but reproducing the descriptions of the genera which he had not seen. He has, however, overlooked Stal's important work, "Rio Janeiro Hemiptera, II: Homoptera." Of the new genera and species of Delphacidae described by Stal in this work not even the names are mentioned. *Delphax cylindricornis* Fabr., redescribed from the type by Stal in his "Hemiptera Fabriciana" as *Canyra cylindricornis*, has also been omitted. From the facts that Crawford says this work was published in 1858, and that *Delphax seminigra* Stal (not "seminegra!") is described on p. 275 of it (whereas the work is from 1869, has only 130 pages, and contains nothing about that species) it is clear that the work is unknown to him. *Hygyops pictifrons* Stal from the Philippine Islands is cited as a synonym of *Delphax pictifrons* Stal from Mexico, a synonymy which had been impossible if the author had known the cited papers where these generically distinct species are described. In all Crawford enumerates seven of Stal's publications in his bibliographic list, but it seems dubious whether he has seen any of them.

Stal is the founder of modern hemipterology, and it is not advisable to begin the study of any group of the Homoptera Auchenorrhyncha without knowing his works.

A KEY TO THE FAMILIES OF TRICHOPTEROUS LARVÆ.*

BY JOSEPH KRAFKA, JR., LAKE FOREST, ILL.

The larvæ of the caddis-flies are among the most common of aquatic forms; they are most interesting in their habits, and they are of undoubted economic importance; but their study is greatly retarded by the fact that there is available no means of determining them even approximately. The larvæ of the European fauna have been dealt with adequately by Ulmer, Siltala, Klapálek, Struck, Thienemann, and other European entomologists. While no thorough-going attempt has been made to trace the natural relationships in larval characters, the European genera and species can at least be recognized by keys of a more or less artificial character. Even this cannot be done for American genera, since the only species described are some eighteen by Vorhies in his excellent paper.† However, a key to the families is possible and should prove serviceable, as none has so far appeared in English. For the key here offered, that of Ulmer‡ has been used as a basis, but the whole ground has been covered in an independent study of American material.

Reference to the figures should make the distinctions of the key clear, but perhaps the terms "thysanuriform" and "eruciform" as used in the order may be more fully explained. In the Trichoptera, those larvæ are designated as thysanuriform that have the long axis of the head in line with the long axis of the body, the abdomen dorso-ventrally compressed and the depressions between the segments deep. In the eruciform type, the long axis of the head is at a decided angle with the long axis of the body, the abdomen is cylindrical and the strictures between the segments shallow. The sub-eruciform type is intermediate between thysanuriform and eruciform.

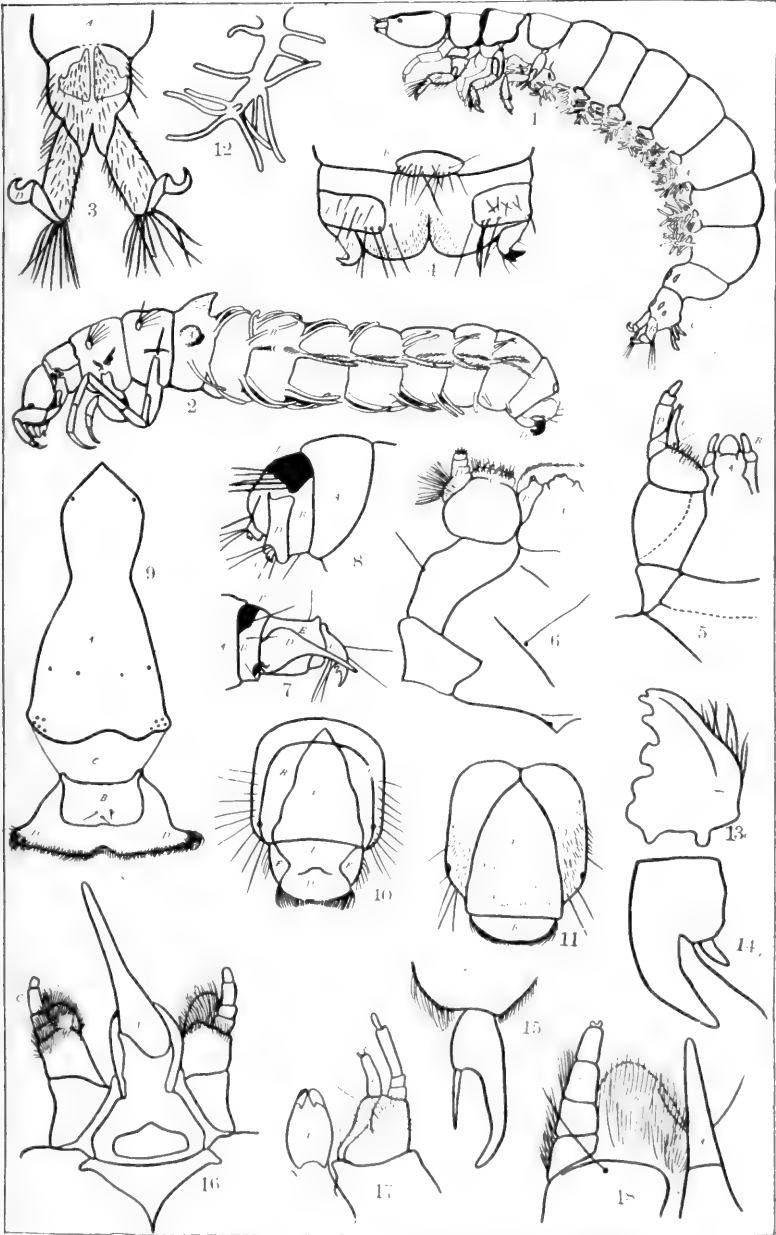
*This key is prepared as a contribution to Dr. Betten's forthcoming monograph in which the structure of all the stages of Trichoptera is dealt with, and in which descriptions of all the American genera and of all eastern American species are included.

†Vorhies, Dr. Charles T., Studies on the Trichoptera of Wisconsin. Trans. Wis. Acad. Science Arts and Letters, Vol. XVI, Part 1, No. 6, 1909, pp. 647-738, pls. LI-LXI.

‡Ulmer, Dr. Georg, Trichoptera in Brauer's Die Süßwasserfauna Deutschlands, Heft 5 u. 6, 1909. Key to larvæ, pp. 213-217.

- 1a. Larvæ thysanuriform. (Fig. 1.) Abdomen of nine segments; prolegs not fused in median line to form an apparent tenth segment.* (Fig. 3.) No tubercles on first abdominal segment. No prosternal horn. No lateral line. Tracheal gills generally absent; rectal gills generally present, but not always everted.....2
- 1b. Larvæ eruciform or sub-eruciform. (Fig. 2.) Basal segments of prolegs fused in median line to form an apparent tenth abdominal segment. (Fig. 4.) Tubercles present on first abdominal segment. Prosternal horn often present. (Fig. 35.) Lateral line present, but sometimes very light. No rectal gills; tracheal gills generally present.....10
- 2a. Abdomen very much wider than the thorax. Small larvæ with portable cases of silk.....*Hydroptilidæ*.
- 2b. Abdomen not very much wider than thorax. Cases when present not of silk only.....3.
- 3a. Chitinous shield present on the dorsal surface of the ninth abdominal segment. (Fig. 7 and 8).....4.
- 3b. No chitinous shield on the dorsal surface of the ninth abdominal segment. (Fig. 3).....5.
- 4a. Prolegs well developed, free; claws of the prolegs long and slender, without teeth on convex surface, but sometimes with teeth on concave surface. Sometimes accessory claws present at side of main ones. (Fig. 7). Maxillary lobe long and slender. (Fig. 5.)...*Rhyacophilinæ* (Fam. *Rhyacophilidæ*).
- 4b. Prolegs short; basal segments wholly chitinized and fused to the ninth abdominal segment in a nearly vertical position. Claw very long with small teeth on convex side. (Fig. 8.) Maxillary lobes short, broad, with many sense rods. (Fig. 6).....*Glossosomatinae* (Fam. *Rhyacophilidæ*).
- 5a. Branched tracheal gills present. (Fig. 12.) All three thoracic segments chitinized dorsally. Numerous bristles on convex side of mandibles. (Fig. 13).....6.
- 5b. No tracheal gills. Only prothorax chitinized dorsally (except in *Econominae*, where all three segments are chitinized). Only two bristles on convex side of mandibles.....7.

*In the *Hydroptilidæ* there is an indefinite suture crossing the ninth segment dorsally, giving somewhat the appearance of a tenth, but this family can easily be set off by the general shape of the body (see 2a).



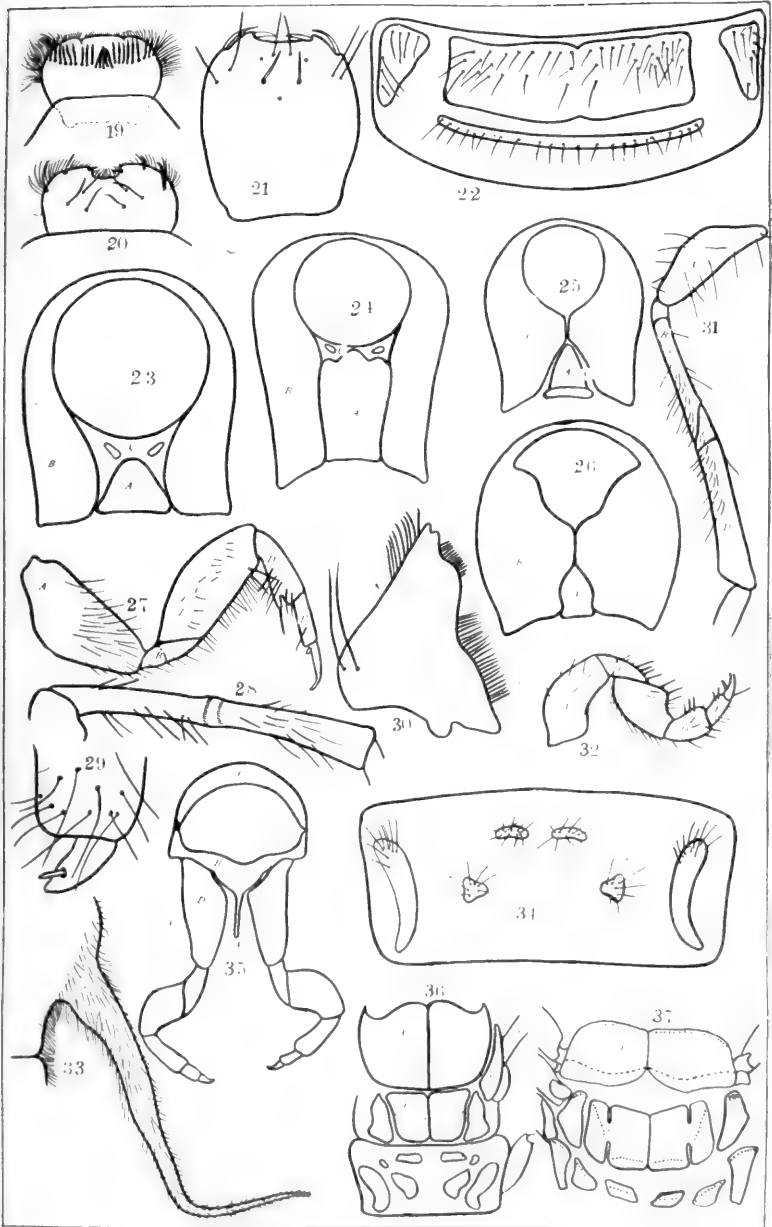
LARVÆ OF TRICHOPTERA.
(See p. 224).

- 6a. Dorsal surface of head flattened, forming a broad disk, inclosed by a heavy horse-shoe shaped ridge or carina, making a false clypeus. This carina crosses the true clypeus near its apex, setting off a small triangle. (Fig. 10.) Mandibles toothed on whole inner margin; teeth broad and blunt; interspaces broad and deep. (Fig. 13)
 *Macronematinae* (Fam. *Hydropsychidae*)
- 6b. Dorsal surface of the head flattened, but disk not so sharply defined and practically limited to the true clypeus. (Fig. 11.) No carina. Mandibles with sharp teeth at apical end.
 *Hydropsychinae* (Fam. *Hydropsychidae*).
- 7a. Labrum not wholly chitinized; its anterior angles and membrane connecting it to the clypeus, forming a flexible lip, bearing numerous bristles. Usually the anterior margin of the clypeus is asymmetrically curved (Fig. 9) *Philopotamidae*.
- 7b. Labrum wholly chitinized; its anterior angles rounded. Anterior margin of the clypeus never asymmetrically curved
 8
- 8a. All three thoracic segments chitinized dorsally
 *Econominæ* (Fam. *Polycentropidae*).
- 8b. Only prothorax chitinized dorsally 9.
- 9a. Claws of legs long, slender, with but one basal spur. (Fig. 15.) Labial lobes short, not so long as the maxillary palps (except in *Phylocentropus*). Penultimate segment of maxillary palpus very long. (Figs. 16, 17)..... *Polycentropidae*.
- 9b. Claws of legs short; claw on first leg bears a basal spur and a bristle beside it. (Fig. 14.) Two basal spurs on claws of second and third legs. Labial lobe long, slender, pointed, generally longer than the maxillary palps. Maxillary palps short; segments of equal length. (Fig. 18)
 *Psychomyida*.
- 10a. Labrum with a very distinct row of twenty or more heavy bristles traversing its dorsal surface at about one-third the distance from its front margin. (Fig. 19)
 *Calamoceratida*.
- 10b. Labrum without armature as above in 10a. - Generally only three pairs of black bristles on its dorsal surfaces and three pairs of yellow spines on its front margin. (Fig. 20) 11.

- 11a. Labrum much longer than broad. (Fig. 21.) Pronotum and mesonotum chitinized. Metanotum with four plates; two broad medium ones, lying one behind the other (the posterior one being hard to distinguish) and two lateral ones, small and triangular. (Fig. 22).....*Odontoceridæ*.
- 11b. Labrum much broader than long. (Fig. 20.) Thoracic armature various, but not as above.....12.
- 12a. *Gula subquadrate, widely separating the pleuræ. (Figs. 23, 24.) Prothorax and mesothorax chitinized dorsally. Metathorax membranous. No prosternal horn.....13.
- 12b. *Gula triangular or elongated. Pleuræ contiguous or nearly so at the apex of the gula. (Figs. 25, 26.) Thoracic armature not as in 12a. Prosternal horn generally present. (Fig. 35).....15.
- 13a. Long spur-bearing processes on distal ends of first and second tibiæ. (Fig. 27.) Hind tibiæ divided. (Fig. 28.) Hind claw either long and bristle-like or very short and bearing many bristles. (Fig. 29.) Labial lobe with numerous bristles near the middle of the ventral side
.....*Molanninæ* (Fam. *Molannidæ*.)
- 13b. No spur-bearing processes on first and second tibiæ, but sometimes a swelling on the first tibiæ. (Fig. 32.) Hind tibiæ not divided except in *Mystacides*. Claws normal. Few bristles on labial lobe.....14.
- 14a. Femora not divided into a short apical and a long distal piece. Mandibles with inner bristles, and a clump of accessory bristles near distal end of convex side. (Fig. 30.) Chitin points over lateral line on abdominal segments III to VIII.
.....*Berainæ* (Fam. *Molannidæ*.)
- 14b. Femora of middle and hind legs divided into a small basal and a long apical piece. (Fig. 31.) Right mandible without inner bristles. No accessory bristles on back of mandibles*Leptoceridæ*.

*In two subfamilies the characters will not agree with all those listed in either 12a or 12b. Forms agreeing with 12b in all except the form and position of the gula (*Brachycentrinæ*) or in all except thoracic armature (*Sericostomatinae*) should remain in 12b.

- 15a. Postsegmental gills on lateral line always covered with black hairs. (Fig. 33). Prothorax only chitinized. One pair of small bristle-bearing plates on mesothorax and on metathorax *Phryganeidæ*.
- 15b. Gills never with black hairs. Thoracic armature not as in 15a.....16.
- 16a. Prothorax and mesothorax chitinized dorsally. Metathorax membranous, bearing three pairs of small shields; median anterior pair very small; second pair small, slightly laterad and posterior to first; third pair largest, generally crescent-shaped, lying laterad to second; all well supplied with bristles. (Fig. 34)..... *Limnophilidæ*.
- 16b. Thoracic armature not as in 16a.....17.
- 17a. Pronotum chitinized. Mesothorax bearing two or three pairs of heavily chitinized plates, metathorax with two or four pairs of smaller plates.....18.
- 17b. Pronotum chitinized. Mesonotum and metanotum membranous, or at most only weakly chitinized.....19.
- 18a. Anterior angles of pronotum produced into pointed processes. Head retractile. Two or three pairs of plates on mesothorax; four pairs on metathorax. (Fig. 36).—Tubercles present on first abdominal segment. Gula triangular; pleuræ nearly contiguous behind its apex. (Fig. 25)
.....*Goerinæ* (Fam. *Sericostomatidæ*).
- 18b. Anterior angles of pronotum rounded. Head not retractile. Four broad plates on mesothorax, but only two pairs of smaller ones on metathorax. (Fig. 37.) No lateral tubercles on first abdominal segment. Gula subquadrate; pleuræ separated widely by the gula.
..... *Brachycentrinæ* (Fam. *Sericostomatidæ*).
- 19a. Only lateral tubercles on first abdominal segment well developed. Gills thread-like, single. Middle and hind tibiæ with one distal spur each. Prosternal horn present
.....*Lepidostomatinae* (Fam. *Sericostomatidæ*)
- 19b. All three tubercles on first abdominal segment well developed. Gills thread-like, clustered; only on the anterior margins of the segments. Middle and hind tibiæ without distal spur. No prosternal horn *Sericostomatinae* (Fam. *Sericostomatidæ*)



LARVÆ OF TRICHOPTERA.

(See p. 225).

EXPLANATION OF PLATES VI AND VII.

PLATE VI.

Fig. 1. *Macronema zebratum* Hag.; a, branched tracheal gills; b, prolegs; c, rectal gills.

Fig. 2. *Phryganea* sp.; a, tubercles; b, tracheal gills; c, lateral line; d, prolegs.

Fig. 3. *Macronema zebratum* Hag.; ventral aspect of prolegs; a, 8th abdominal segment; b, 9th abdominal segment; c, basal segment of prolegs; d, claw of proleg.

Fig. 4. *Platycentropus hostis* Hag.; dorsal aspect of prolegs; b, 9th abdominal segment; c, basal segments of prolegs forming a 10th abdominal segment; d, claws of prolegs; e, supporting plate of claw.

Fig. 5. *Rhyacophila fuscula* Walk.; labium and maxilla; a, labial lobe; b, labial palpus; c, maxillary lobe; d, maxillary palpus.

Fig. 6. *Mystrophora americana* Banks; labium and maxilla; a, labial lobe; b, labial palpus; c, maxillary lobe; d, maxillary palpus.

Fig. 7. *Rhyacophila fuscula* Walk.; lateral view of prolegs; a, 8th abdominal segment; b, 9th abdominal segment; c, claw of proleg; d, accessory claw; e, basal segment of proleg; f, dorsal plate on 9th abdominal segment.

Fig. 8. *Mystrophora americana* Banks; a, 8th abdominal segment; b, 9th abdominal segment; c, claw of proleg; d, basal segment of proleg; e, dorsal plate on 9th abdominal segment.

Fig. 9. *Chimarra* sp.; dorsal view of clypeus and labrum; a, clypeus; b, labrum; c, connecting membrane; d, anterior angles of labrum.

Fig. 10. *Macronema zebratum* Hag.; dorsal view of head; a, true clypeus; b, false clypeus; c, carina; d, labrum; e, connecting membrane; f, mandibles.

Fig. 11. *Hydropsyche* sp. dorsal view of head; a, true clypeus; b, labrum.

Fig. 12. *Macronema zebratum* Hag.; branched tracheal gill.

Fig. 13. *Macronema zebratum* Hag.; ventral aspect of left mandible.

Fig. 14. *Psychomyia pusilla* Fabr; claw of 1st leg (after Ulmer).

Fig. 15. *Phylocentropus* sp.; claw of 1st leg.

Fig. 16. *Phylocentropus* sp.; labium and maxillæ; a, labial lobe; b, max. lobe; c, max. palpus.

Fig. 17. *Plectrocnemia conspersa* Curt.; labium and maxilla (after Ulmer); a, labial lobe; b, max. lobe; c, max. palpus.

Fig. 18. *Psychomyia pusilla* Fabr.; labium and maxilla (after Ulmer); a, labial lobe; b, max. lobe; c, max. palpus.

PLATE VII.

Fig. 19. *Ganonema americanum* Walk.; dorsal view of labrum.

Fig. 20. *Chilostigma* sp.; dorsal view of labrum.

Fig. 21. *Psilotreta frontalis* Banks; dorsal view of labrum.

Fig. 22. *Psilotreta frontalis* Banks; dorsal view of metathorax showing chitinous plates.

Fig. 23. *Leptocella uwarowii* Kol.; ventral view of head; a, gula; b, pleura; c, membrane.

Fig. 24. *Mystacides sepulchralis* Walk.; ventral view of head; a, gula; b, pleura; c, membrane.

Fig. 25. *Goera pilosa* Fabr.; ventral view of head; a, gula; b, pleura; c, membrane.

Fig. 26. *Arctoecia medialis* Banks; ventral view of head; a, gula; b, pleura.

Fig. 27. *Molanna cinerea* Hag.; first leg; a, coxa; b, trochanter; c, femur; d, tibia; e, tarsus.

Fig. 28. *Molanna cinerea* Hag.; femur of 3rd leg.

Fig. 29. *Molanna cinerea* Hag.; claw of 3rd leg.

Fig. 30. *Beræodes minuta* L.; mandible (after Ulmer).

Fig. 31. *Leptocella uwarowii* Kol.; third leg; a, coxa; b, trochanter; c, apical piece of femur; d, distal piece of femur.

Fig. 32. *Leptocella uwarowii* Kol.; first leg; a, coxa; b, trochanter; c, femur; d, tibia; e, tarsus.

Fig. 33. *Phryganea* sp.; tracheal gill.

Fig. 34. *Platycentropus hostis* Hag.; dorsal view of metathorax.

Fig. 35. *Arctæcia medialis* Banks; anterior view of prothorax; a, prosternal horn; b, prosternum; c, pronotum; d, 1st leg.

Fig. 36. *Gæra pilosa* Fabr.; thoracic armature; a, prothorax; b, mesothorax; c, metathorax; d, base of legs; e, supporting plates.

Fig. 37. *Brachycentrus nigrosoma* Banks; thoracic armature; a, prothorax; b, mesothorax; c, metathorax; d, base of legs.

NEW NORTH AMERICAN GALL MIDGES.

BY E. P. FELT, ALBANY, N. Y.

The following descriptions relate to undescribed species which have been received from various localities during several months past.

***Lestremia floridana*, n. sp.**

The midge characterized below was collected by Mr. C. W. Johnson and labelled Jacksonville, Fla. It is easily separable from both *L. elongata* Felt and *L. barberi* Felt by the relatively much longer antennal segments. The somewhat similar *L. sambuci* Felt and *L. kansensis* Felt are easily distinguished from this species by the much greater production and more slender character of the terminal antennal segment.

Female.—Length 1.2 mm. Antennæ extending to the base of the abdomen, sparsely haired, reddish brown; 11 segments, the fifth with a stem about $\frac{1}{4}$ the length of the cylindric basal enlargement, which latter has a length $2\frac{1}{2}$ times its diameter; terminal segment moderately stout, only slightly produced, the basal portion with a length three times its diameter and apically with a short, stout, fusiform appendage. Palpi: first segment narrowly oval, with a length over twice its diameter, the second $\frac{1}{2}$ longer than the first, more slender, the third $\frac{1}{2}$ longer than the second, more slender, the fourth nearly twice as long as the third, slender, irregular. Mesonotum yellowish brown. Scutellum yellowish, postscutellum reddish yellow. Abdomen reddish brown. Halteres, coxæ and femora basally, fuscous yellowish, distal portion of femora, tibiæ and tarsi reddish brown. Claws moderately stout, simple, the pulvilli about half the length of the claws. Ovipositor triarticulate, the terminal lobe narrowly ovoid and with scattering, large setæ in addition to numerous smaller ones. Type Cecid. 1514.

***Microcerata aldrichii*, n. sp.**

The midges described below were collected by Prof. J. M. Aldrich by sweeping winter wheat at Lafayette, Ind., May 6, 1914. The species approaches closely *M. spinosa* Felt, from which it may be easily separated by the darker colour and the fused eighth and ninth antennal segments of the male, the latter having a length

about twice its diameter, while in *M. spinosa* these two segments are free, the last having a length only about three-fourths greater than its diameter. There are doubtless other differences in the similar appearing midges.

Male.—Length 1.5 mm. Antennæ moderately short, tapering, the basal segment dark brown, the others light brown; 9 sessile segments, the second greatly enlarged, the ninth plainly fused with the eighth, and with a length about twice its diameter. Palpi: first segment subquadrate, with a length over twice its diameter, the second a little longer and more slender than the first, the third one-half longer than the second, more slender, the fourth twice as long as the third, slightly expanded distally. Body a nearly uniform brownish black, the submedian lines of the mesonotum sparsely haired. Wings moderately large, costa, subcosta and the third vein yellowish brown, whitish basally. Halteres yellowish transparent. Coxæ dark brown. Legs mostly fuscous yellowish, the pulvilli as long as the moderately stout, slightly curved, finely pectinate claws.

Genitalia: basal clasp segment moderately stout, long; terminal clasp segment short, swollen basally, somewhat recurved and thickly setose apically; dorsal plate moderately long, triangularly emarginate, the lobes narrowly rounded apically; ventral plate long, apically roundly and obliquely truncate and thickly setose.

Female.—Length 1 mm. Antennæ yellowish brown, the second segment only moderately enlarged, the fourth with a length about three-fourths its diameter and with thick groups of short, stout spines subapically; terminal segment produced, with a length nearly twice its diameter, somewhat swollen basally and broadly rounded apically. Body a nearly uniform brownish black. Ovipositor short, the lobes yellowish, biarticulate, the distal segment roundly oval and thickly setose, minor lobes thickly setose, triangular, narrowly rounded apically. Type Cecid 1585.

***Porricondyla wellsii*, n. sp.**

The midge described below was taken by Mr. D. B. Young on a window at Wells, N. Y., July 5, 1914. It is easily distinguished from allied forms by the greatly produced stems of the flagellate

antennal segments and the short, greatly swollen terminal clasp segment.

Male.—Length 2 mm. Antennæ a little longer than the body, sparsely haired; 16 segments, the fifth with a stem twice the length of the basal enlargement, which latter has a length one-half greater than its diameter; terminal segment reduced, with a length nearly three times its diameter and tapering almost uniformly to an acute apex. Palpi reddish, first segment with a length four times its diameter, second a little shorter, stouter, the third longer than the second, more slender and the fourth one-half longer than the third. Mesonotum shining dark brown. Scutellum and post-scutellum yellowish. Abdomen yellowish white, with narrow, double, transverse, brownish sclerites on each abdominal segment, the distal segments tinged with reddish. Genitalia fuscous yellowish. Halteres and coxæ pale yellowish. Legs mostly a variable straw; claws rather slender, strongly curved, unidentate, the pulvilli as long as the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment short, greatly swollen near the middle and with a length hardly one-half greater than the diameter; dorsal plate rather long, deeply and roundly emarginate, the lobes broadly rounded; ventral plate moderately long, broad, deeply and triangularly emarginate, the lobes tapering to a roundly truncate apex. Harpes short, stout, irregular, heavily chitinized. Type Cecid. 1564.

***Asteromyia sylvestris*, n. sp.**

The yellowish or brownish blister leaf galls of this species were very abundant October 22, 1914, on *Aster cordifolius* at Mount Kisco, N. Y. A number of adults were reared together with several parasites, the latter undetermined.

Gall.—Diameter three to four mm., circular, a variable yellowish or brownish blister leaf gall on *Aster cordifolius*. Some are yellowish with brown centres and others mostly dark brown. There may be three to twenty on a leaf and the larvæ evidently hibernate in the gall, though adults appeared under insectary conditions in mid-winter.

Male.—Length 1.6 mm. Antennæ extending to the base of the abdomen, sparsely haired, reddish brown; 16 segments, the fifth with a length one-fourth greater than its diameter; terminal

segment somewhat produced, with a length nearly one-half greater than its diameter and sometimes partly fused with the preceding. Palpi; first segment narrowly oval, the second one-half longer, tapering to a subacute apex. Mesonotum shining reddish brown, the submedian lines sparsely haired. Scutellum and postscutellum shining yellowish brown. Abdomen mostly dark brown basally, the segments sparsely margined sublaterally and posteriorly with a broken line of white scales, the fifth to the seventh segments sparsely clothed with fuscous scales, the latter hardly obscuring the reddish orange colour of the abdomen; discal spot white, elongate and near the middle of the wing. Halteres fuscous yellowish basally, fuscous apically. Coxæ fuscous yellowish, femora and tibiæ fuscous yellowish basally, fuscous apically; tarsi a nearly uniform dark brown; claws long, rather slender, strongly curved, unidentate, the pulvilli nearly as long as the claws. Genitalia; dorsal plate deeply and triangularly emarginate, the broad lobes broadly and rather irregularly rounded; ventral plate long, broad, broadly rounded.

Female.—Length 2 mm. Antennæ fuscous basally, yellowish or reddish apically, sparsely haired; 16 segments, the fifth with a length about equal to its diameter. Palpi; the first segment with a length nearly twice its diameter, the second a little longer than the first, abruptly tapering distally. Mesonotum dark reddish brown. Scutellum and postscutellum dark brown. Abdomen a nearly uniform brownish black, the ovipositor fuscous yellowish, about one-third the length of the abdomen, the terminal lobes being broadly ovate and thickly setose. Halteres yellowish transparent basally, brownish black apically. Coxæ and legs a nearly uniform brownish black, the posterior tibiæ narrowly and indistinctly annulate distally with white. Type Cecid. a2585.

Kalodiplosis, n. g.

The unidentate, heavily toothed claws, the rudimentary pulvilli, the third vein joining the margin at or slightly before the apex of the wing, the triarticulate palpi, the heavy, rather thick and moderately short circumfili, and the long dorsal and ventral plates, the latter deeply emarginate and with relatively narrow lobes, serves to distinguish this genus from *Dicrodiplosis* Rubs. and the series related thereto. Type *Dicrodiplosis multifila* Felt.

Kalodiplosis multifila Felt

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 19-20 (Dicrodiplosis).

1908 Felt, E. P. N. Y. St. Mus. Bul. 124, p. 300, 394 (Dicrodiplosis).

The male representing this species is in the U. S. National Museum and was collected by August Busck at Porto Rico.

Male.—Length 1.5 mm. Antennæ as long as the body, thickly haired, dark brown; 14 segments, the fifth having the basal part of the stem with a length about one-half its diameter, the distal part with a length three-fourths its diameter; basal enlargement subglobular, the distal enlargement vasiform and with two circumfili, each with about twelve moderately heavy, stout loops; terminal segment, basal portion of the stem with a length twice its diameter, the distal enlargement subcylindric, with a length nearly twice its diameter, at the distal fourth tapering to an acute apex. Palpi; first segment short, stout, subglobose, the second with a length thrice its diameter, the third longer and more slender than the second. Mesonotum dark brown, the submedian lines indistinct. Scutellum dark reddish brown, postscutellum fuscous. Abdomen dark brown, the segments sparsely margined posteriorly with coarse setæ. Costa light straw, the third vein joining the margin just before the apex, the fifth forked; halteres fuscous yellowish. Coxæ and base of femora pale yellowish, the distal portion of femora, tibiæ and tarsi a variable brown; claws long, stout, strongly curved, unidentate, the pulvilli about half the length of the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment short, swollen basally; dorsal plate long, broad, broadly and roundly emarginate, the lobes irregularly rounded; ventral plate long, broad, dilated apically, broadly and triangularly emarginate, the lobes rather slender and narrowly rounded. Type Cecid. 1024.

Kalodiplosis floridana, n. sp.

The midges described below were received under date of September 21, 1914, from Dr. Frederick Knab and recorded as having been collected August 22, 1914, on sea grape (*Coccoloba*) at Miami, Fla., by W. W. Yothers. This species is easily dis-

tinguished from *K. multifila* Felt, by the longer stems of the flagellate antennal segments as well as by differences in colour.

Male.—Length 1 mm. Antennæ probably one-half longer than the body, thickly haired, yellowish brown; 14 segments, the fifth having the stems nearly equal, each with a length one-half greater than the diameter; terminal segment missing. Palpi; first segment irregularly ovate, the second with a length over twice its width, the third one-half longer than the second, more slender. Mesonotum dark reddish brown. Scutellum and postscutellum yellowish. Abdomen mostly dark brown, yellowish brown apically. Halteres yellowish basally, slightly fuscous apically. Coxæ and femora fuscous straw, the tarsi somewhat darker; claws stout, unidentate, the pulvilli about half the length of the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment short, rather stout, swollen near the basal third; dorsal plate long, broad, deeply and triangularly emarginate, the lobes rather long, broad and narrowly rounded; ventral plate long, deeply and triangularly emarginate, the slender, slightly diverging lobes narrowly rounded and sparsely setose apically; style long, stout, strongly curved.

Female.—Length 1.25 mm. Antennæ probably nearly as long as the body, sparsely haired, yellowish brown; 14 segments, the fifth with a stem one-fourth the length of the cylindric basal enlargement, which latter has a length about twice its diameter; terminal segment slightly prolonged and obtusely rounded apically. Palpi; first segment irregularly ovate, the second rather slender, with a length nearly three times its diameter, the third a little longer and more slender than the second. Mesonotum dark brown. Scutellum and postscutellum yellowish. Abdomen reddish brown, yellowish basally and with an oval subbasal spot dorsally. Halteres mostly a light fuscous yellowish. Coxæ and femora mostly fuscous yellowish, the apical portion of femora, tibiæ and tarsi dark brown. Ovipositor short, the terminal lobes narrowly oval and sparsely setose. Other characters practically as in the male. Type Cecid. 1563.

***Hormomyia fenestra*, n. sp.**

This species is closely related to *H. shawi* Felt, though easily distinguished by marked differences in colour characters and in

the structure of the basal clasp segment. Both sexes were taken by Mr. C. P. Alexander, August 22, 1910, at Woodworth's Lake, Fulton County, N. Y.

Male.—Length 5 mm. Antennæ probably as long as the body, sparsely haired, dark yellowish brown; probably 15 segments, the fifth having the two portions of the stem nearly equal, each with a length one-half greater than the diameter. Palpi; the first segment irregular, with a length about twice its diameter and apically with an irregular, quadrate, pseudo-segment; the second segment extremely slender, with a length fully ten times its diameter and at the basal third a pseudo-articulation. Mesonotum reddish brown, the submedian lines and posterior median area, scutellum and postscutellum mostly brownish yellow. Abdomen dark brown. Genitalia fuscous yellowish, the basal clasp segment subrectangular, with a length about three times its diameter and a conspicuous, broadly rounded internal lobe at the basal third; terminal clasp segment stout, curved, diameter nearly uniform, fuscous apically; dorsal plate broad, broadly and irregularly emarginate, the lobes broad and tapering irregularly to a narrowly rounded, setose apex; ventral plate long, spatulate, sparsely setose, broadly and roundly emarginate distally.

Female.—Length 5 mm. Antennæ missing. Palpi; the first segment subglobose, the second rectangular, with a length one-half greater than its diameter, the third greatly produced, with a length fully ten times its diameter. Mesonotum a variable reddish brown, the submedian lines brownish yellow. Scutellum and postscutellum mostly fuscous yellowish. Abdomen sparsely haired, dark reddish brown. Halteres yellowish transparent. Coxæ yellowish brown, legs a variable straw colour, the articulations slightly darker. Ovipositor short, the terminal lobes broadly oval and thickly clothed with short, stout setæ, minor lobes triangular, with a few coarse setæ on the rounded apex. Type Cecid. 1596.

The female, Cecid. 1595 is referred with little question to the same species, a procedure justified by similar abdominal structures and the capture of the two on the same date and under presumably identical conditions. The specific name is given on account of the peculiar, light coloured, window-like spots in the body walls of the abdomen.

A NEW GENUS AND SPECIES OF TRICHOGRAMMATIDÆ
FROM THE PHILIPPINES.

BY A. A. GIRAULT,

Bureau of Entomology, U. S., Department of Agriculture.

The following genus belongs to the Chætostrichini:

Pseudobrachysticha, new genus.

Female.—In my table of genera runs to *Brachysticha* Mayr, but differs from that genus in that there is only one-ring joint and the fore wings are naked, the marginal ciliation at the apex but moderately long and the club is 2-jointed, the antennæ 6-jointed. Moreover, in the male the club is solid. Because the single funicle joint is connected rather closely with the club, sometimes making the latter appear 3-jointed, this genus may be confused with *Pteryogramma* Perkins, but the male is different from the female, the discal ciliation of the fore wing is absent, excepting a single line of it along the cephalic margin from venation to apex, the funicle is really present and the ovipositor is inserted in the middle of the abdomen. Marginal vein as long as the submarginal, the stigmal with a short neck and a rounded knob. Mandibles tridentate. Male the same, except the shape of the abdomen and the 5-jointed antennæ. A short, distinct postmarginal vein.

1. **Pseudobrachysticha semiaurea**, new species.

Female.—Length, 0.60 mm.

Bright golden yellow, the abdomen black (the incisions of the segments sometimes showing through as yellow cross-stripes), the venation dusky black, the fore wing smoky from base to slightly beyond the apex of the venation, but subhyaline at base to the break of the submarginal vein and along under the marginal vein, the infuscation accented across from base of the marginal vein and less so across from the apex of the stigmal (thus more or less bifasciate). Caudal wings slightly dusky to some little distance beyond the venation. Two to four isolated cilia on the fore wing in a line longitudinally between apex of stigmal vein and apex of the wing. Marginal cilia at apex of the fore wing about between a fourth and a third of the greatest wing width, distinctly shorter than the caudal marginal cilia of the caudal wing. The latter rather broad, but distinctly narrower than the length of its marginal

cilia, naked discally, excepting for a pair of isolated cilia in a line longitudinally, central and somewhat proximad of the middle between the apex of the venation and the apex of the blade. Antennal club dusky. Cephalic face of the pronotum black. Hind femora sometimes dusky. Scape and legs nearly white.

The male is similarly coloured.

Described from a large number of specimens of both sexes reared from the eggs of *Hilda breviceps* Stal, Los Banos, Philippine Islands, February, 1915, C. F. Baker.

Types.—Catalogue No. 19300, U. S. N. M., four males, four females on a slide. A large number of paratypes on another slide.

A NEW SPECIES OF *PSEUDOMPHALE* FROM CHILE.

BY A. A. GIRAULT,

Bureau of Entomology, U. S. Dept. Agriculture.

The genus *Pseudomphale* Schrottky is the same as *Horismenus* in the North American sense. It may be *Horismenus* in the European sense, yet doubtfully. There are three ring-joints. The single Australian species of *Horismenus* represents a new genus which may be named *Horismenopsis*, new genus. The genotype is *Horismenus antiopa* Girault. The following new species of *Horismenus* was found in the collections of the United States National Museum when reviewing the North American Entedoninae.

1. *Pseudomphale hypatia*, new species.

Female.—Length, 2.50 mm.

Differs from *lixivorus* Crawford in that the tibiae are not dark, but merely embrowned centrally or brown except at tips; the stripe of scaliness across near apex of segment 2 of the abdomen is not so wide nor so produced proximad at lateral margin, the petiole is distinctly shorter and vertical, the abdomen sessile, the median carina of the propodeum longer and broader. From *floridanus* Ashmead in the same particulars except the tibiae, which are darker than in that species, brown, not white; also in *floridanus*, segment 2 of the abdomen is longer, slightly over half the length of that region (somewhat less than half in this new species); also the thorax is blue, not black. Differs from *microgaster* Ashmead in the shorter segment 2 of the abdomen. Runs close to *brasiliensis* Ashmead, but differs in the shorter abdominal

petiole, shorter segment 2 of the abdomen, which in *brasiliensis* occupies $\frac{3}{4}$ of the surface and is sculptured broadly distad, the median carina of the propodeum is broader and the pedicel longer, the tibiae darker being brown. Compared with types of the named species except *microgaster*. Three ring-joints. Pedicel slightly longer than funicle 1.

Differs from the genotype in its dark femora, scape, etc. Described from three females labelled "*Ceroplastus novaesci*, Santiago, Chile, M. J. Rivera, Letter March 15, 1910."

Types.—Catalogue No. 19320, U. S. N. M., two females on tags (one a paratype). Parapsidal furrows half complete from caudad. Median groove of scutum delicate, only at proximal third.

ERRATA.—In my article "Geometrid Notes" in the Canadian Entomologist, Vol. XLVII No. 5, pp. 155-158, I wish to make the following corrections:—

P. 157, line 24, for "*paratype*" read "*paratypes*".

P. 157, line 28, for "*saawichata*" read "*saanichata*".

P. 158, line 29, for "*fuscata*" read "*furcata*".

P. 158, line 34, for "*saawichatu*" read "*saanichata*".

L. W. SWETT.

BOOK REVIEW.

KEY TO THE FAMILIES OF NORTH AMERICAN INSECTS.—An Introduction to the Classification of Insects. By Charles T. Brues, Assistant Professor of Economic Entomology, Harvard University, and A. L. Melander, Professor of Entomology, State College of Washington, Boston, Mass., and Pullman, Wash. Published by the Authors, 1915. 137 pp., 18 plates.

This little book brings together a complete analytical key to the orders and families of North American insects compiled from the works of the most recent authorities in the various branches of systematic entomology. Such a work has been a great desideratum among teachers of entomology in view of the rapid changes in the classification of insects which have been brought about in recent years as a result of the labours of an ever-increasing army of workers in this field.

The book "has been prepared to meet the requirements not alone of college courses in systematic entomology, but also of

agricultural high schools and of physicians, fruit inspectors, the modern farmer, the nature-lover, or anyone who is concerned with the practical identification of insects." It begins with a conspectus of the higher groups of insects down to the families, following which is a key to the orders, dealing with the earlier as well as the adult stages. The remainder of the text is occupied by short diagnoses of each order, followed in each case by dichotomous keys to the suborders, superfamilies and families. A few typical genera are mentioned in connection with each family, and when these contain well-known species of economic importance, both the scientific and common names of such species are given.

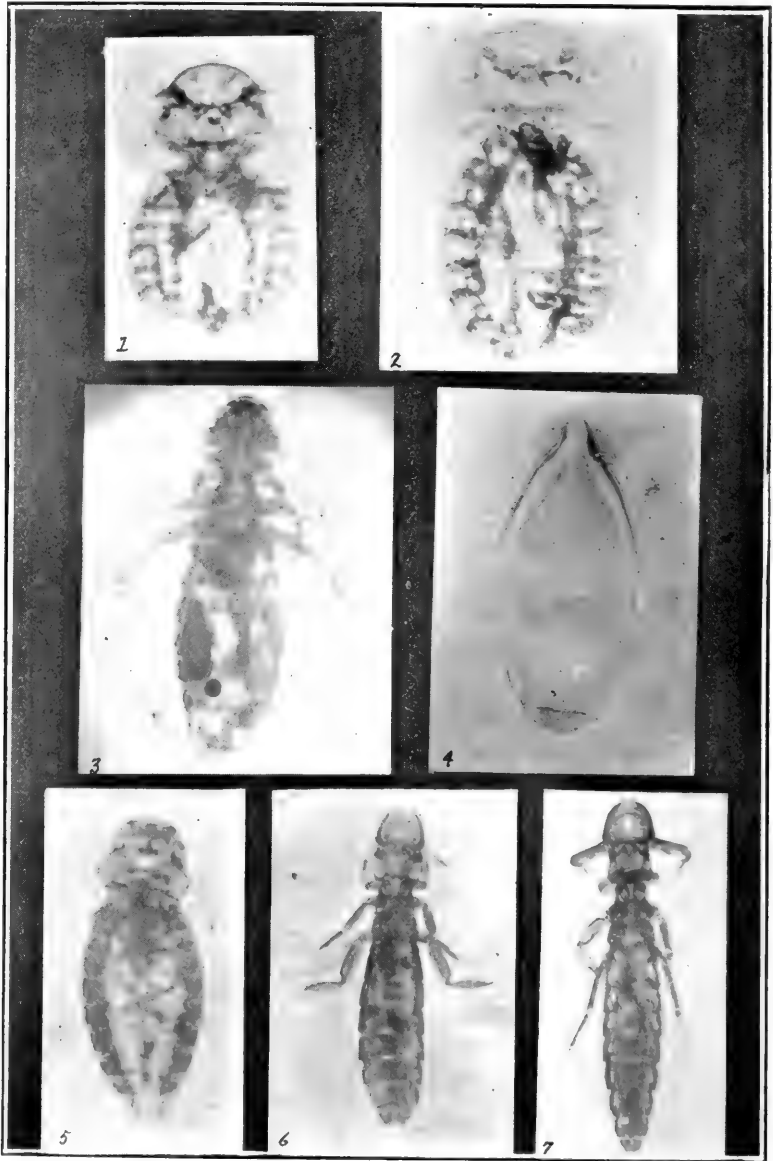
The book is copiously illustrated by 427 simple but excellent figures, showing the general appearance of members of typical genera or characters of taxonomic value.

The classification into orders and the grouping of these into subclasses and classes is essentially that of Handlirsch*, who recognizes five classes and divides one of these, the *Pterygonea*, into 11 subclasses and 30 orders, there being 37 orders altogether. Only the orders and lower groups, however, are characterized in the keys. This system is undoubtedly based upon a much broader and more thorough consideration of all available data on the subject than any other hitherto proposed, and probably expresses the true relationships of the main groups of insects with correspondingly greater accuracy, and yet we cannot but think that the wisdom of following it in a manual such as this is open to question, at least in so far as its usefulness to the average teacher, or the physician or nature-lover is concerned, for it is far more complex than any of the older systems, and can only be appreciated by the most advanced students. For some reason, not apparent to the reviewer, the most generalized groups, usually known as the *Apterygota* or *Thysanura* and *Collembola*, but divided by Handlirsch into four classes, are placed at the end of the series, although the general sequence of groups is an ascending one.

The book also contains a glossary of special terms, an index to genera and higher groups, and an index to common names. It should certainly prove a most useful addition to any entomological or zoological library.

*Die fossilen Insekten und die Phylogenie der rezenten Formen. Leipzig 1908.





LICE AFFECTING THE DOMESTIC FOWL.

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No. 8

POPULAR AND ECONOMIC ENTOMOLOGY.

LICE AFFECTING THE DOMESTIC FOWL.

BY A. W. BAKER, GUELPH, ONT.

The lice affecting the Domestic Fowl are members of the order Mallophaga and are commonly called Biting or Bird Lice to distinguish them from the sucking lice of mammals. The name "Biting Lice" is applied because of the fact that the mouth-parts of the insects are fitted for biting. The food consists of bits of feathers and epidermal scales—the lice never feeding on the blood of the host save possibly where it may have dried around wounds. The injury to chickens arises from the irritation produced by the constant feeding and probably also to a considerable extent by the sharp claws.

The loss occasioned to poultry keepers through the attacks of lice is of course difficult of estimation, but it is certain that it is much greater than is usually supposed to be the case. The injury to chicks is especially great, proper growth being prevented through the restless activity of the bird. It is even quite possible that much of the mortality of small chicks is due directly to the attacks of lice. More mature birds are also prevented from making proper growth and egg-laying is doubtless checked to a considerable extent by the weakened and restless condition of the birds. Where setting hens are used there are often losses in hatching as a result of the abnormal activity of the bird. In addition to these direct losses birds as a result of their weakened condition are more susceptible to the various diseases to which poultry are at all times a prey.

One point which makes the biting lice of great importance as ectoparasites is that the whole life of the insect is passed on the body of the host. The female attaches her eggs to the feathers of the bird and each young louse escapes by pushing off a cap-like structure at the free end of the egg. The rest of the life of the

louse is then spent on the body of this bird with the exception of course that migration may take place from bird to bird during contact on the perches or in nesting boxes.

Control Measures.

1.—*Lice Powders.*

There are many different lice powders on the market. Many are costly and some are not extremely effective. One of the most successful powders is that known as the "Lawry Lice Powder." This is not a proprietary powder and can be prepared cheaply by the poultry man. It will give extremely satisfactory results. This powder is made by adding to 3 parts of gasoline and 1 part of crude carbolic acid 90-95% enough plaster of paris to take up all the liquid. The plaster should be stirred in gradually so that a dry pinkish powder results.

This powder should be worked into the feathers of the bird especially on the more heavily infested parts of the body, that is in the region of the vent, wings and under side of the body. It must be borne in mind that this powder will not kill the eggs or "nits" of the lice, and it will accordingly be necessary to give another dusting and in severe cases even a third at intervals of 5-7 days, to kill those young lice which have hatched since the last dusting.

There are several grades of crude carbolic acid on the market. That of 90-95% must be used in the powder to obtain satisfactory results. The Poultry Department of the Maine Agricultural Experiment Station state that they have used cresol in place of the crude carbolic acid with good results where the carbolic could not be obtained.

2.—*Blue Ointment.*

Prof. W. R. Graham, of the Ontario Agricultural College, states that he has used Blue Ointment with success where setting hens are heavily infested with lice. The ointment is worked into the feathers of the bird by hand, but it must be used *sparingly and very carefully.*

3.—*Dust Baths.*

Baths containing a mixture of road dust and tobacco dust may be kept in the poultry house or in the run. Birds will make

free use of these baths and the chances of infestation will be to a great extent reduced.

It will be found advisable also where brood hens are used to set them on tobacco stems which may be obtained cheaply from any cigar factory. The possibilities of infestation of the chicks will thus be greatly reduced.

4.—*Carbolized Sweet Oil.*

Dusting young chicks will be found to be a difficult practice. Where head lice are very bad on young chicks it may be found necessary, however, to treat them. In this case a little carbolized Sweet Oil may be rubbed into the infested regions. The oil, however, must be used *only in extreme cases and then very sparingly*, as its use in any quantity may endanger the life of the chick.

A much surer method is to protect young birds from infestation by thoroughly treating all old birds with which they may come in contact.

5.—*Disinfection of Houses.*

If incubator and brooder-raised chicks are kept free from contact with old birds during their development, and are then placed in houses which have been thoroughly cleansed and disinfected, the danger of infestation is reduced to a minimum. Under these conditions any old birds which must be introduced into the house should, of course, be given two or three thorough dustings before they are allowed to run with the young birds.

Before the introduction of the young pullets the whole house, nests, perches, walls and floor should be thoroughly scraped and scrubbed and then well painted or sprayed with a mixture of 3 parts of Kerosene and 1 part of Crude Carbolic Acid 95%. This ensures absolutely lice-free surroundings for the young birds and also checks to a great extent, if it does not entirely eradicate, an infestation of red mites if such be present.

Following are the species of lice which are known to infest the Domestic Fowl in Canada with brief descriptions to aid in their identification.

The Common Hen Louse (*Menopon pallidum* N.).

This louse is about .04 to .06 inches in length. The body is compact, the head is long and the legs short. The abdomen

tapers strongly and regularly to the posterior end and is beset with numerous bristles. The whole body is a light straw colour.

This is in Canada as elsewhere the most common species affecting the Domestic Fowl. It can be readily recognized by its light yellow colour and extreme activity on the birds. It has been recorded in America also from the pigeon and is said by some to attack horses if such are in close proximity to lousy birds. The writer has never seen horses so attacked.

Menopon biseriatum Piaget.

This species is about .08 to .09 inches in length. The female has the body elongate and loosely jointed, the head short and the legs long. The abdomen tapers abruptly but slightly at the posterior end, and the posterior margin of the last segment bears a close series of fine hairs. The general body colour is yellowish brown. The male is shorter and stouter than the female and lacks the series of hairs on the posterior margin of the last segment. This species occurs commonly and often abundantly in company with *M. pallidum*. It can readily be distinguished from the latter by its larger size and less compact form. It has been recorded in America also from the turkey and pigeon, and is said to attack the pea fowl.

The Variable Chicken Louse (*Lipeurus variabilis* N.).

The length of this species is about .09 to .095 inches. The body of the female is elongate and slender. The head is broadly rounded in front and the antennæ are slender with the first joint short. The legs are long and the abdomen tapers weakly from the sixth segment. The colour is whitish, the margins of the body and front margins of the legs being pitchy black. The abdominal segments each bear a large squarish median brown patch. The male is more slender than the female and the first joint of the antenna is very large, and bears a peg-like appendage as does also the third segment.

This species is quite common and can usually be found on any heavily infested flock.

The Lesser Chicken Louse (*Goniocotes hologaster* N.).

The length of this species is about .035 to .06 inches. The body of the female is very broad. The head is squared behind, the legs short and the abdomen regularly rounded behind. The colour is light yellowish brown. The abdomen of the male is much shorter and broader and squared behind.

This species is not common in Canada, though I have specimens taken at Guelph at various times. It has been recorded in the United States and I have received specimens from Prof. Haseman taken at Columbia, Mo.

EXPLANATION OF PLATE VIII.

1. *Goniocotes hologaster* N. ♂.
 2. *Goniocotes hologaster* N. ♀.
 3. *Menopon biseriatum* Piaget.
 4. Egg of a Bird Louse.
 5. *Menopon pallidum* N.
 6. *Lipeurus variabilis* N. ♀.
 7. *Lipeurus variabilis* N. ♂.
-

A NEW HOPLANDROTHIRIPS (THYSANOPTERA) FROM BRITISH GUIANA.

BY J. DOUGLAS HOOD, U. S. BIOLOGICAL SURVEY.

The new species described below was received for determination from Mr. G. E. Bodkin, Government Economic Biologist of British Guiana.

Hoplandrothrips affinis, sp. nov.

Female (macropterous).—Length about 1.8 mm. Colour dark blackish brown with bright crimson hypodermal pigmentation; tarsi, fore tibiae, and bases of antennal segments 3-6 lemon yellow; distal ends of mid and hind tibiae and of tube paler; wings slightly

yellowish, with scale of fore wings and a short subbasal streak in hind wings, brown.

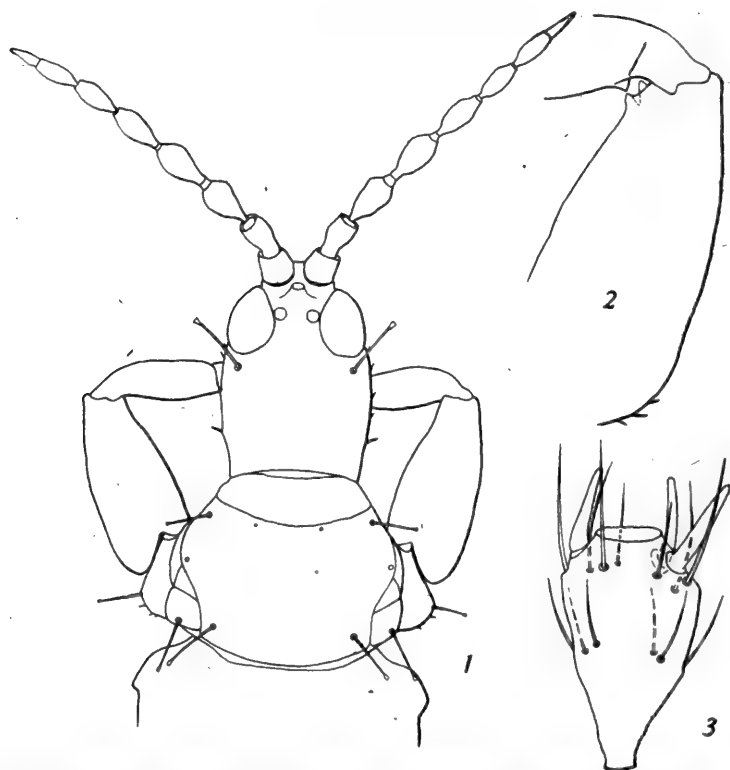


Fig. 26.—*Hoplandothrips affinis* Hood—1. Head and prothorax of female; holotype. 2. Right fore leg of male; Allotype. 3. Third segment of right antenna of female; holotype.

Head a little less than one and one-half times as long as wide and 1.5 times as long as prothorax, broadest at middle; cheeks rounded gently to eyes and to near base, thence nearly parallel, forming a neck which is narrower than greatest distance across eyes or about 0.86 the greatest width of head, set with a few small spines arising from slight tubercles, a pair at posterior sixth stronger; dorsal surface smooth and shining except at extreme base, which with the lateral surfaces is weakly subreticulate; vertex slightly and narrowly subconically produced, the anterior ocellus only

slightly overhanging; postocular bristles alone prominent, equal in length to eyes expanded at apex. Eyes $\frac{1}{3}$ as long as head, equal in width to their interval. Ocelli of posterior pair opposite middle of eyes and equal in size to anterior ocellus, which is slightly more distant. Antennæ about 1.6 times as long as head, moderately slender; segment 1 as broad as long; 2 about 1.7 times as long as wide, inner side straight, pedicel not curved outward; 4 very slightly longer and narrower than 3, clavate, pedicellate, narrowed at apex, broadest in advance of middle, about 1.8 times as long as wide; 5 almost similar in form to, but distinctly narrower and slightly shorter than, 4; about 2.1 times as long as wide; 6 clavate, more briefly pedicellate than 4 and 5, nearly 2.4 times as long as wide; 7 oblong, briefly pedicellate, truncate at apex and nearly 2.5 times as long as wide; 8 about three-fourths as long as 7, conical, more than three times as long as greatest width; segments 1 and 2 concolorous with head, 2 paler at middle of apex; 3 yellow, lightly infusate in apical half; 4 yellow in basal two-fifths, brown beyond, slightly paler at apex; 5 yellow in basal third, brown beyond, slightly paler at apex; 6 yellow in basal fourth, beyond blackish brown, darker than 5; 7 and 8 blackish brown, pedicel of former paler; sense cones: 3, 1-2; 4, 2-2; 5, 1-1⁺; 6, 1-1⁺; 7 with one on dorsum near apex. Mouth cone short, broadly rounded, reaching only about half way across prosternum, labrum scarcely surpassing labium.

Prothorax about two-thirds as long as head and (inclusive of coxæ) about twice as wide as long; pronotum smooth; all usual bristles present, expanded apically, a little shorter than the postoculars. Wings slightly narrowed at middle; fore pair with scale brown, light yellowish beyond, six accessory hairs on posterior margin. Legs moderately slender; fore tarsus with a strong, slightly curved tooth.

Abdomen very slightly broader than pterothorax. Tube 0.6 as long as head, only about twice as long as greatest subbasal width, which is about 2.1 times the apical, sides straight. Lateral bristles expanded at apex, almost colourless; segment 9 with the

three long, pointed pairs; terminal bristles brown, about one and one-half times as long as tube.

Measurements of holotype: Length 1.76 mm.; head, length 0.274 mm., width 0.192 mm.; prothorax, length 0.180 mm., width (inclusive of coxæ) 0.366 mm.; pterothorax, width 0.372 mm.; abdomen, width 0.378 mm.; tube, length 0.168 mm.; width at base 0.081 mm., at apex, 0.038 mm.

Antennal segments.....	1	2	3	4	5	6	7	8
Length (μ).....	42	35	66	69	64	59	54	42
Width (μ).....	42	33	39	38	30	25	22	13
Total length of antenna, 0.431 mm.								

Male (macropterous).—Length about 1.6 mm. Colour and structure essentially as in female. Genal spines a little stouter than in female. Antennæ 1.7 times as long as head, more slender. Tarsal tooth large, stout, curved. Abdomen slightly narrower than pterothorax. Tube about 0.54 as long as head, about twice as long as greatest subbasal width, which is about twice the apical, sides slightly concave. Segment 9 of abdomen with the lower lateral and the dorsal bristles longer than tube and pointed, the upper laterals very short (three-fifths as long as basal width of tube) stout, pointed, and dark in colour.

Measurements of allotype: Length 1.56 mm.; head, length 0.246 mm., width 0.168 mm.; prothorax, length 0.157 mm., width (inclusive of coxæ) 0.318 mm.; pterothorax, width 0.322 mm.; abdomen, width 0.284 mm.; tube, length 0.132 mm., width at base 0.068 mm., at apex 0.033 mm.

Antennal segments.....	1	2	3	4	5	6	7	8
Length (μ).....	38	51	63	65	62	54	47	38
Width (μ).....	38	30	36	34	27	23	20	11
Total length of antenna, 0.418 mm.								

Described from one female and one male taken between leaf sheaths of sugar cane, at Rose Hall, Berbice, British Guiana, March 2, 1915, by G. E. Bodkin.

The only species of the genus recorded from South America.

MAYFLIES OF THE SIPHLONURUS GROUP.

BY WILBERT A. CLEMENS, ITHACA, N. Y.*

The nymphs of two interesting species of mayflies, *Siphonurus* (*Siphylurus*) *mirus* Eaton and *Siphlonisca arodromia* Needham, were handed me for description by Mr. C. P. Alexander, who successfully reared them during the summer of 1914 at Northampton, Fulton Co., N. Y. Before describing these nymphs, it seemed desirable to work over the material available in the *Siphonurus* group, and the results of this work are given in the following paper.

THE NAME *Siphonurus*.

The name *Siphonurus* was proposed for a new genus by Eaton in the Ent. Mag., vol. 5, p. 89, 1868. The name was used again by Eaton in the Trans. Ent. Soc., London, 1870, p. 7. But in 1871 in the Trans. Ent. Soc., London, p. 125, the name *Siphylurus* is used and *Siphonurus* (err.) Etn., 1868, given as a synonym. The name *Siphonurus* was not preoccupied and therefore according to the International Code of Zoological Nomenclature, the first name used must stand and the name of the genus should be *Siphonurus*.

NEW GENUS.

In 1913 in the Can. Ent., vol. XLV, p. 338, I described a new species which I referred to the genus *Siphonurus*. This species appeared to be nearest to this genus, and as I had no specimens of this genus with which to compare it, I decided to describe it as a *Siphonurus* until other material was available for comparison. Now with such material at hand, I find this species shows characters of sufficient value for the erection of a new genus, and for this I propose the name *Siphloplecton* (defective-feeler, from the defective condition of the labial palpus).

KEYS.

The generic keys which follow are simply those parts of the key published by Dr. Needham, Bull. 86, N. Y. State Mus., referring to the *Siphonurus* group, modified to include the two genera since proposed.

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

August, 1915

IMAGOS.

- ff. The intercalaries between the first and second anal veins represented by a series of veinlets, often sinuous or forking, extending directly from the first anal to the wing margin (except in *Siphloplecton*); costal angulation of hind wing close to the base; but two well developed caudal setæ, the median one being rudimentary or wanting; basal joint of hind tarsi evident but not well developed.
- g. Median caudal seta a distinctly segmented rudiment; forceps of male three-jointed; posterior prolongation of sternum of ninth segment of abdomen of female bifid at tip.
- h. Basal segment of fore tarsus of male shortest; claws of each tarsus unlike each to each; hind wing with the costal angulation acute, and the fork of the median vein occupying two-thirds the length of that vein..... *Coloburus*.
- hh. Basal segment of fore tarsus of male longest; claws of each tarsus alike, hind wing with costal angulation obtuse, and the median vein forked through one-third its length *Chirotenetes*
- gg. Median caudal seta more rudimentary or wanting; forceps of the male distinctly four-jointed; sternum of the ninth abdominal segment not prolonged, or if so, entire at tip.
- h. Cubitus 2 with a very pronounced curve at its base *Siphloplecton*.
- hh. Cubitus 2 without such pronounced curve at its base.
- i. Segments 5-9 of abdomen with very broad lateral expansions (onisciform); mid-ventral, meso- and metathoracic spines *Siphlonisca*.
- ii. Segments 5-9 of abdomen without such broad expansions and thorax without ventral spines.

- j. Claws of each tarsus alike; caudal setæ at least one-half longer than body *Siphonurus*.
 jj. Claws of each tarsus unlike; caudal setæ about as long as the body *Ameletus*.

NYMPHS.

- e. Postero-lateral angles of the hinder abdominal segments prolonged into thin flat sharp lateral spines.
 f. Fore legs conspicuously fringed with long hairs; gill-tuft present upon the bases of maxillæ and front coxæ and at bases of lamellæ on abdomen *Chirotentes*
 ff. Fore legs without conspicuous fringes; no maxillary or coxal gills; no gill-tufts at bases of lamellæ on abdomen.
 g. Gills double on abdominal segments 1-3; claw of fore tarsus flattened and bifid; terminal segment of labial palpus wanting *Siphloplecton*.
 gg. Gills not double on abdominal segments 1-3; claw of fore tarsus uncinatè; labial palpus normal.
 h. Abdominal segments with broad lateral expansions; mid-ventral meso- and meta-thoracic spines *Siphonisca*.
 hh. Abdomen without such broad lateral expansions and thorax without ventral spines
 i. Gills double on the first two abdominal segments; end of maxilla fringed with simple hairs *Siphonurus*
 ii. Gill lamellæ all single; end of maxilla fringed with pectinated hooks *Ameletus*

KEY TO THE SPECIES OF *Siphonurus*.

IMAGOS.

- a. Wings clear, without clouded areas.
 b. Venter with brown stripes, dots and streaks *S. alternatus*.
 bb. Venter with U-shaped brown marks *S. occidentalis*.
 bbb. Venter with triangular brown marks *S. triangularis*.

- aa. Wings with clouded areas.
- c. Venter with brown markings.
 - d. The hind wing wholly clouded with brown or almost so. Fore wing clear *S. mirus*
 - dd. A small brownish cloud along the axillar fold of fore wing. Hind wing clear *S. typicus*
 - cc. Venter transparent whitish.....*S. femoratus*.

NYPHS.

- a. Setæ dark-banded beyond middle.
 - b. Setæ dark-banded just beyond middle and again across the tips *S. alternatus*.
 - bb. Setæ but once banded.
 - c. Venter with U-shaped dark areas; spines of the 9th abdominal segment just half the length of tergum of 10th segment in the median line *S. occidentalis*.
 - cc. Venter with large dark triangular areas; spines of 9th abdominal segment slightly over half the length of tergum of the 10th segment in the median line *S. triangularis*.
- aa. Setæ unbanded *S. mirus*

Siphonurus alternatus Say.

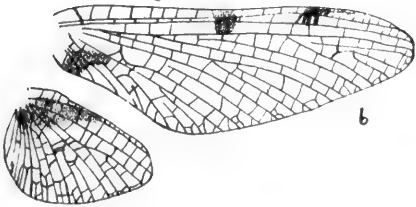
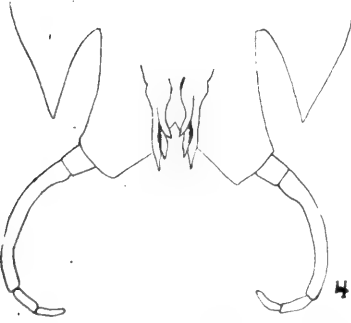
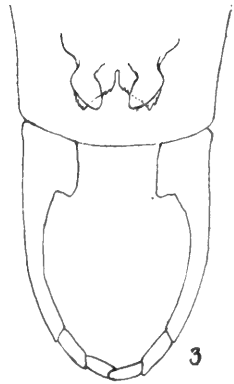
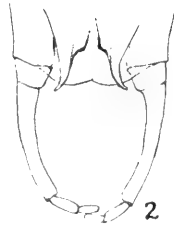
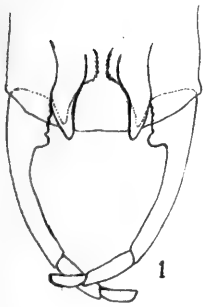
For description of adult see Eaton's Revisional Monograph, p 219, and of nymph, Bull. 47, N. Y. State Mus., 1901.

The nymph shows the same ventral abdominal markings as the adult. See Pl. IX, fig. 8.

Siphonurus occidentalis Eaton.

The nymphs and adults of this species were taken by Professor T. D. A. Cockerell at Florissant, Colorado, June 30, 1907, at a place where subimagos were emerging in numbers. Other specimens were taken by Prof. Cockerell at Twin Lakes, Col., Upper Lake, July 14, 1902. See Pl. IX, fig. 9.

Nymph.—Length 13 mm.; leg 4.5 mm.; setæ 5 mm.



MAYFLIES OF THE SIPHLONURUS GROUP.

Structurally the nymph is very similar to that of *S. alternatus* except that the lateral abdominal spines are shorter. The setæ are but once banded and there is a very pronounced brownish band at the apical end of each tarsus.

The nymphs show the same U-shaped ventral abdominal brown markings as the adults.

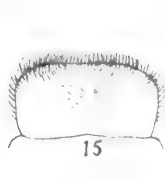
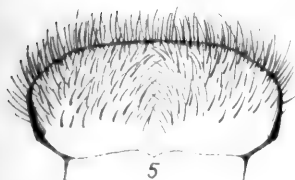
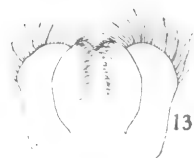
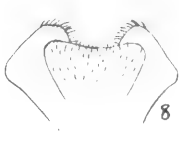
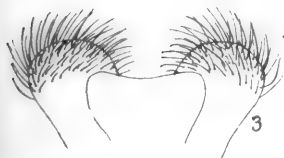
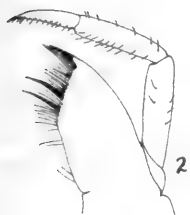
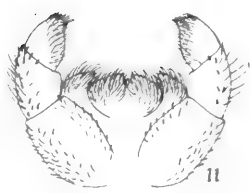
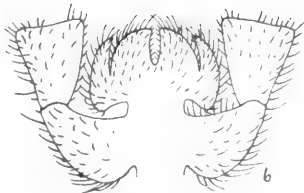
***Siphonurus triangularis* sp. nov.**

Male subimago.—Length 12-13 mm. Head mostly deep brown, varied with whitish and yellowish irregular markings. Lower part of face transparent whitish. Thorax above deep brown; sides and ventral surface brown with white areas. Legs uniform light brown, but with darker markings on coxæ and trochanters at joints. Wings rather dull with light brown venation and without clouded areas. Dorsal surface of abdomen deep brown with a pair of lateral light areas on segments 2-7. Ventral surface of abdomen light brown with deep brown triangular areas, See Pl. IX., fig. 10. Lateral setæ 11-12 mm. long, the middle one rudimentary, showing 4-5 segments.

Female subimago.—Length 14-15 mm. Similar to male in coloration.

Female imago.—Length 15 mm.; setæ 15 mm.; fore leg 8 mm. Middle and hind legs 6.5 mm. Very similar in coloration to the male subimago, but lighter and ventral markings of abdomen more pronounced. Wings clear, light brown venation, no clouded areas.

Nymph.—Length (mature) 12-15 mm.; setæ 5-6 mm.; leg 5 mm. General colour brown and white. Mouth-parts, see Pl. X, fig. 11-15. Thorax darker on upper surface. Legs whitish, banded with brown as follows: Femur with a basal brown band and another on apical fifth; tibia with a basal band, tarsus with basal and apical bands. Legs covered with numerous small spines and hairs; claws long, slightly curved and very pointed. Each segment of abdomen dorsally, except 1 and 10, usually light coloured in middle with brown band across basal margin from which project caudad two brown streaks. Each segment brownish toward the lateral margins, but with light areas in both anterior and posterior margins. A pair of very dark dots at posterior margin of each



MAYFLIES OF THE SIPHLONURUS GROUP.

segment. Segments of abdomen ventrally whitish with two somewhat triangular-shaped brown areas on each segment as in case of adult. The gills are of the typical *Siphonurus* type. See Pl. X, fig. 11-15. Setæ once banded beyond middle.

This species is rather larger than *S. alternatus*. It was found emerging at Ithaca from June 5 to the 18th from a quiet spring-fed pond. This pond was very much grown up with aquatic vegetation, especially *Spirogyra*, and many of the nymphs were covered with colonial *Vorticellæ*.

Transformation.—The pond was about 40 ft. by 15 ft. with a maximum depth of about 2 ft., but the greater part of it only 6 in. or so. The water was very clear, so that the bottom could be seen in many places through the vegetation. The nymphs could be seen clambering about the water plants, swimming swiftly from place to place by means of the very efficient tail fin and gill lamellæ, or quietly clinging to some object, while the gills moved in gently undulating movements and the abdomen swayed up and down. Most of the nymphs were mature, and subimagos were continually flying up from the pond. One mature nymph swam about with its head up to the surface of the water as though looking for a suitable place for emergence, going from plants, to dead leaves and to twigs. It tried to climb upon a small twig, endeavouring to hang on with its legs and bending its abdomen and setæ around in its attempts to get up on top. It was almost successful, but suddenly abandoned the twig for a dead leaf. The leaf was only partly submerged and the nymph climbed up over the edge and up on top until only the abdomen was left in the water. Thus it remained quietly for two minutes with its gills in constant motion. It then crawled farther up the leaf until entirely out of the water, and remained quietly for about 3 minutes, when the body, especially the abdomen began to move convulsively, and in a couple of seconds the thorax split and the body of the subimago gently slid out over the surface of the leaf. When the legs were freed they were extended and at the same time the wings. Then the subimago took a few steps, leaving only the setæ still in the nymph slough.

It remained on the leaf for about four minutes, moving its legs and wings occasionally, and finally twisted and bent the abdomen

upward and freed the setæ. For six minutes more it stayed in the sunlight on the leaf, apparently getting accustomed to the new world into which it had emerged. Then it took flight, flying upward about thirty feet and coming to rest on a leaf of a tree near the pond. In the meantime three other nymphs emerged within two feet of the first one. One emerged on the side of an almost vertical leaf so that the subimago slid out partly on to the surface of the water and it had considerable difficulty freeing itself, but finally it succeeded and remained clinging to the leaf with its abdomen resting on the water for about six minutes. Its upward flight was accomplished without any difficulty. Another nymph crawled up a blade of grass at the edge of the pond. It took a little longer for this subimago to get out of the old nymph skin. There was a great abundance of life in the pond. Just a few sweeps of a small dipnet brought out salamanders, beetles, beetle larvæ, chironomid, mosquito, crane-fly, and other dipterous larvæ, dragon-fly, and damsel-fly nymphs, and mayfly nymphs of the following genera: *Heptagenia*, *Ephemerella*, *Leptophlebia* and *Cloeon*.

No imagos were observed in flight and repeated trips to the vicinity of the pond for a week and at various times of the day from ten o'clock in the morning to nightfall, failed to find any imagos flying.

Siphonurus mirus Eaton.

Male imago.—Length 12-14 mm.; setæ 18 mm.; fore leg 12-14 mm. Wing 12-13 mm. Head and thorax dark brown; a few lighter areas on sides of thorax. Legs uniform brown, a little darker at joints. Hind wing of male usually entirely brown as compared with the hind wing of the female, which is only about two-thirds brown. Each segment of the abdomen 2-9, dorsally light in colour with dark areas toward the lateral margin, along posterior margin and two streaks extending forward from posterior margin. Ventral surface with two lateral longitudinal bands on each segment and a darker area in middle. Genitalia, see Pl. IX, fig. 2.

Female imago.—See description, Eaton, p. 221.

Nymph.—Length 15 mm.; setæ 6-7 mm.; legs 5-6 mm. General colour brown. Head has a light area in front of the middle ocellus

and a very dark band from margin of this area to eye below antenna. Clypeus and labrum deep brown. Mouth-parts similar to those of *S. triangularis*. Thorax with light areas on ventral surface and sides. Legs light brown, unbanded but apical areas of tarsi darker. Dorsal surface of abdomen brown with a pair of blackish streaks about the middle of each segment, a blackish area lateral to each streak and a pair of black dots at the posterior margin of each segment. Ventral surface of the same general colour as dorsal surface with darker markings similarly arranged to those of adult. Setæ unbanded.

The following notes were given me by Mr. Alexander:

"Sport Island, Sacandaga River. Adults of *Siphonurus mirus* Eaton, appeared on June 6, 1909, and were very common on the 12th. Seven specimens were taken home alive and three lived 51 hours."

See also under *Siphonisca*.

Nymphs of *Siphonurus femoratus* Say, *S. bicolor* Walker, and *S. typicus* Eaton have not been taken as yet, and adults of these species I have not had the opportunity of examining.

Siphonisca Needham.

With more material at hand, including the nymph, the generic characters may be restated as follows:

Caudal setæ two, slightly longer than the body. Claws on all the legs (male and female) hooked and clawlike, and the two of each leg alike. Hind tibia longer than its tarsus, and last segment of tarsus longest. Female fore tibia about same length as its tarsus, last segment of tarsus the longest. Male fore tarsus about 3 times the length of its tibia, the last segment of the tarsus the shortest. Median and cubital veins in the fore wing symmetrically forked. No humeral angulation of hind wing. Mesothorax and metathorax each with a prominent midventral spine. Abdomen with conspicuous lateral expansions of the middle segments. No backward prolongation of 9th abdominal segment in female. Forceps base of male very broad; forceps 4-jointed and strongly divaricate.

The nymph has conspicuous lateral expansions to the segments of the abdomen and has prominent mid-ventral meso- and metathoracic spines. Gills on segments 1-7 and all single. The terminal segments of the labial and maxillary palpi pointed and the lateral lobes of the hypopharynx rounded.

Siphonisca aerodromia Needham.

The description given in Bull. 134 N. Y. State Mus. errs in two minor points, namely, the claws of the fore leg of the female are normal, i.e., similar to those on the other legs, and there is a metathoracic mid-ventral spine as well as a mesothoracic one.

Nymph.—Length 19-20 mm.; setæ 8-9 mm.; legs 4.5 mm. General colour a dark brown. Antennæ longer than head, light in colour, but terminal joint tipped with dark brown. Mouth-parts, see Pl. IX, fig. 1-5. Thorax darker above. Prominent mid-ventral meso- and metathoracic spines. Legs comparatively short and stout. Tarsi and tibiæ of about equal length. Abdomen dark brown dorsally, tending to be darker along median line and along a line just inside the line of gills. Segments 5-9 greatly expanded laterally and each expansion produced backward into a spine. Two longitudinal lateral dark brown lines on ventral surface. Gills on segments 1-7 and all single, see Pl. IX, fig. 1-5. Three setæ, the middle one very slightly shorter than the outer ones, which are fringed on the inner sides only. Setæ brown, but with white tips.

Ecological Notes.—The following are Mr. Alexander's notes in regard to this species:

"The type specimen, a female, was taken on June 6, 1908, on rank vegetation at the south end of Sport Island in the Sacandaga River. Careful search on that day failed to locate other specimens."

"On June 6, 1909, at 5.20 p.m., there were scores of specimens flying over the bridge, several of these were in copulation and a large series of both sexes were taken. As it grew dark, the insects mounted higher in the air. At dusk the species could be distinguished high up in the air by the remarkable breadth of the abdomen. It is probable that the type taken in 1908 was the last

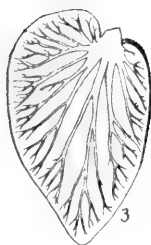
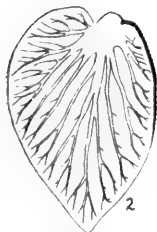
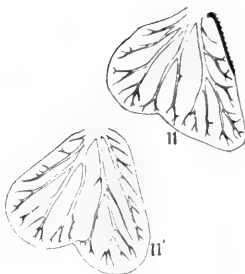
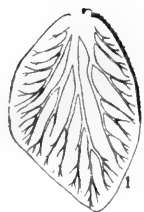
of that season's brood and the main emergence of the year took place in late May. This probably shows that the males die first, the females surviving longer in order to complete oviposition."

"The following field notes were made at Northampton (Fish-house) in Fulton County, New York State, from May 25 to 29, 1914, where adults were reared from nymphs taken in small temporary pools left by the vernal overflow of the Sacandaga River:"

"*Siphonisca* was first noted as a subimago in a tent-trap set on May 25th. The contents of the trap were examined on the following day and the catch included a subimago of *S. aerodromia*. After determining the habitat of the nymph, it was a simple matter to obtain the later stages. The nymphs crawl up the rush stems in order to emerge, usually leaving the cast skins three to four inches above the water level. Occasionally the cast skins are found on the upper surface of flat leaves."

"The nymphs of *Batisca obesa*, *Siphylurus mirus*, and *Siphonisca aerodromia* occurred together in company with a great abundance of other mayfly nymphs of smaller and less conspicuous habit. The pools evaporated rapidly, and on May 27th, only two days after the first observations were made, had dwindled to one-half of their former size. The water became very warm and tepid towards midday, and this was more apparent each day as the amount of water decreased and the abundant animal life became more concentrated."

"Nymphs of the various mayflies were isolated and reared through to the imago. The most abundant species in the pools, with the exception of some of the smaller and less conspicuous species, was *Batisca obesa*. In an area of a few square yards, there were hundreds of cast skins of the species adhering to the rush stems long after the subimagoes had flown away. The cast skins of *Siphonisca* were almost as common, on some of the rush stems there being as many as four of the cast skins on a single stalk, arranged end to end and crowding one another. *Batisca* was found to emerge at midday or slightly after, specimens being observed at 2 p.m. *Siphonisca* came out at all hours of the day, but more abundantly in the late forenoon."



MAYFLIES OF THE SIPHLONURUS GROUP.

"By May 28th, the water in the temporary pools was entirely evaporated, but the larger mayfly nymphs had matured so rapidly or were timed so opportunely that not a single nymph was left. An immense number of the nymphs of smaller species and the plankton (a large red ostracod in great abundance; *Daphnia* and a great number of other Entomostraca; Planarians of two species, one being a small light green form; Mollusca, (*Aplexa hypnorum*, *Segmentina*, *Pisidium* sp.; etc.) of the pools were exposed and perished. The stench of their decaying bodies attracted many carrion-loving insects such as *Lucilia*, *Silpha inæqualis*, etc."

Siphloplecton gen. nov.

Caudal setæ two, middle one rudimentary. Fore tarsus of male with 2nd segment about equal to 1st, the 3rd slightly longer than 1st, the 4th slightly shorter than 1st, the 5th about half the length of 1st. Female fore tarsi 1, 2 (3 and 5) equal, 4. Hind tarsi of both male and female in order of decreasing lengths 1, (2 and 5) equal, 3, 4. Hind tibia shorter than its tarsus. Claws of each tarsus unlike. Wing without dependent intercalaries from the 1st anal, and cubitus 2 strongly curved at base. Penes lobes rounded with slight indentations. Sternum of ninth abdominal segment of female produced slightly and entire at tip.

Nymph with hind claws hooked and claw-like, but fore claws flattened and bifid. Labial palpus with but two segments. Gills double on segments 1, 2, and 3.

Type species—*Siphylurus flexus* Clemens (Can. Ent., 1913, vol. XLV, p. 338), Go Home Bay, Georgian Bay, Ont.

Besides the Georgian Bay material I have seen specimens from Douglas Lake, Michigan, Nov. 25, 1904, from Walnut Lake, Mich., April 12, 1906, and from the Michigan Agricultural College campus, East Lansing, Mich., July 15, 1910.

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EXPLANATION OF PLATES.

PLATE IX.

Fig. 1.—Genitalia male *Siphonurus occidentalis*.

Fig. 2.—Genitalia male *Siphonurus mirus*.

Fig. 3.—Genitalia male *Siphonurus alternatus*.

Fig. 4.—Genitalia male *Siphonisca ærodromia*.

Fig. 5.—Genitalia male *Siphloplecton flexus*.

Fig. 6.—Wings *Siphloplecton flexus*.

Fig. 7.—Claws fore leg female *Siphonisca ærodromia*.

Fig. 8.—Ventral colour-pattern on segment of abdomen of *S. alternatus*.

Fig. 9.—Ventral colour-pattern on segment of abdomen of *S. occidentalis*.

Fig. 10.—Ventral colour-pattern on segment of abdomen of *S. triangularis*.

PLATE X—Mouth-parts.

Fig. 1-5.—Labrum, maxilla, hypopharynx, mandible and labrum, respectively, of nymph of *Siphonisca ærodromia*.

Fig. 6-10.—Labrum, maxilla, hypopharynx, mandible and labrum, respectively, of *Siphloplecton flexus*.

Fig. 11-15.—Labrum, maxilla, hypopharynx, mandible and labrum, respectively, of *Siphonurus triangularis*.

PLATE XI.—Gills.

Fig. 1-5.—Gills from Segments 1, 2, 3, 4 and 7, respectively, of right side of nymph of *Siphonurus ærodromia*.

Fig. 6-10.—Gills from Segments 1, 2, 3, 4 and 7, respectively, of right side of nymph of *Siphloplecton flexus*.

Fig. 11-15.—Gills from Segments 1, 2, 3, 4 and 7, respectively, of right side of nymph of *Siphonurus triangularis*.

A CONTRIBUTION TOWARDS THE TAXONOMY OF THE
DELPHACIDÆ.

BY F. MUIR,

Hawaiian Sugar Planters' Experiment Station, Honolulu, T. H.

(Continued from Page 212.)

LIST OF GENERA.

1. *Achorotile* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 521; type *albosignata* (Dahlbom), Pl. VIII, f. 16.
2. *Aloha* Kirkaldy, 1904, Entom., XXXVII, 177; type *ipomoeæ* Kirk.; 1908, P. Haw. Ent. Soc., 1, Pl. IV, f. 9.
3. *Amblycotis* Stal, 1853, Ofv. Vet. Ak. Forh., 265; type *laticeps* Stal.
4. *Anectopia* Kirkaldy, 1907, H. S. P. A. Ent. Bull., 11, 143; type *mandane* Kirk., Pl. XI, f. 11-13, Pl. XIV, 4-6.
Aræopus Spinola, 1839, Rev. Zool.; type *crassicornis* (Fabricius) Syn. *Delfhax*.
5. *Arcofacies* Muir, gen. nov.
6. *Asiraca* Latreille, 1801, Hist. Nat. Crust. Ins., 114, 259; type *clavicornis* (Fabricius).
Atropis Kirschbaum, 1868, Cicad. Wies. u. Frank., 10; type *latifrons* Kirsch—*lævifrons* Shlb. Syn. *Metropis* Fieb.
7. *Bakerella* Crawford, 1914, Pro. U. S. Nat. Mus., XLVI, 601; Pl. XLVII, f. D.
Bambusaria Melichar, 1914, Phil. J. Sci., IX, 3, D. 274; Pl. I, f. 6, a-b.; type *picta* Mel.—Syn. *Sogatopsis pratti* Muir.
8. *Bambusibatus* Muir, gen. nov.
9. *Belocera* Muir, 1913, Pro. Haw. Ent. Soc., II, 5, 239; type *sinensis* Muir., Pl. VI, f. 4, a.
Bergia Scott, 1881, E. M. M., XVIII, 155; type *nimbata* (Berg.) n. preoc. Syn. *Bergias*.
10. *Bergias* Kirkaldy, 1904, Entom., XXXVII, 279; nom. nov. for *Bergia*.
Bidis Walker, 1856, J. Lin. Soc. Lond., Zool., I, 88; type *notivena* Walker, Pl. IV, f. 2. Syn. *Ugyops*.
11. *Bostæra* Ball, 1902, Can. Ent., XXXIV, 266; type *nasuta* Ball. Syn. *Cochise*.
12. *Calligypona* J. Sahlberg, 1871, Not. Sallsk. Faun. Fenn., XII, 408; type *albicollis* Sahlb.

13. *Canyra* Stal, 1862, Svensk. Vet. Ak. Hand., 3, No. 6, p. 7; type *placida* (Stal).
14. *Chloriona* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 519; type *unicolor* (H-S); Pl. VIII, f. 5.
15. *Chlorionidea* Low, 1885, Verh. Zool. Bot. Ges. Wien, XXXV, 356; type *flava* Low; Melichar, 1896, Cic. Mitt. Eur., Pl. IV, f. 23-25.
Cochise Kirkaldy, 1907, H. S. P. A. Ent. Bull. IV, 63; type *apacheanus* Kirk; Muir, 1913, P. Haw. Ent. Soc., II, 5; Pl. VI, f. 3, a. Syn. *Bostæra* Ball.
Cona White, 1879, E. M. M., XV, 218; type *celata* White, n. pr. Syn. *Micromasoria*
Conicoda Matsumura, 1900, Ent. Nachr., XXVI, 258; type *graminæ* Mats.—*brunnipennis* Sign. Syn. *Tripidocephala* (or a subgenus).
16. *Conomelus* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 520; type *limbata* (Fabricius), Pl. VIII, f. 10.
17. *Copicerus* Swartz, 1802, Kon. Vet. Nya. Hand, XXIII, 181; type *irroratus* Swartz; Pl. VI, f. 2, a-f; also Fowler, B. C. Amer., Hem.-Hom., I, Pl. XIII, f. I, a, 2, a, Syn. *Holotus* Guerin.; *Jerala* Walker.
18. *Criomorphus* Curtis, 1833, Ent. Mag., I, 195; type *albomarginatus*. Curtis; Syn. *Ditropis* Kirsch; *Stiroma* Fieb.
19. *Delphacinus* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 520; type *nesomelas* (Boheman), Pl. VIII, f. 12.
Delphacissa (Subg. *Delphacodes* Fieb.), Kirkaldy, 1906, Can. Ent., XXXVIII, 155; type *uncinata* (Fieber).
Delphacodes (Subg. *Delphax-Liburnia*) Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 524; type *mulsanti* Fieber, Pl. VIII, f. 32.
Delphacodes Melicher, 1901, Wien. ent. Zeit., 55; type *lethierryi* (Rey); n. pre. Syn. *Psendaræopus*.
20. *Delphax* Fabricius, 1798, Ent. Syst. Suppl., 511; type *crassicornis* Fab. Syn. *Aræopus* Spin.
21. *Dichoneura* Lethierry, 1890, A. Soc. Ent. Fr. (6) X 151; type *simoni* Lethierry.
22. *Dicranotropis* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 521; type *hamata* (Boh), Pl. VIII, f. 17 Syn. *Phacalastor* Kirk.

23. *Dictyophorodelphax* Swezey, 1907, Pro. Haw. Ent. Soc., I, 104; type *mirabilis* Swezey. Fig. op. c. II, p. 2.
Dictropis Kirschbaum, 1868, Cicad. Wies. Frank. (nec. Fieber) part. Syn. *Jaßidæus crimorphus* and *Stiroma* Fieber. (Fieber used *Stiroma* in text and *Ditropis* on his plate and Kirschbaum followed the name on plate.)
Ectopiopterygodelphax Kirkaldy, 1906, H. S. P. A. Ent. Bull., I, 412; type *eximius* Kirk. Syn. *Tropidocephala*.
24. *Embolophora* Stal., 1853, Ofv. Vet. Ak. Forh., X, 265; type *monoceros* Stal.
25. *Eodelphax* Kirkaldy, 1901, Entom., XXXIV, 39; type *serendiba* Kirk. Syn. *Eudelphax setulosus* Mel.
26. *Eoeurysa* Muir, 1913. Pro. Haw. Ent. Soc., II, 249; type *flavocapitata*, Muir.
27. *Epeurysa* Matsumura, 1900, Ent. Nachr., 261; type *nawaii* Mats.
28. *Epibidis* Fowler, 1905, B. C. Amer., Hem.-Hom., I, 131; type *goodmani* Fowler, Pl. XIII, f. 3, a, b, 4-5.
29. *Eucanyra* Crawford, 1914, Pro. U. S. Nat. Mus., XLVI, 568; type *stigmata* Crawford, Pl. XLIV, f. G. N. R. S.
Eudelphax Melichar, 1903, Hom. Cey., 32 (Cixiidae); type *setulosus* Mel., Pl. I, f. 6; Syn. *Eodelphax serendiba* Kirk.
30. *Euidella* Puton, 1886, Cat. Hem. Pal., 72; type *basilinea* (Germ.) n.n. for *Euides*.
Euides Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 519; type *basilinea* (Germ). Fig of *speciosa* (Boh), Pl. VIII, f. 7.
Syn. *Euidella*, n. pr.
Eueides Dallas, 1867, Zool. Rec., III, 560, Syn. *Euidella*.
31. *Eumetopina* Breddin, 1896, Deut. Ent. Zeit., 109; type *kruegeri* Bred.
32. *Eurybregma* Scott, 1875, E. M. M., XII, 92; type *nigrolineata* Scott (considered by some a syn. of *Criomorphus*).
33. *Eurysa* Fieber, Verh. Zool. Bot. Ges. Wien, XVI, 520; type *lineata* (Perr), figure Melichar Cic. Mitt. Eur., Pl. IV, f. 31-35.
Gadora Walker, 1858, Cat. Hom. Suppl. 84; type *capensis* Walker. Syn. *Hapalomelus flavipes* Stal.
34. *Gelastodelphax* Kirkaldy, 1906, H. S. P. A. Ent. Bull. I, 411; type *histrionicus* Kirk.: 1907, op. c., III, Pl. XVII, f. 1-3, Pl. XVIII, f. 16.

- Geoneossus* Muir, 1913, P. Haw. Ent. Soc., II, 238; type *sacchari* Muir., Pl. VI, f. 5-6. Syn. *Pseudaræopus* Kirk.
- Goniolcium* Foller, 1905, B. C. Amer. Het.-Hom., I, 132; type *granulosum* Fowler, Pl. XIII, f. 7-8. Syn. *Stobæra* Stal.
- Hadeodelphax* Kirkaldy, 1906, H. S. P. A. Ent. Bull., I, 410; type *pluto* Kirk.; 1907, op. c., III, Pl. XVII, F. 12. Syn. *Sardia* Mel.
35. *Hapalomelus* Stal, 1853, Of. Vet. Ak. Forh., 265; type *flavipes* Stal. Syn. *Gadora* Walker.
36. *Haplodelphax* Kirkaldy, 1907, H. S. P. A. Ent. Bull., III, 145; type *iuncicola* Kirkaldy, 1907, XII, f. 8-9.
- Holotus* (-*Holatus*) Guerin, 1856, de la Sagras Kist. Cuba, VII, and 1857, op. c., An. Artic., 429; type *thoracicus* Guerin. Syn. *Copicerus* Swartz.
37. *Idiosemus* Berg, 1883, Ann. Soc. Argentine, XVI, 233; type *xiphias* (Berg).
38. *Idiosystatus* Berg, 1883, Ann. Soc. Argen., XVI, 231; type *acutiuscula* (Spin.).
- Ilburnia* White, 1878, Pro. Zoo. Soc. Lond., 471; type *ignobilis* White (—*Ilburnia* Scudder. Nom. Zool., II, 160). Subgenus of *Liburnia*.
39. *Jassidæus* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 521; type *moris* Fieber. Pl. VIII, f. 13. Syn. *Ditropis* Kbm. prt. *lugubris* (Sign).
- Jerala* Walker, 1858, List. Hom. Suppl., 85; type *singula* Walker (—*Jeralia* Scudder Nom. Zool. II, 163) Syn. *Copicerus* Swartz.
40. *Kalpa* Distant, 1906, F. B. I. Rhyn., III, 474; type *aculeata* Dist. Fig. 261.
41. *Kelisa* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 519; type *guttula* (Germar); Pl. VIII, f. 4.
42. *Kormus* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 520; type *artemisiæ*; Fieber, Pl. VIII, f. 8.
43. *Laccocera* Van Duzee, 1897, Bull. Buff. Soc. Nat. Sci., V, 229 and 241; type *vittipennis* Van Duzee.
44. *Lanaphora* Muir, gen. nov.
45. *Leialoha* Kirkaldy, 1910, Faun. Haw. II (6), p. 579; type *naniicola* (Subgenus now erected to genus).

46. *Leimonodite* Kirkaldy, 1907, H. S. P. A. Ent. Bull., III, 133 (foot note); type *beckeri* (Fieber), Fig. Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, f. 17.
Lepticus-Crawford, 1914, Pro. U. S. N. Mus., XLVI, 567. Erected on nymph.
47. *Liburnia* Stal, 1866, Hem. Afr., IV, 179; type *pellucida* (Fab.) Syn. *Delphax* Auct. nec Fabricius; *Delphacodes* s. g. Fieber. *Delphacissa* s. g. Kirkaldy.
48. *Liburniella* Crawford, 1914, Pro. U. S. Nat. Mus., XLVI, 585. Pls. XLV, f. T. XLVII, f. E.; XLIX f. N.
49. *Livatis* Stal, 1859, Eugen. Resa. Ins. 274; type *annulipes* (Stal), Pl. IV, f. 3.
50. *Macrotomella* Van Duzee, 1907, Bul. Buff. Soc. Nat. Sci., VIII, 44; type *caranata* Van Duzee
51. *Malaxa* Melichar, 1914, Phil. Jour. Sci., IX, 3, D 275; Pl. III, f. 7.
52. *Megamelanus* Ball, 1902, Can. Ent., XXXIV, 265; type *bicolor* Ball.
53. *Megamelus* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, 519; type *notulus* (Germar). Pl. VIII f. 2.
54. *Melanesia* Kirkaldy, 1907, H. S. P. A. Ent. Bull., III, 128; type *pacifica* Kirkaldy. Pl. XVII f. 13-14.
55. *Mestus* Motschulsky, 1863, Bull. Soc. Nat. Mosc., XXXVI (3) III; type *morio* Motsch.
56. *Metropis* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 521; type *mayri* Fieber, Pl. VIII, f. 14. Syn. *Atropis*. Kirsch.
57. *Micromasoria* Kirkaldy, 1904, Entom., XXXVII, 279; n.n. for *Cona*; type *celata* (White).
Nephropsia Costa, 1862, Ann. Mus. Zool. Nap., I, 76; type *elegans* (Costa). Syn. *Tropidocephala*.
58. *Nesodryas* Kirkaldy, 1908, P. Haw. Ent. Soc., I, 203; type *freycinetiæ* Kirkaldy.
59. *Nesopleias* Kirkaldy, 1910, Faun. Haw., II (6), 582; type *nimbata* Kirkaldy. Syn. *Aloha* in part, *Nesorestias* in part.
60. *Nesorestias* Kirkaldy, 1908, P. Haw. Ent. Soc., I, 205; *filicicola* Kirkaldy.
61. *Nesosydne* Kirkaldy, 1907, P. Haw. Ent. Soc., I, 161; type *koæ* Kirkaldy; fig. op. c. 1908, Pl. IV., f. 2.

62. *Nesothoe* Kirkaldy, 1908, P. Haw. Ent. Soc., I, 203; type *fletus* Kirkaldy.
63. *Nilaparvata* Distant, 1906, F. B. I. Rhyn., III, 473; type *greeni* Dist., f. 260.
Orchesma Melichar, 1903, Hom. Cey., 94; type *marginepunctata* Mll., Pl. III, f. 3, a-c. Syn. *Tropidocephala* (or Sub. gen.).
64. *Ostama* Walker, 1857, J. Lin. Sc. Lond., Zool., I, 151; type *juncta* Walker, Pl. 7, f. 4 a.
65. *Paranda* Melichar, 1903, Hom. Cey., 92; type *globiceps* Melichar, Pl. III, f. 10.
67. *Pentagramma* Van Duzee, 1898, Bull. Buff. Soc. Nat. Sci., V, 260; type *vittatifrons* (Uhl).
68. *Perigrinus* Kirkaldy, 1904, Entom. XXXVII, 175; type *maidis* (Ashmead); figure, Psyche, V, 1890, 323.
69. *Perimececera* Muir, 1913, P. Haw. Ent. Soc., II, 250; type *giffardi* Muir, Pl. VI, f. 13.
70. *Perkinsiella* Kirkaldy, 1903, Entom., XXXVI, 179; type *saccharicida* Kirkaldy. Figure H. S. P. A. Ent. Bull., I, Pl. XXVI, f. 1-8, Pl. XXVII, f. 1-4; op. c., III, Pl. XI, f. 5-8
Phacalastor Kirkaldy, 1906, H. S. P. A. Ent. Bull., I, 408; type *Pseudomaidis* Kirk. Syn. *Dicronotropis* Fieber.
71. *Phyllodinus* Van Duzee, 1898, Bull. Buf. Soc. Nat. Sci., V, 240; type *nervatus* Van Duzee.
72. *Pissonotus* Van Duzee, 1898, Bul. Buff. Soc. Nat. Sci., V, 236; type *marginatus* Van Duzee.
73. *Platybrachys* Bierman, 1910, Notes Leyden Mus., XXXIII, 41; type *platypoda* Dammerman.
74. *Prokelisia* Osborn, 1905, Ohio. Nat., 373; type *setigera* Osborn, f. I a-f.
75. *Proterosydne* Kirkaldy, 1907, H. S. P. A. Ent., Bull. III, 130; type *arborea* Kirkaldy, Pl. XVIII, f. 11-12.
76. *Pseudaraeopus* Kirkaldy, 1904, Entom., XXXVII, 177 (foot note); type *lethierryi* (Rey) n. n. *Delphacodes*. Melichar (nec Fieber) n. pr. Figure Melichar, 1896, Cic. Mitt. Eur., Pl. III, f. 46; Syn. *Geonessus* Muir.
77. *Punana* Muir, 1913, Pro. Haw. Ent. Soc., II, 249; type *brunnea* Muir.

78. *Pundaluoya* Kirkaldy, 1902, J. Bomb. Nat. Hist. Soc., XIV, 52; type *ernesti* (Kirby), figure Kirby, 1891, J. Linn. Soc. Lond. Zool., XXIV, Pl. V, f. 14; Melichar, 1903, Hom. Cey., Pl. II, f. 12 a-c.
79. *Purohita* Distant, 1906, F. B. I. Rhyn., III, 470; type *cervina* Distant, F. 257.
80. *Rhinotettix* Stal, 1853, Ofv. Vet. Ak. Forh., 1853, 265; type *fuscipennis* Stal.
81. *Saccharosydne* Kirkaldy, 1907, H. S. P. A. Ent. Bull., III, 139; type *saccharivora* (Westw), f. Westwood, 1833, A. M. N. H., 413, f. 54 a-c.
82. *Sardia* Melichar, 1903, Hom. Cey., 96; type *rostrata* Melichar, Pl. II, f. 4 a-b. Syn. *Hadeodelphax* Kirk. *Smara* Distant, 1906, F. B. I. Rhyn., III, 478; type *festiva* Distant, F. 264, Syn. *Tropidocephala* Stal.
83. *Smicrotodelphax* Kirkaldy, 1906, H. S. P. A. Ent. Bull., I, 411, type *perkinsi* Kirkaldy; figure Kirkaldy, op. c., III, Pl. XVI, f. 14-16; Pl. XVIII, f. 14.
84. *Sogota* Distant, 1906, F. B. I. Rhyn., III, 471; type *dohertyi* Distant, f. 258.
85. *Sogatopsis* Muir, 1913, P. Haw. Ent. Soc. II, 247; type *pratti* Muir; Syn. *Bambusaria picta* Mel.
86. *Sparnia* Stal, 1862, Sve. Vet. Sk. Hand, III, p. 6.
87. *Stenocranus* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 519; type *minutus* (Fab.), Pl. VIII, f. 3. *Stiroma* Fieber, 1866, Verh. Zool. Bot. Ges. Wien, XVI, 521; type *mæsta* (Bohman). Syn. *Criomorphus* (Fieber's figure 18 is marked *Ditropis*).
88. *Stobæra* Stal, 1859, Berl. Ent. Zeit., III, 327; type *concinna* (Stal); Syn. *Goniolcium* Fowler.
89. *Toya* Distant, 1906, F. B. I. Rhyn., III, 472; type *attenuata* Distant, F. 259.
90. *Tropidocephala* Stal, 1853, Ofv. Vet. Ak. Forh., 266; type *flaviceps* Stal. Syns. *Conicoda* Mats.; *Ectopiopterygodelphax* Kirk.; *Nephropsis* Costa; *Orchesma* Mel.
91. *Ugyops* Guerin, 1834, Voy. Belanger, Zool., 477; type *percheronii* Guerin, Syn. *Hygyops*, *Hygiops*; *Bidis* Walker.
92. *Upachara* Distant, 1906, F. B. I. Rhyn., III, 469; type *stigma* Distant, f. 256.

93. *Zuleika* Distant, 1912, A. M. N. H. (8) IX 198; type *bengalensis* Dist.

TABLE OF GENERA.

1. Fulgorids, with movable spur on hind tibiæ.....*Delphacidæ*.
- 2 (3) Post-tibial spur subulate, with cross section either circular or angular, apex more or less acuminate, without teeth on side *Asiracinæ*.
- 3 (2) Post-tibial spur, cultrate or subcultrate or laminate, with or without teeth on hind edge.....*Delphacinæ*.

ASIRACINÆ.

- 1 (2) First femora and tibiæ foliaceous.....*Asiraca*
- 2 (1) First femora and tibiæ simple or only slightly flattened.
- 3 (6) Three mesonotal carinæ.
- 4 (5) Antennæ cylindrical or subcylindrical.....

}	<i>Malaxa</i>
}	<i>Ostama</i>
- 5 (4) Antennæ, with both joints foliaceous.....*Copicerus*
- 6 (3) More than three mesonotal carinæ.
- 7 (8) Four mesonotal carinæ.....*Idiosemus*.
- 8 (7) Five mesonotal carinæ.
- 9 (10) First joint of antennæ cylindrical, shorter than second, second joint ovate and considerably flattened; face with two median carinæ.....*Punana*.
- 10 (9) Both joints of antennæ cylindrical or subcylindrical.
- 11 (12) Antennæ with "articulo secundo supra sulcato".....*Canyra*.
- 12 (11) Second joint of antennæ not sulcate.
- 13 (22) Face with two medio-longitudinal carinæ.
- 14 (17) Face much longer than broad.
- 15 (16) Second joint of antennæ more than three times the length of first *Perimececera*.
- 16 (15) Second joint of antennæ less than three times the length of first *Ugyops*
- 17 (14) Face about as broad as long, second joint of antennæ about twice the length of first.
- 18 (19) Medio-longitudinal carinæ of face arcuate, nearer together at apex and base than at middle.....*Pentagramma*
- 19 (18) Medio-longitudinal carinæ of face "slightly widening from the lower margin of the frons to apex."

- 20 (21) Clypeus with median carina.....*Bergias*.
 21 (20) Clypeus without median carina.....*Idiosystatus*.
 22 (13) Face with one medio-longitudinal carina, furcate or simple.
 23 (24) First joint of antennæ less than half the length of second
 (second joint slightly flattened).....*Melanesia*.
 24 (23) Joints of antennæ subequal or first, but slightly shorter
 than second.
 25 (26) Medio-longitudinal carina of face simple.....*Eucanyra*.
 26 (25) Medio-longitudinal carina of face furcate.
 27 (28) First joint of antennæ considerably shorter than
 second.....*Ugyops*.
 28 (27) First joint of antennæ but slightly shorter than
 second.....*Epibidid*.

DELPHACINÆ.

- Post-tibial spur cultrate, solid, both surfaces convex, dis-
 tinct teeth along the hind edge.....*Alohini*
 Post-tibial spur cultrate, solid but with inner surface con-
 cave; no teeth along hind edge.....*Tropidocephalini*
 Post-tibial spur laminate or foliaceous, sometimes tecti-
 form, with or without teeth along hind
 edge.....*Delphacini*

ALOHINI.

- 1 (4) First joint of antennæ very short, broader than long;
 second joint short and thick, often ovaliform or sub-
 ovaliform (all macropterous).
 2 (3) Two median frontal carinæ, approximating at base or
 apex, or both, or even meeting together, but not forming
 a stalk.....*Leialoha*.
 3 (2) A single median frontal carina, forked at extreme base, if
 at all.....*Nesodryas*.
 a Slender, elongate forms.....Subgenus *Nesodryas*
 b Broader, more robust forms.....Subgenus *Nesothoe*
 4 (1) First joint of antennæ distinctly longer than broad,
 second joint cylindrical or only slightly enlarged at
 middle (few macropterous, most brachypterous).
 5 (8) Two median frontal carinæ.

- 6 (7) Tegmina reaching well beyond middle of abdomen....*Aloha*.
 7 (6) Tegmina very short, not reaching to middle of abdomen *Nesorestias*.
 8 (5) One median frontal carina, forked or simple.
 9 (10) Head enormously elongate, longer than thorax and abdomen combined.....*Dictyophorodelphax*
 10 (9) Head not elongate.
 11 (12) Mesonotum with rounded disk, a depression dividing the disk from the posterior angle.....*Proterosydne*.
 12 (11) Mesonotum with flattened disk, no distinct depression dividing the disk from posterior angle.....*Nesosydne*

TROPIDOCEPHALINI.

- 1 (8) Lateral carinae of vertex and face only moderately developed.
 2 (7) First joint of antennae terete, or if at all flattened than longer than wide with lateral edges sub-parallel.
 3 (4) Vertex turbinate (triangular with curved sides), sometimes considerably elongate; lateral edges of face arcuate; antennae very much shorter than face, first joint annular, second about twice the length of first.....*Tropidocephala*.
 4 (3) Vertex quadrate.
 5 (6) Antennae slightly longer than face, joints subequal in length, first slightly flattened; lateral edges of face straight, subparallel; length of vertex equal to width at base; in profile clypeus not bent at right angle to face *Sogatopsis*.
 6 (5) Antennae about length of face, first joint terete, about 2-3 length of second; lateral carinae of face arcuate; in profile clypeus bent at right angle to face..... *Arcofacies*.
 7 (2) First joint of antennae subsagittate, broader at apex than base, only a little longer than wide.....*Bambusibatus*.
 8 (11) Lateral carinae of vertex and face forming deep keels.
 9 (10) First joint of antennae about equal to second, not foliaceous *Lanaphora*
 10 (9) First joint of antennae much longer than second, flattened, foliaceous *Purohita*.

(To be continued.)

ON THE EARLY STAGES OF TWO MOTHS.

BY WM. BARNES AND J. MCDUNNOUGH, DECATUR, ILL.

Apantesis michabo Grt.

Eggs of this species were received early in the spring from Southern Pines, N. C. They were laid in small patches of from 30-40 ova in one patch and were similar to those of *A. arge*. The larvæ fed up quickly on lettuce and dandelion. It was noticeable that the larvæ producing the male moths underwent one less moult than those producing the female; on account of this extra moult the female larvæ were considerably smaller than the male ones in the fourth and fifth stages, but when full grown were much larger.

Stage I.—Head black. Body pale greyish with large black tubercles similar in arrangement to those of our sketch (Can. Ent., 44, p. 133, 1912). Prothoracic plate brownish, rounded posteriorly, with four long black equidistant setæ on anterior margin and two similar setæ on posterior margin situated one on each side of the centro-dorsal line; laterad to each of these is a minute white seta. Posterior to the outer corner of the prothoracic plate is a minute white seta situated on a small chitinous patch; laterad to this plate, on the anterior margin of the segment, is a larger chitinous patch with two black setæ, below which again are two small white setæ on a small chitinous area. On the meso- and metathorax the two setæ of tubercles I. and the single seta of III are black, all the others white and shorter than the black ones; tubercle IV situated laterad and posterior to III, small; on the first eight abdominal segments the seta of tubercle II and the upper one of III are black, the setæ of the other tubercles and the lower one of III being white; tubercle I minute. On the 9th abdominal segment two large dorsal tubercles contain each 4 setæ and the anal plate is shield-shaped with four short setæ on each side of the centro-dorsal line.

Stage II.—Head black with the sutures of the clypeus strongly marked in white. Body black-brown dorsally, shading into light brown laterally; a broad dorsal whitish stripe, a narrower sub-dorsal one above tubercle III and a slightly waved subspiracular one between tubercles IV and V. The tubercles are black and

show a considerable augmentation of setæ, of which a single black central one from each dorsal tubercle is very long, the individual setæ thus forming a double dorsal row, the hairs increasing in length towards the anal segments where they are pointed rearwards and tend to become white in the upper half; the central seta of tubercle III is almost as long and these form a similar lateral row pointing sideways. Besides these long black setæ on the meso- and metathorax tubercle I has 3 shorter black setæ and several minute white ones; tubercle III has three white setæ; tubercle IV of the previous stage is only represented by a faint chitinous patch, but immediately below it and posterior to V is a minute white seta; tubercles V and VII have each about 5 white setæ. On the prothorax the prothoracic plate has the setæ on the anterior margin arranged in two groups, each containing four black setæ, pointing forwards, and several shorter white ones; the setæ of the posterior margin are as in the preceding stage with the addition of two minute white ones behind the two central black setæ. Behind the corner of the plate are two small white setæ; the lateral tubercle on the anterior margin is large with two long black setæ and 4 or 5 short white ones, laterad to this is a tubercle with one central black and 4 white setæ.

On the abdominal segments tubercle I has a single short white seta, tubercle II 5 black setæ grouped around the long central one, with occasional white setæ intermingled; tubercle III with a longer black seta and 5 short white ones which tend to become blackish on the rear segments; the other lateral tubercles with about 4 or 5 white setæ each.

Stage III.—Head as before. Body with dorsal area black, shading into paler laterally, with velvety black patches on anterior dorsal portion of each segment and along edge of centro-dorsal stripe which is broad and whitish-yellow; subdorsal stripe as before, but tending to break up into spots; lateral area browner than the dorsal area, mottled with ochreous around base of tubercle III and with pale subspiracular band as before.

Prothoracic plate with two well marked anterior warts each containing numerous long black and shorter white setæ pointed forwards; the posterior row of setæ consists of 4 black ones with

the central two accompanied each by two short white setæ and the outer two each by a single one. Warts large, black, with numerous setæ, of which the double dorsal row and the lateral row of long black ones is still present, these hairs tending to become white towards their apices; besides these tubercle III has a single very long white hair pointing sideways. The dorsal setæ are mostly black and tubercle II contains about 12, arranged in two concentric rows around the long central seta; tubercle I is small with three short whitish setæ; the lateral tubercles contain each 10-12 white setæ. On the meso- and metathorax tubercle IV is again represented by a single short seta, whilst below it the secondary tubercle now contains two white setæ.

Stage IV.—Head as before. Body dull black blotched dorsally with velvety black; warts black; a broad pale yellow dorsal stripe often considerably tinged with orange; subdorsal stripe reduced to round white spots on anterior portion of each segment, occasionally lengthened posteriorly; a subspiracular waved white stripe; legs and prolegs pale orange; spiracle ochreous ringed with black; setæ much as before, but greatly increased in number, the long dorsal setæ are now whitish in colour and besides these there are several rather long black ones from tubercle II, the remainder being considerably shorter; tubercle III with the very long white seta pointing outwards and the shorter black one pointing upwards as in preceding stage; all lateral setæ white.

Stage V.—Much as in the preceding stage; the dorsal stripe often assumes a more orange hue whilst the subdorsal row of dots remains white and is occasionally almost wanting; the subspiracular stripe is overlaid with smoky and not so sharply defined as in previous stages; apart from the subspiracular ones the setae are mostly dull black and only very slightly barbed, any white ones occurring on the dorsal and supraspiracular tubercles being very short. The orange central portion of the spiracle often tends to become obscure. This is the final stage for the male larva.

Stage VI (♀)—Practically as in the preceding stage with a considerable increase in size. The full grown larva may be at once distinguished from that of *arge* by its blacker body colour and the lack of the continuous subdorsal stripe which in *michabo* is reduced to small spots. Dr. Dyar (Jour. N. Y. Ent. Soc. VIII,

36) has recorded 7 stages for the ♀ larva of *arge*, spring brood; we are practically certain that we have missed no stage in our brood of *michabo*, so if the number of moults is constant, it would form a further means of differentiation between the two species. Of the two *michabo* would seem to be the newer species, being a further development of the *arge* type, as the subdorsal line is present in the earlier stages only, being obsolescent or wanting in the mature larva.

***Acronycta impressa* Wlk.**

We use this name in the ordinarily accepted sense, i.e. for the species as figured by Smith in his Monograph of the genus *Acronycta*, Pl. XIII, figs. 4 and 5, and of which *verrilli* G. & R. is regarded as a synonym. The type of *impressa* Walker in the British Museum is in such poor condition that on a recent examination we were unable to tell definitely to just what form the name should be applied; until material from the type locality is available, more or less doubt will surround the application of the name. We received ova of the species late in the fall of 1914 from New Washington, Pa.; the larvæ fed up readily on poplar and pupated within a month from the time of emergence from the egg. Two ♀'s emerged the same fall, the remainder of the pupæ hibernated and produced imagines early the following spring.

Ovum.—Rather flat, base of egg broad, irregularly circular, about 1 mm. in diameter, with a slight rim around the periphery; from this rib arise 50-60 ribs, arranged more or less in pairs, which ascend the sides of the egg about half way to the micropylar area where the two component parts of each pair join and are either continued to the micropylar area by a single rib or else end blindly; occasionally the upper ends of two pairs are joined by the single rib. Colour when first laid yellow, becoming later purple with numerous white blotches and finally almost black.

Stage I.—Head shiny black; body white with abdominal segments I, IV, V and VIII deep black-brown to below the spiracles: traces of a dark dorsal stripe especially on segments preceding and following the dark ones; on the white segments traces of a lateral brown band situated above tubercle VI on a level with the lower edge of the dark colour of the four above mentioned abdo-

minal segments. Prothoracic plate black with about eight long setæ projecting forward; tubercles large, shiny black, the dorsal thoracic tubercles with about 3 long setæ and the abdominal ones with about six; all the lateral tubercles bear single black setæ, tubercle IV being small with very minute seta. Length 2 mm.

Stage II.—Head shiny black. Body white with abdominal segments I, IV, V and VIII deep black brown as before, at times shaded dorsally with yellowish; a lateral brown band with the upper edge situated on a level with tubercle III, slightly mottled with white, and with the tubercles contained in this band ringed with white basally; this white area around tubercle V tends to spread laterally forming a more or less consecutive white subspiracular line. On the flange in some cases is a brown dorsal band with central white line, in other cases this band is lacking and the general colour appears in consequence lighter. Tubercles shiny black, large, except IV, situated immediately posterior to the spiracle, which is minute with a single seta; the number of setæ have greatly increased, tubercle I bearing about 12 stiff black bristles and the other tubercles 6-8 similar ones. Length 4 mm.

Stage III.—Head black. Body largely deep black-brown, abdominal segments I, IV, V and VIII entirely so, the other segments with an orange-yellow subdorsal stripe occupying the area between the lower portion of tubercle I and the upper portion of tubercle III; some specimens show a slight white marbling both laterally and dorsally on the dark ground colour. Lateral tubercles strongly ringed with white, forming, as in previous stage, a broken subspiracular line on a level with tubercle V; on the dark segments tubercle II is also white ringed and at times tubercle I shows traces of white at the base; tubercles as before, the dorsal ones with numerous black stiff bristles and a few slight white ones around the bases, the lateral ones with several central black setæ and numerous white ones; from the prothoracic shield numerous white hairs overhang the head. The segmental incisions are well marked, abdominal segments I and VIII being noticeably humped. Length 9 mm.

Stage IV.—A considerable change in the general appearance. Head black. Body black with orange subdorsal line on the seg-

ments corresponding to the pale segments of the previous stages and a whitish subspiracular line as before; tubercles large, black, prominently white-ringed; spiracle ringed with white. On the first four segments the dorsal hairs are red-brown paling to white laterally, the red-brown colour occasionally extending over to abdominal segments II and III, on the other segments all the hairs are white with the exception of a few black hairs on the 8th abdominal segment which is markedly humped; several long white hairs arise from the lateral tubercles, these being pointed forwards on the anterior segments and backwards on the anal segments. Length 12 mm.

Stage V.—Head black. Body velvety black; all trace of the orange subdorsal stripe is lost and the white subspiracular line and rings round the tubercles greatly reduced, when present the former being orange-tinged. Hairs whitish-yellow except on the meso- and metathoracic and 1st abdominal segments where the whole area above the spiracle shows red-brown hairs which often extend dorsally on to the 2nd and 3rd abdominal segments; occasionally similar hairs are found dorsally on the 8th abdominal segment which scarcely ever shows any black setæ as in previous stage; the tubercles from which these reddish hairs arise are slightly tinged with red-brown and the other tubercles are mostly black occasionally tinged with whitish. Spiracle white.

Width of head 1.8 mm. Length 18 mm.

Stage VI (full grown).—Very much as in preceding stage, quite variable in coloration. Head black. Body velvety black with white spiracles and with reddish subspiracular line either slightly present or entirely lacking or confined to the base of tubercle V. Hairs ranging in colour from pure white to yellowish, the dorsal hairs being usually rather stunted and crinkly; red-brown hairing as in preceding stage on the anterior segments except prothorax and extending dorsally to 2nd and 3rd abdominal segments and frequently with similar hairs dorsally on 8th and 9th abdominal segments; the tubercles bearing the red-brown hairs are usually themselves similarly coloured, whilst the others may be black shaded with white or entirely white and frequently the lateral abdominal ones are entirely black. Length 25-30 mm.

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POPULAR AND ECONOMIC ENTOMOLOGY.

SOME CURIOUS OLD BELIEFS ABOUT INSECTS.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

"Oft from the putrid gore of cattle slain
Bees have been bred A narrow place,
And for that use contracted, first they choose,
Then more contract it, in a narrower room,
Wall'd round, and covered with a low built roof,
And add four windows, of a slanting light
From the four winds. A bullock then is sought,
His horns just bending in their second year;
Him, much reluctant, with o'erpowering force,
They bind; his mouth and nostrils stop, and all
The avenues of respiration close:
And buffet him to death: his hide no wound
Receives; his battered entrails burst within,
Thus spent they leave him, and beneath his sides
Lay shreds of boughs, fresh lavender and thyme.
This, when soft zephyr's breeze first curls the wave,
And prattling swallows hang their nests on high.
Meanwhile the juices in the tender bones
Heated, ferment: and wondrous to behold,
Small animals in clusters, thick are seen,
Short of their legs at first; on filmy wings,
Humming at length they rise; and more and more
Fan the thin air; 't ll numberless as drops
Pour'd down in rain from summer clouds, they fly."

Such is the fabulous, poetic method given by Virgil in his *Georgics* for generating a swarm of bees. These erroneous ideas of ancient naturalists, philosophers and poets were not by any means confined to insects. For instance, Kircher, a learned man

of the 17th Century gave the following recipe for the manufacture of snakes: "Take some snakes, roast them and cut them in small pieces—then sow those pieces in an oleaginous soil; then from day to day sprinkle them lightly with water from a watering pot, taking care that the piece of ground be exposed to the spring sun, and in eight days you will see the earth strewn with little worms, which, being nourished with milk diluted with water, will gradually increase in size till they take the form of perfect serpents."

Other investigators who tried this method succeeded, of course, only in raising large broods of flies. Kircher noted flies also, but explained their presence by saying that they were "engendered from that substance which constituted the aliment of the snakes."

For restoring dead bees to life, Columella, a Roman writer, recommended that the dead bees be kept until spring and then exposed to the sun among the ashes of the fig tree properly pulverized. Another fanciful statement concerning bees is that of Aristotle, who said that the olive, the cerinthus, and other plants, had the property of generating young bees from their purest juices. Quoting Virgil again on bees, we have these lines:

"From herbs and fragrant flowers, with their mouths
They cull their young."

The peculiar stalked eggs of the lace-winged fly (*Chrysopa* sp.) were at one time described as fungi, but this, however, is not surprising when one considers their peculiar appearance. "Minute insects flying in the air" were supposed to have some connection with intestinal worms in man, and a blight was at one time described as "an easterly wind attended by a blue mist." the easterly wind being loaded with aphids and the eggs of various destructive insects. Electric changes in the air were thought by some to be responsible for honey dew, and Linnæus thought that the honey dew on hop leaves was due to the caterpillar of the ghost moth (*Hepialus humuli*) attacking the roots.

Coming to insect transformations, Heroldt explained this in a novel way. He stated that "the blood of caterpillars is the only original portion of them, which, being endowed with a formative power, produces an envelope for itself of mucous net-work, and this again by means of a similar power is successively transmuted into the caterpillar, the pupa and the perfect insect."

According to Swammerdam, the hairs on the tip of the breathing tube and end of the body of a mosquito larva are anointed with oil so as to repel water. He also remarks that this oil is removed when the larva is roughly handled. Harvey, who discovered the circulation of the blood, made the statement that "bees, wasps, hornets, or butterflies, and whatever other animals are generated by metamorphosis from a creeping insect, are offspring of chance, and therefore never to keep up their species."

Baster thought that the spiracles of insects were their organs of smell, and this opinion was also held by Cuvier, Dumeril and Lehmann, Cuvier believing that the lining of the tracheæ were constructed to receive stimuli. The old superstitions connected with certain wood-boring beetles and their tappings, known as the "death watch," prompted Swift to write the following lines:

"A wood worm
That lies in old wood, like a hare in her form,
With teeth or with claws it will bite, it will scratch;
And chambermaids christen this worm a death watch;
Because like a watch it always cries click.
Then woe be to those in the house that are sick,
For sure as a gun, they will give up the ghost,
If the maggot cries click when it scratches the post.
But a kettle of scalding hot water injected,
Infallibly cures the timber affected;
The omen is broken, the danger is over,
The maggot will die and the sick will recover."

In 1730, during a severe outbreak of the Brown-tail Moth in the vicinity of Paris, the French journalists stated that part of the caterpillars were produced by spiders, and that these spiders, and not the caterpillars, produced the webs from the slime of snails, which they were said to have been seen collecting for that purpose. A more garbled idea than this it would be hard to invent. The outbreak was so severe at that time that the city officials of Paris issued an order compelling the people to "uncaterpillar" (*decheniller*) their trees. Cold rains, however, produced so much mortality among the larvæ that it was not necessary to enforce the order.

And so on, through all of the pages of early entomology, run these curious beliefs and fascinating old accounts of insects.

SUNFLOWER INSECTS.

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

I am much indebted to Mr. R. L. Thompson for the following information regarding sunflower insects observed at Salisbury, Rhodesia:

"As yet we have no record of any serious pest attacking sunflowers in Southern Rhodesia, and the nearest approach to injury that has come under my notice was a partial defoliation of a few plants at the Experimental Station, Salisbury, by the larvæ of *Plusia orichalcea*. In this case the plants rapidly recovered, and no injury to the flower heads was apparent. The only other injury I have seen was the work of a species of finch, which stripped the heads of some garden varieties of *Helianthus*. I regret that it is rather too late to collect insects which visit the flowers. Such are very numerous, and, from memory, I should say that our wild and domesticated races of *Apis mellifica* (var. *caffra* and var. *unicolor adansonii*) rank first, while other insects attracted include large numbers of Diptera, mainly Muscids or Syrphids, and smaller numbers of Aculeate Hymenoptera, especially Scoliids and Sphegids. *Chloridea obsoleta* occurred in some numbers at the flowers this season, but otherwise I should say that diurnal Lepidoptera are only casual visitors. Among the Syrphids the most conspicuous visitor is an undetermined species rather similar in appearance to the European *Eristalis tenax*, and of similar habits." (April 6, 1915.)

This account is interesting because, although from a region so remote from the original home of *Helianthus*, it describes a situation singularly like that in other parts of the world where sunflowers are grown. Here in Colorado finches attack the heads, so that we have to bag them in order to save seed. Here at Boulder, *Chloridea* (or *Heliothis*) *obsoleta* Fabr.—the very moth observed in Rhodesia—visits the flowers of annual *Helianthus*, as well as those of the perennial *H. coloradensis* Ckll. In Rhodesia, as in America and Europe, there is the same general absence of butterflies as sunflower visitors. The particular *Plusia* feeding on sunflower in Rhodesia does not occur with us, but J. R. Parker (Journ. Econ. Ent., 1915, p. 288) records that *Plusia* (or *Autographa*) *gamma californica* Speyer feeds on sunflower

Mr. A. W. Hanham (Canad. Entom., 1914, p. 145) has shown that in British Columbia sunflowers are especially visited by species of *Plusia* and related genera. Records from other localities suggest that much the same thing may be observed elsewhere, though no other collector has taken the trouble to make a careful list. At Boulder, Colorado, Sept. 2, 1914, in bright sunshine, I found *Caloplusia ignea* (Grote) visiting the flowers of *Helianthus lenticularis*. Also at Boulder, July 31, I collected *Plusia* (or *Syngrapha*) *falcifera* Kirby (*simplex* Gn.) at flowers of annual garden *Helianthus*. Three specimens were taken.

During the season of 1914, the one really serious pest of our red sunflowers (varieties of *Helianthus annuus*) was the common *Nysius*. These insects assembled in numbers on the flower-stalks, and caused the heads to wilt and die. They seemed to be principally injurious on plants the heads of which had been bagged for cross-pollination, multitudes of them collecting just below the bag, and by their combined attack destroying the head. Although this is a very common insect, its name is not settled beyond doubt. Formerly, following Van Duzee and others, it was labelled *N. angustatus*; but according to Horvath this is a synonym of *N. ericae* Schill. Professor C. P. Gillette writes, however, that the common Colorado species is now to be referred to *N. minutus* Uhler. He even doubts whether true *angustatus* occurs in Colorado. Dr. Van Duzee writes that formerly he considered *minutus* a synonym of *angustatus*, but he now treats it as a distinct variety of *ericae* or *angustatus*. At La Jolla, California, he finds that all the specimens are *minutus*; but in Kansas and elsewhere in the Mississippi Valley he found *angustatus* the commoner form. It appears, from all this, that we should call our Boulder pest *Nysius ericae minutus*.

Dr. S. A. Forbes, in Rept. Ill. State Entomologist for 1913 and 1914 (1915), p. 4, refers to the sunflower weevil, "an insect new to agriculture which has led to the virtual abandonment of the growing of sunflower seed for oil." Dr. Forbes does not mention the scientific name of the weevil, but in a letter he kindly informs me that it is *Smicronyx fulvus*. Now, this *S.* (or *Desmoris*) *fulvus* Lec. is very common on the sunflowers at Boulder, but we have not found it a serious pest. There are two Torymine Chalcids,

kindly determined by Mr. J. C. Crawford as *Callimome* sp. and *Zaglyptonotus schwarzi* Cwfd., which we find hovering over and alighting on the sunflower heads, and from their actions it is suspected that they may be parasitic on the weevils. An effort will be made this year to determine whether this is the case, and whether they can be of any use if introduced in Illinois. A third Chalcid common on the sunflower heads is *Perilampus hyalinus* Say.

Some years ago Mr. Busck reported of the Gelechiid *Paltodora similiella* (Chamb.) that he had received specimens in poor condition, but apparently this species, reared from sunflower heads by E. E. Bogue in Oklahoma. At Longmount, Colorado, Aug. 30, 1914, I found a number of small moths at flowers of *Helianthus lenticularis*, and when specimens were sent to Mr. Busck, it turned out that they belonged to this same *P. similiella*, which is doubtless a regular sunflower insect.

A cutworm from a sunflower head, collected at Boulder, Aug. 16, gave a moth Oct. 4. It was the widely distributed *Lycophotia margaritosa* Haw. (*saucia* Hbn.).

In Sept., 1914, at Boulder, a larva of *Phyciodes ismeria* (*carlota* Reak.) was found on *Helianthus argophyllus* in the garden; a new food plant. On the ordinary sunflower young larvæ of *P. ismeria*, about 8 mm. long, were common October 5. Like *Chlosyne lacinia*, this species evidently hibernates as a larva.

The yellow Bombyliid fly, *Phthiria sulphurea* Lw., visits sunflower heads at Boulder in August, but I found that it sometimes got caught by the likewise cryptically coloured bug, *Phymata fasciata*.

NOTES ON SOME RECENTLY DESCRIBED SPECIES OF NORTH AMERICAN LEPIDOPTERA.*

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In the November number, 1914, of "Insecutor Inscitiæ Menstruus," Dr. Dyar describes eight species of North American Lepidoptera. As far as can be judged from a mere reading of the descriptions, several of these species appear to have already received names, but without an actual knowledge of the type specimens we cannot state authoritatively that such is the case. We therefore

offer the following notes in the hope that those students who have an opportunity to examine the type material may either verify or disprove our statements.

Apantesis moierra Dyar.

This is apparently *quadrinotata* Stkr., a name at present sunk in the synonymy of *placentia* A. & S. Strecker's species, described and figured in the Proc. Dav. Acad. N. Sciences, Vol. II, p. 271, 1878, from several ♀'s from Texas agrees in locality with *moierra* Dyar. *Sociata* B. & McD., described from a single ♀ from New Mexico (1910, Journ. N. Y. Ent. Soc., XVIII, 149), will probably also prove to be a synonym. Until the ♂'s are known, nothing very definite can be said about the species, but we venture the guess that they will prove to have banded primaries and be intermediate between *figurata* Dru. and *placentia* A. & S.

Schinia navarra Dyar.

The description reads remarkably like that of *cupes* Grt. and the type localities are similar. If it were not for the fact that *cupes* should be correctly identified in the National Museum, and therefore known to Dr. Dyar, we should not hesitate in making the two names synonymous. In his tables Hampson has not been very fortunate in his placing of *cupes*, and this may have misled Dr. Dyar.

Gonocausta sabinalis Dyar.

This is doubtless the species referred to by us (Contrib. II, 224) to *zephyralis* Led. A series will be necessary to prove whether the points of distinction mentioned by Dr. Dyar have specific value or not. Our single specimen lacks the fringes, so is of no value in this connection.

Artopsis nua Dyar.

We fear that the genus *Artopsis* Dyar must fall before *Parachma* Wlk. Hampson (Proc. Lond. Zool. Soc., 1897, p. 659), it is true, figures and defines the genus as having only 11 veins on the primaries, at the same time making *Perseis* Rag. (Ann. Soc. Ent. Fr., 1890, p. 538) a synonym. This latter genus, founded on *culiculis* Hlst., is distinctly stated, however, to have twelve veins, and later Ragonot himself, after an examination of the British Museum types (Ann. Soc. Ent. Fr., 1892, p. 624) sinks his genus to *Parachma* Wlk.

Our own examination recently of the type of *Parachma ochracealis* Wlk. has confirmed Ragonot's statement and proved Hampson in error. Judging by Dr. Dyar's remarks, we doubt greatly whether he has correctly identified *ochracealis* Wlk., for he refers to it in the present paper for some subtle synonymic reason which we cannot fathom to *Arta* Grt., a genus not erected until 1875 and over which *Parachma*, in any case, would have priority if the two were synonymous, which they are not. We might further point out that *culiculis* Hlst., at present reposing in the synonymy of *ochracealis* Wlk., was described from Florida as is *nua* Dyar, and it is not at all improbable that these two names refer to one species, which may or may not be distinct from *ochracealis*. A study of the type material will be necessary before any definite statement in this connection can be made.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

The 52nd Annual Meeting of the Society will be held at Ottawa on the 4th and 5th of November. The public lecture will be delivered on the evening of Thursday, the 4th, by Dr. L. O. Howard, Chief of the Bureau of Entomology at Washington. The titles of papers to be presented should be sent as soon as possible to the acting secretary, Mr. Arthur Gibson, Division of Entomology, Department of Agriculture, Ottawa, in order that they may be included in the programme which is shortly to be issued. The length of time required for reading the paper should be mentioned, and also whether the use of a lantern is desired.

The members of the Society will be much gratified to learn that a branch has been formed in Nova Scotia, bearing the name of the Province and with headquarters at Truro. The initial membership is twenty-seven, and there are prospects of a goodly increase when the branch has become fully organized and entered upon active work. This is the first time that one of the Maritime Provinces has become formally connected with our Society, though all along we have had individual members in a few localities by the sea.

Professor Brittain, of the Agricultural College at Truro, N.S., is the acting secretary. A career of great usefulness is open to the branch, and hearty good wishes are extended for its growth and permanent success.

NEW CANADIAN AND ALASKAN MUSCOIDEA.

BY CHARLES H. T. TOWNSEND,
Bureau of Entomology, Washington, D. C.

This paper presents descriptions of some British Columbian forms, received for determination at the Bureau of Entomology, U. S. Department of Agriculture, sent by Mr. F. Kermode, Director of the Provincial Museum at Victoria, B. C. To these are added descriptions of a few new forms, represented by material in the U. S. National Museum collection, from British Columbia, Saskatchewan and Alaska, collected by Messrs. Currie, Cockle, Knab and Kincaid

Family *Callirhoidæ*.**Alaskophyto** new genus.

Genotype—*Muscopteryx obscura* Coquillett, 1902, Proc. U. S. Nat. Mus., XXV, 116.—St. Paul Island, Alaska.

May be distinguished from other members of the Phyto group as follows: Male—Vertex and posterior part of front one-ninth or one-tenth of head width. Ocellars rather strong; vibrissæ strong and decussate, curved, single, inserted even with oral margin; second and third antennal joints about equal, arista thickened on basal fourth or less; front but feebly prominent, cheeks over one-half eye-height; facial profile much shorter than frontal; palpi stout-filiform. Long decussate apical pair of scutellars and two laterals. Macrochætæ of abdomen weak, rather thickly placed, interspersed with hair, venter more hairy. Claws elongate. Wings narrow. Apical cell narrowly open or closed, ending slightly before wing-tip; cubitus very broadly open, no stump or wrinkle, apical cross-vein straight. Abdomen same width as thorax, elongate.

Family *Miltogrammidæ*.**Arabiopsis** new genus.

Genotype—*Arabiopsis cocklei* Townsend, new species.

Allied to *Euaraba* Townsend, from which it differs chiefly as follows: Head subrectangular in profile, the lower border about three-fourths as long as upper, the epistoma distinctly produced; facial depression shorter, facial profile slightly concave, third antennal joint of male shorter and broader, arista slender on distal third or more; parafacials naked below, with a patch of hairs above

male with row of about six proclinate weak orbital bristles situated well in front outside frontal row, usually two or three more strongly developed than the others. Male front at vertex about equal to one eye, vibrissæ hardly meeting. Macrochætæ of mesoscutum, scutellum and abdomen long, rather thickly and evenly distributed, interspersed with long bristly hairs; apical scutellar pair well-developed and decussate. Abdominal macrochætæ only marginal, two median on first segment, about four median on second segment, practically complete row on third and anal segments, all very closely placed.

Arabiopsis cocklei new species.

Length of body 5 mm.; of wing 4 mm. One male, London Hill Mine, Bear Lake, British Columbia, 7,000 ft., July 21, 1903 (J. W. Cockle).

Blackish, front and face heavily silvered, changing to a leaden shade with incidence of light; frontalia invaded on each side about middle by an irregular patch from parafrontals whose light incidence is contrasted with that of frontalia, whereby the latter alternate with the patches in brilliancy according to the change of light. Mesoscutum thinly silvery on sides and in front, showing four narrow black vittæ, of which the middle ones stop at suture; in very oblique lights the scutellum and disk of mesoscutum are seen to be also covered with a thin coat of silvery pollen, but this is invisible in direct view. Abdomen blackish below and broadly so above, with rather broad silvery margin on sides, leaving a small blackish spot segregated from the median black on hind margin of second and third segments laterally. Legs wholly black, the femora silvery on outer surface. Wings clear; tegulæ whitish, narrowly bordered with pale yellowish. Third antennal joint soft black with a grayish sheen, arista deep black.

Holotype, No. 19554 U.S.N.M.

This species is named in honour of Mr. J. W. Cockle.

Family *Salmaciidæ*.

Knabia new genus.

Genotype—*Knabia hirsuta* Townsend, new species.

Differs from *Salmacia* as follows (male only described): Front at vertex distinctly less than one-half head-width. Frontal

bristles hairlike, in only two rows; parafrontals and parafacials thickly covered with long fine hair. Ocellars and the two proclinate and two reclinate fronto-orbitals rather hairlike, even the inner verticals but slightly stronger and still quite hairlike. Marginal row of bristles on parafacials same strength as frontals. Face conspicuously wider than front. Parafacials fully as wide as cheeks, hardly at all narrowed below, the parafrontals very conspicuously narrower. Proboscis much shorter, the part below geniculation, not as long as third antennal joint. Thorax, pleurae, scutellum, abdomen and femora thickly clothed with fine long hair, all the macrochaetae comparatively weak, Legs more slender. Claws short.

This genus is named in honour of Mr. Frederick Knab.

Knabia hirsuta new species.

Length of body 10.5 to 11 mm.; of wing 8 to 8.5 mm. Two males, Oxbow, Saskatchewan, April 30 and May 13, 1907 (F. Knab).

Black. Head all yellow, pale gold pollinose, satiny; lateral portions of occiput lead-gray. Palpi and second antennal joint rufous, third joint soft gray-black, arista jet-black. Occipital beard pale grayish-golden; cheek, facial, frontal and all the other hair black. Thorax with very faint bloom, four linear brownish or blackish vittae showing. Scutellum testaceous, broadly black on base. Abdomen rather shining black; segments two to four, narrowly edged on base with silvery-white, broadening on sides of anal segment. Legs black, tibiae often with a brownish tinge. Wings clear except the smoky oblique, basocostal area. Tegulae nearly white, margined with pale tawny.

Holotype, No. 19555 U.S.N.M.

Family *Minthoidea*.

Pseudodidyma new genus.

Genotype—*Pseudodidyma pullula* Townsend, new species.

Differs from Wulp's description of *Didyma* as follows: Head subquadrilateral, but profile much narrowed below, the face very receding. Front prominent, much wider than one eye, about same in both sexes. Facialia not ciliate, with only a few bristles that reach hardly over one-fourth way up. Facial depression

broad, facialia flared outward, a weak median carina present. Parafacialia more on edge in male than in female. Second antennal joint short in both sexes; third joint of male well broadened and about six times second in length, that of female no broader than distal end of second and not over four times length of second. Arista thickened on basal three-fifths. Male without proclinate fronto-orbitals, but with three reclinate ones in triangle, of which the outer one corresponds to a proclinate one in female. Female with two proclinate and two reclinate. Both sexes with the frontal row doubled anteriorly, the outer row weak. Frontals descending quite to insertion of arista. Frontalia occupying fully one-third of frontal width in female, broad throughout; those of male narrowed anteriorly. Cheeks about one-half eye-height in both sexes. Epistoma cut off, vibrissæ practically on oral margin. Eyes quite thickly hairy in both sexes. Antennæ as long as face. Proboscis very short and fleshy, palpi slightly thickened apically. Scutellum without apical decussate pair of bristles; with three laterals, of which the posterior is longest; and a closely-approximated discal pair. Abdomen ovate in both sexes; macrochaetæ marginal and discal, including median marginal pair on first segment. Claws of male quite elongate, about as long as last tarsal joint; these of female a little shorter. Hind cross-vein much nearer to cubitus than to small cross-vein. Belongs in the *Admontia* group. May be distinguished from *Admontia* by the bare parafacialia and short second arisal joint.

Pseudodidyma pullula new species.

Length of body 5.25 mm.; of wing 5 mm. One female, Farragut Bay, Alaska, June 1, 1899 (T. Kincaid). This is the specimen determined by Coquillett as *Didyma pullula* Wulp, Dipt. Harriman Alaska Exped., 438 (sep. pag. 52).

Blackish, cinereous pollinose. Whole face and anterior edge of parafrontals silvery-ashy, cheeks somewhat less so. Palpi fulvous. Frontalia brown. Antennæ blackish or brownish. Parafrontals blackish, thinly pollinose; thorax and scutellum same. Four vittæ on mesoscutum, middle ones narrow, outer ones heavier and broken. Abdomen blackish, not shining, with a submarmorate ashy-pollinose effect, the pollen for most part of same

obscure shade as that of thorax and front, but with a silvery shade in some lights; the pollen best defined on narrow base of second segment, basal half of third, and all of anal segment. Legs brownish, tibiae rufous. Wings distinctly smoky-yellow along the veins. Tegulae smoky-yellowish, front scale slightly more whitish.

Holotype, No. 19556 U.S.N.M.

A male from Victoria, British Columbia, April 2, 1906 (E. M. Anderson, through F. Kermode), measures 6 mm., wing 5.5 mm., and differs in wings being clear, tegulae watery-whitish, pollen of base of second abdominal segment broadening on sides, tibiae only narrowly rufous on middle, and antennae wholly deep black. It may be a distinct species, but seems congeneric with the above female.

Family *Larvæoridae*,

Okanagania new genus.

Genotype—*Okanagania hirta* Townsend, new species.

Differs from *Ostracophyto* as follows: Male.—Facial profile deeply bent in, the epistoma very prominent. Facialia with thick bunch of bristles just above vibrissae, but otherwise bare. Eyes thickly clothed with long hair. Parafacials bare, wide. Front at vertex a little narrower than eye, much narrowed in middle, widening still more anteriorly than at vertex, very prominent in profile. Parafrontals broad anteriorly, with bristly hairs outside the frontal row and long hair on vertical and ocellar regions. Occipito-orbital fringe very long, decreasing in length gradually from the outer verticals. Vibrissae inserted well above oral margin, widely separated. Second antennal joint long; third broad, not twice as long as second. Arista thickened on more than basal half, first joint short, second joint elongate. Long apical decussate pair of macrochaetae on scutellum; discal pair of straight bristles, with several others approximating them in strength. Median marginal and discal macrochaetae on second and third segments, median and lateral discal on fourth with marginal row, fourth and fifth rather thickly covered with long hair besides the bristles. Thorax, pleurae, scutellum, venter and legs also with long hair and bristles. Claws elongate, about as long as last tarsal joint. Hypopygium large. Apical cell narrowed at extremity, narrowly open, ending

far before wing-tip. Hind cross-vein nearly straight, close to the right-angled cubitus. Apical cross-vein quite evenly concave outwardly. Cubitus^e with slight wrinkle. Costal spine small. Wings broad; third vein bristled only at base, others bare.

Okanagania hirta new species.

Length of body 9.5 mm.; of wing 7.5 mm. One male, Okanagan Falls, British Columbia, April 27, 1913 (E. M. Anderson, through F. Kermode, No. 190).

Black. Head silvery-cinereous, epistoma and vertex with darker shade. Occipital beard brassy-gray, all other hair black. Thorax with submetallic shining greenish shade. Scutellum broadly testaceous on apex. Abdomen blackish, subshining; with a small rufous spot on each side of second segment near lateral margin, and a faint suggestion of same on third segment. Wings nearly clear. Tegulae whitish.

Holotype, No. 19557 U.S.N.M.

Panzeriopsis new genus.

Genotype—*Panzeriopsis currici* Townsend, new species.

Differs from *Ernestia* as follows: Male. Front at vertex much wider than eye. Epistoma very prominent, subhorizontally projected. First and second arisal joints both elongate, the first longer than second. Third antennal joint same length as the elongate second, widened, rounded apically. Parafacials with long hair, same as front and cheeks. No ocellar bristles. Eyes bare. Three to six facio-orbitals. Proboscis much longer than head-height, moderately slender. Palpi elongate, slender, a little widened apically but thin. Cheeks only a little less than eye-height. Mesoscutum devoid of macrochætæ except on lateral margins and a weak pair or two on hind margin, the surface being clothed with long hair. Scutellum with a decussate apical pair of bristles, three fairly strong laterals, some weaker laterals and hairs, and some discals and hair. Abdomen with two to four discals on second and third segments, two to four median marginal on second, third with marginal row, fourth with marginal row and more or less complete discal row. Apical cell ending farther

before wing-tip, the cubitus more removed from hind margin of wing.

Panzeriopsis curriei new species.

Length of body 10.5 to 11.5 mm.; of wing 9 to 9.5 mm. Four males, London Hill Mine, Bear Lake, British Columbia, 7,000 feet, July 21 to 29, 1903 (R. P. Currie).

Black. Clypeus and parafacials silvery pollinose, shading to dark in oblique lights. Parafrontals polished black. Epistoma and cheeks subshining black, former slightly pollinose. Frontalia light brown. Palpi pale rufous to rufous. Beard brassy-gray. Thorax without pollen or vittæ, subshining, with slight metallic greenish lustre. Scutellum rufotestaceous on apex or almost wholly so. Abdomen subshining black, without pollen, usually obscure dull rufotestaceous on sides of second and third segments or on sides of second segment alone. There is some suggestion of metallic green on abdomen, especially on anal segment. Legs and antennæ black. Wings clear, base pale flavous, veins fulvous. Tegulæ watery-whitish, with pale yellowish margins.

Holotype, No. 19558 U.S.N.M. July 21.

Named in honour of Mr. R. P. Currie.

Rhachogaster new genus.

Genotype—*Rhachogaster kermodei* Townsend, new species.

Differs from *Upodemocera* as follows: Male. --Front narrowed at vertex to little over one-half eye-width. Third antennal joint normal, rounded apically. First aristal joint short. Lobular edges of second genital segment set with short toothlike spines. Second ventral plate with thick bunch of short sharp needle-point spines directed backward. Third ventral plate with some very short inconspicuous spines; fourth with a few short hairs; fifth with some long hairs. Ventral profile deeply cut out when hypopygium is exerted.

Rhachogaster kermodei new species.

Length of body 13 mm.; of wing 10 mm. Two males, Penticton, British Columbia, July 4 and 8, 1913 (E. M. Anderson, through F. Kermode, Nos. 187, 188).

Black. Face and cheeks pale golden pollinose. Parafrontals silvery-white pollinose. First two antennal joints and palpi rufous; frontalia brownish-rufous, with silvery bloom. Beard brassy. Thorax metallic greenish; scutellum testaceous. Abdomen black, shining. Wings clear, bases pale yellow. Tegulae tawny-white to whitish.

Holotype, No. 19559 U.S.N.M.

Named in honour of Mr. F. Kermode.

ORGANIZATION OF AN ENTOMOLOGICAL SOCIETY FOR NOVA SCOTIA.

At a meeting held at Truro on Aug. 3rd a Nova Scotia branch of the Ontario Entomological Society was successfully formed. This meeting was held in the Assembly Hall of the Normal College, and was largely attended by members of the staff of the Normal and Agricultural Colleges, by students of the Rural Science School, by members of the Provincial and of the Dominion Entomological Branch and others.

Both an afternoon and evening session were held, at which various interesting and instructive papers on various phases of entomology were read and discussed. Following the reading of the papers, the aims and purposes of the Society were explained by Mr. W. H. Brittain, Provincial Entomologist, whereupon the meeting proceeded to the election of the following officers for the ensuing year:

Hon. President—Dr. A. H. MacKay, Supt. of Education, Halifax.

President—E. Chesley Allan, Yarmouth.

Vice-President—L. A. DeWolfe, Truro.

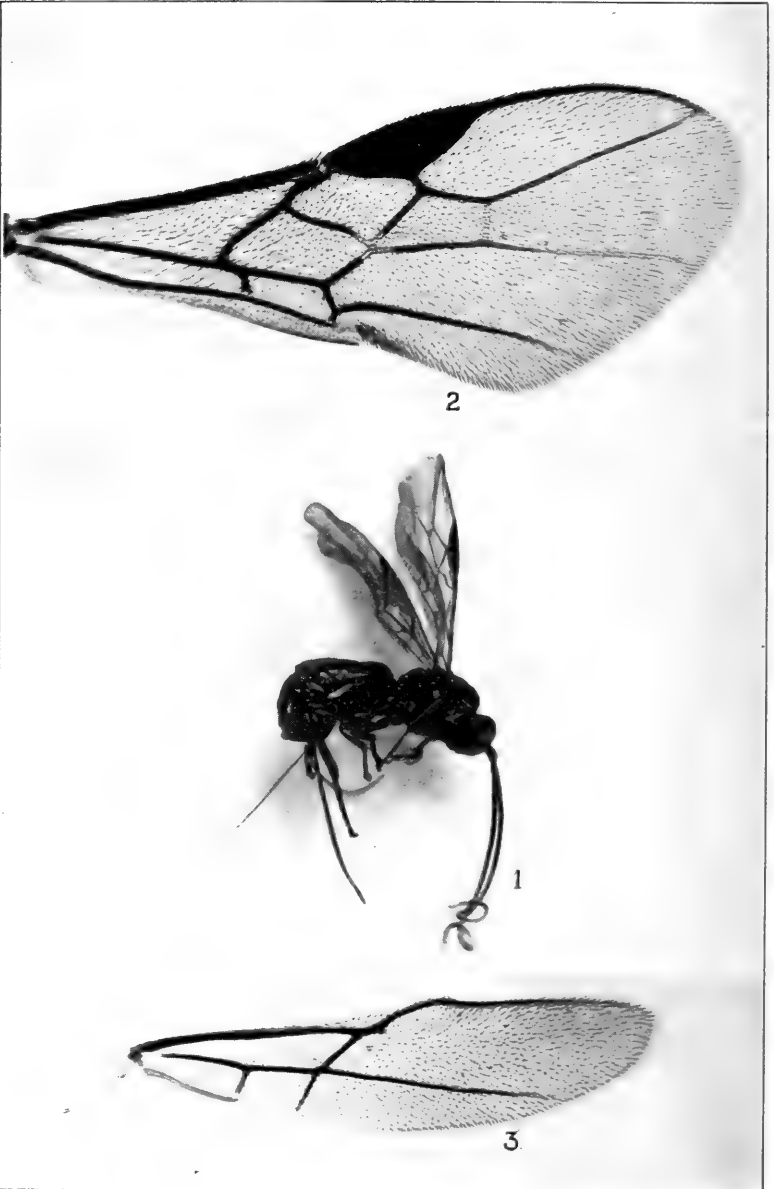
Secretary-Treasurer—W. H. Brittain, Truro.

Assistant Secretary-Treasurer—G. E. Sanders, Bridgetown.

Committeemen—C. A. Good, Truro; J. M. Scott, Truro.

At the close of the evening session 27 individuals signed the roll of the Society and handed in their annual subscription, while a number of others signified their intention of becoming members. With this auspicious beginning it is hoped that the Nova Scotia Entomological Society will continue to increase in members and influence and remain a live organization in the Province for many years to come.





BIOSTERES RHAGOLETIS, N.SP.

BIOSTERES RHAGOLETIS RICHMOND, SP.N., A PARASITE
OF *RHAGOLETIS POMONELLA* WALSH.*

BY WILLIAM COLCORD WOODS, ORONO, MAINE.

During the summer of 1913 the writer was engaged in studying blueberry insects in Washington County, Maine. A maggot was found infesting the berries, which when bred proved to be *Rhagoletis pomonella* Walsh, the apple maggot or railroad worm (Journal of Economic Entomology, 1914, Vol. VII, pp. 398-399). There were also obtained from larvæ of this species collected at Cherryfield, Maine, in August and September, 1913, twenty-one specimens of a parasite, which emerged from puparia kept under laboratory conditions, at various dates between February 25 and April 21, 1914.

Since no parasite has been recorded from *Rhagoletis pomonella* Walsh, this note accompanied by the plate should be of interest. The figures represent, enlarged, an adult, and the fore and hind wings.

This species belongs to the family *Braconidæ* and to the sub-family *Opiinæ*. In this same group are placed many of the parasites, including one of this genus, which are recorded by Silvestri as bred from various fruit-flies (Bulletin 3, Hawaii Board of Agriculture and Forestry, 1914).

Specimens of this species were swept on the blueberry barrens of Washington County last summer, where apparently they had considerably reduced the number of the maggots as compared with the preceding season. Unfortunately all the puparia which I collected during the summer of 1914 were destroyed so that neither parasites nor flies emerged, but I hope to make further collections this present year. I have not observed oviposition, but this species is undoubtedly a larval parasite, although the adults do not emerge until after the puparia have been formed.

Dr. H. H. P. Severin has this year bred the same species from puparia of *Rhagoletis pomonella* Walsh, obtained either from the

*Papers from the Maine Agricultural Experiment Station. Entomology No. 80.

wild crab or cultivated apples in Orono, Maine, while engaged in special work for this Station.

Specimens of the Cherryfield parasites were submitted to Mr. E. A. Richmond, of Cornell University, who determined it as a new species. The following description, which he has given me permission to publish, should be credited to him, as well as the synonymy of the genus, which follows:

Biosteres rhagoletis, sp.n. (Plate XII.)

"Fulvous (xanthine orange); antennæ, except scape in ♂ (partly in ♀), terminal joints of pro- and mesothoracic tarsi, entire metathoracic tarsi and tips of mandibles, brown; eyes and ocelli black; wings with membrane colourless, nervures and stigma brown; sheath of ovipositor brown; inner stylets fulvous. Length 3 mm.; ovipositor 3 mm. Habitat—Cherryfield, Maine.

"*Head* shining, closely tessellate, punctulate, pilose (including mouth-parts); ocellar elevation impunctate and not pilose; face with a median longitudinal elevation, almost a keel; *clypeus* with sparser punctures in centre; *flagellum* 36-41-jointed; scape a little longer than first joint of flagellum, pedicellum globular. *Thorax* shining, sparsely punctulate and pilose; parapsidal furrows converging and ending in a median V-shaped, impunctate impression, which lies in the posterior third of the mesonotum; mesonotum (including scutellum) margined; propodeum not flat but rounded, more pilose and punctulate than the rest of thorax, irregularly rugulose and tending to have poorly-defined areoles, which are more especially prominent in ♀ ♀; r (first abscissa of the radius), a little more than $\frac{1}{6}$ as long as r-m; shorter than the petiole of M_4 ; M_4 petiolate, petiole about $\frac{1}{5}$ as long as m-cu. *Abdomen* finely punctulate, shining, very sparsely pilose; 1st segment margined laterally, finely and closely striated with some of the elevations often more prominent at basal half; 2nd segment with a little more than its basal half finely and closely striated, except at sides; ♂ and ♀ similar, except as noted above.

"Cotypes deposited in collections of the Maine Agricultural Experimental Station, Orono, Maine; Cornell University, Ithaca, N. Y., and in the private collection of E. A. Richmond, Ithaca,

N. Y. Paratypes deposited in the collections of the Maine Agricultural Experiment Station, Orono, Maine; the United States National Museum, Washington, D. C., and in the private collection of W. C. Woods, Orono, Maine. Type locality, Washington County, Maine.

"Described from 10 specimens, 7 ♀♀ and 3 ♂♂. Bred from puparia of *Rhagoletis pomonella* Walsh from blueberries, by W. C. Woods, Maine Agricultural Experiment Station; lot 1,700, sub. 17."

Genus *Biosteres* Förster.

1862. *Chilostrichia* Förster, Verh. Nat. Ver. Preuss. Rheinl., v. 19:258.

Biosteres Förster, Verh. Nat. Ver. Preuss. Rheinl., v. 19:259.

Rhabdospilus Förster, Verh. Nat. Ver. Preuss. Rheinl., v. 19:259.

1895. *Trichopius* Thompson, Op. Ent., p. 2,176.

1904. *Biosteres* Szepliget, Gen. Ins., Fasc. 22, p. 161.

The following description is a translation of the distinguishing characters of the genus *Biosteres* Förster, as stated in the Genera Insectorum, fascicle 22, p. 161.

"Clypeus bare or strongly and thickly pilose (*Chilostrichia* = *Trichopius*), forming no opening with the mandibles (except *Rhabdospilus*). Stigma small and long, the inner side shorter or almost as long as the outer. Second submarginal cell shorter than in *Opius*. Second abscissa of radial vein as long or barely longer than the r-m. Parapsides usually distinct, mesopleura with or without furrows."

Mr. Richmond informs me that *B. indotatus* Viereck (described from Kansas in the Trans. Kans. acad. sci., 1905, v. 19: 272-278), which is black in colour, is the only other species of *Biosteres* described from Region 5.

EXPLANATION OF PLATE XII.

Fig. 1. *Biosteres rhagoletis*, n.sp., female; fig. 2, fore wing of same; fig. 3, hind wing of same.

A CONTRIBUTION TOWARDS THE TAXONOMY OF THE *DELPHACIDÆ*.

BY F. MUIR,

Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.

[Continued from Page 270]

DELPHACINI.

- 1 (6) Mesonotum with five carinæ.
- 2 (3) Two medio-longitudinal frontal carinæ, { *Micromasoria*.
meeting together at base and apex { *Livatis**.
- 3 (2) One medio-longitudinal frontal carina.
- 4 (5) In profile head semicircular; antennæ terete.....*Paranda*.
- 5 (4) In profile head not semicircular; first joint of antennæ compressed and dilated, obliquely triangular, second slightly longer than first.....*Eodelphax*.
- 6 (1) Mesonotum with three carinæ or less.
- 7 (20) Antennæ with one or both segments distinctly flattened.
- 8 (9) Two medio-longitudinal frontal carinæ, distinct throughout or approximate at one or both ends. *Pseudaræopus*.
- 9 (8) One medio-longitudinal frontal carina, simple or furcate.
- 10 (13) First antennal joint long, subparallel sided, semi-foliaceous, antennæ as long as face and clypeus together.
- 11 (12) Head as wide, or nearly as wide, as pronotum....*Delphax*.
- 12 (11) Head narrower than pronotum..... *Sparnia*.
- 13 (10) First joint of antennæ subtriangular or sagittate, antennæ not as long as face and clypeus together.
- 14 (15) Length of face equal to width between eyes; clypeus angled in middle, the median carina forming deep keel at bend..... *Bostara*.
- 15 (14) Length of face considerably greater than width.
- 16 (17) First joint of antennæ sagittate, antennæ not as long as face; medio-longitudinal carina of face fureate at extreme base; sides of face slightly arcuate; clypeus bent nearly at right angle in middle.....*Belocera*.
- 17 (16) First joint of antennæ triangular, but not sagittate; clypeus not angular in middle.

*I can find no distinctions between these two genera from the descriptions.
September, 1915

- 36 (37) Antennæ long, reaching nearly to end of clypeus, first joint distinctly more than half the length of second; spur with a few distinct teeth on hind margin *Kormus*.
- 37 (36) Antennæ not so long, reaching about end of face, second joint about double as long as first.
- 38 (39) First joint of hind tarsus longer than the other two together, spur with many fine teeth on hind margin *Anectopia*.
- 39 (38) First joint of hind tarsus not so long as the other two together, spur with minute tooth at apex, but none on hind margin, or very minute hair-like ones *Eurysa*.
- 40 (35) Carinæ of head distinct.
- 41 (52) Face with two medio-longitudinal carinæ.
- 42 (45) Vertex distinctly broader than long.
- 43 (44) Face angular, as wide as long *Amblycotis*.
- 44 (43) Face longer than wide; carinæ on face indistinct, especially at base and over vertex *Eurybregma*.
- 45 (42) Vertex much narrower in proportion to length.
- 46 (49) Apex of vertex subangular, making vertex somewhat 5-sided or apex broadly conical.
- 47 (48) Face broad, about as broad as long, medio-longitudinal carinæ very faint, especially at base, dividing face into three subequal parts *Metropis*.
- 48 (47) Face much narrower, decidedly longer than broad; median carinæ not so faint, contiguous or very approximate at base and apex; median portion of face narrower than lateral portions *Jessidæus*.
- 49 (46) Apex of vertex truncate or but little rounded, vertex square or little longer than wide, not 5-sided.
- 50 (51) Lateral carinæ of pronotum divergingly curved, not reaching hind margin *Criomorpus*.
- 51 (50) Lateral carinæ of pronotum straight, reaching hind margin *Macrotomello*.
- 52 (41) Face with one medio-longitudinal carina, simple or furcate.

- 53 (54) Medio-longitudinal carina of vertex with small areolet in middle; no transverse or medio-lateral carinae *Liburniella*.
- 54 (53) Medio-longitudinal carinae without small areolet, transverse or medio-lateral carinae present.
- 55 (74) Medio-lateral carinae of vertex converging apically, but not meeting on vertex, continued separate on to face, where they meet (frontal carina furcate).
- 56 (63) Lateral carinae of pronotum straight or convergingly curved posteriorly, reaching hind margin, or all but doing so.
- 57 (58) First joint of antennae more than half the length of second *Megamelus*.
- 58 (57) First joint of antennae less than half the length of second.
- 59 (60) Head and thorax (to end of mesonotum) twice or more the width of head, including eyes; length of face three times the breadth; spur with many (about 12-15) small teeth *Stenocranus*.
- 60 (59) Less slender forms. Head and thorax about one and a half times the width of head, including eyes; length of face 2 or 2½ times the breadth.
- 61 (62) Vertex perceptibly longer than broad, apex narrower than base; spur with few (about 8) large teeth.....*Kelsia*.
- 62 (61) Vertex square; spur with numerous minute teeth *Peregrinus*.
- 63 (56) Lateral keels of pronotum divergingly curved posteriorly, not reaching hind margin.
- 64 (65) Medio-lateral carinae of vertex not meeting lateral carinae till base, forming two 4-sided areas; face considerably broadened in middle, furcation of median frontal carina very near base.....*Conomelus*.
- 65 (64) Medio-lateral carinae of vertex meeting lateral carinae before base, forming two 5-sided areas; face not so broad in middle.

- 66 (69) Vertex longer than broad.
- 67 (68) Vertex double the length of pro- and mesonotum together *Embolophora*¹
- 68 (67) Vertex only slightly longer than wide²..... *Euidella*.
- 69 (66) Vertex not longer than wide.
- 70 (71) Face almost circular *Bakerella*³
- 71 (70) Face with sides nearly straight, subparallel.
- 72 (73) Median frontal carinae forked near base..... *Liburnia*.
- 73 (72) Median frontal carinae forked near middle *Dicranotropis*.
- a Median frontal carinae forked near apex..... *Leimonodite*.
- 74 (55) Medio-lateral carinae of vertex meeting together on vertex (meeting sometimes obscure) continued on to face as single carina.
- 75 (92) Lateral pronotal carinae straight or convergingly curved posteriorly, reaching hind margin or exceeding near it.
- 76 (77) Medio-lateral carinae of vertex meeting together some distance before apex, vertex long and narrow, produced well beyond eyes, slightly narrowed in middle; Y-shaped carina obsolete..... *Saccharosydne*.
- 77 (76) Medio-lateral carinae of vertex meeting at apex.
- 78 (79) Head, including eyes, distinctly wider than pronotum, hind edge of eyes nearly reaching to posterior angle of pronotum; vertex apically truncate, produced but slightly beyond eyes *Smicrotodelphax*.
- 79 (78) Head, including eyes, not wider than pronotum; hind edges of eyes not reaching near to posterior angle of pronotum.
- 80 (81) Head in profile semicircular..... *Prokelisia*.

1. I place this genus here on the strength of Stal having separated it from *Liburnia* by the length of head.

2. I have not seen *Euidella Speciosa* or *Dicranotropis hamata* so I must let them stand as above for the present. *Nilaparvaria* may come next to *Euidella*.

3. It is possible that this genus will be more appropriately placed in Section B.

- 81 (80) Head in profile more or less angular at apex of vertex, face flattened.
- 82 (83) Vertex twice as long as wide.....*Zuleika*.
- 83 (82) Vertex considerably less than twice the width.
- 84 (87) First joint of antennæ more than half the length of second.
- 85 (86) Broad forms. In dorsal view width of head (including eyes) nearly twice the length; pronotal carinæ in some species not quite reaching hind margin, but not divergingly curved *Pissonotus*.
- 86 (85) More slender forms. In dorsal view width of head (including eyes) less than $1\frac{1}{2}$ times the length; pronotal lateral carinæ reaching hind margin. } *Megamelus*
Gelasto-
delphax
- 87 (84) First joint of antennæ less than half the length of second.
- 88 (89) Head and thorax (to end of mesonotum) twice or more the width of head, including eyes.....*Stenocranus*.
- 89 (88) Less slender forms. Head and thorax about $1\frac{1}{2}$ times the width of head, including eyes.
- 90 (91) Lateral margins of face straight, face broadest at apex, base truncate*Sogata*.
- 91 (90) Sides of face slightly arcuate, apex narrower than middle, base curved or subconical.
- a Junction of vertex and face angular in profile, a faint carina dividing them.....*Haplodelphax*.
- b Junction of vertex and face more rounded in profile *Kelisia**
- 92 (75) Lateral carinæ of pronotum divergingly curved posteriorly, not reaching hind margin.
- 93 (94) Medio-lateral carinæ of vertex meeting together before apex, vertex well produced beyond eyes (Y-shaped carina faint) *Sardia*.

**Conometus* and *Eurysa* can be distinguished from this genus by the broader vertices if the furcation of the frontal carinæ are obscure. *Megamelanus* appears to be near this genus.

- 94 (93) Medio-lateral carinæ of vertex meeting at apex.
- 95 (96) Apical margin of vertex conically or roundly produced; face distinctly longer than wide *Delphacinus*†
- 96 (95) Apical margin of vertex not conically or roundly produced, but truncate or slightly curved.
- 97 (100) Vertex distinctly longer than wide, apex narrower than base.
- 98 (99) First joint of hind tarsus distinctly longer than the other two together; antennæ reaching beyond apex of face *Chloriona*.
- 99 (98) First joint of hind tarsus hardly as long as the other two together; antennæ not reaching to apex of face *Chlorionidea*.
- 100 (97) Vertex not, or slightly, longer than broad.
- 101 (102) Face nearly as broad as long *Eoeurysa**
- 102 (101) Face much longer than broad.....) *Kalpa*
- 103 (104) Face very long and slender.....) *Nilaparvata* **
- 104 (103) Face longer than broad, but not greatly so.
- 105 (106) Face with lateral edges nearly parallel (first segment of antennæ nearly as long as second; two basal areas of vertex 5-sided; two median sectors, first touching cubitus for short distance, characters not strictly reliable *Liburnia*.
- 106 (105) Face with lateral edges more arcuate (first segment of antennæ much shorter than second; two basal areas of vertex 4-sided; one median sector which amalgamates with first cubitus to apex or near apex) *Conomelus*

†*Megamelanus* is separated from this genus chiefly by the straight lateral pronotal carinæ reaching the hind margin.

*This may prove to be *Eumetopina*.

**In the Fauna of India *Nilaparvata* is separated from *Kalpa* by furcation of median frontal carina at base, but in the description of the genus the medio-lateral carinæ of vertex are described as meeting before apex.

THE 1914 RECORD OF CATOCALÆ AND OTHER
LEPIDOPTERA.

BY R. R. ROWLEY AND L. BERRY, LOUISIANA, MO.

This record has to do with Missouri and contiguous territory only and is mainly the story of the best *Catocala* year since 1900.

The season was not unlike that of 1913, being very hot and dry, and both were duplicates of 1900 and 1901. The winter of 1913-14 was mild up to Christmas, dandelions blooming along the streets of Louisiana to the 23rd of December.

On the 28th of November, the day after Thanksgiving, the senior author collected from black mustard seven larvæ of *Pieris rapæ*, one third of an inch long, securing the first pupa on the 30th of the same month, and the first imago on the 15th of December. This imago was fed on sweet liquids and lived ten days.

Chrysalids of *Smerinthus ophthalmicus*, from larvæ fed the summer before, began giving moths April 18th and up to May 23rd, but only two perfect females out of sixteen were secured. Most of the seven males were perfect. A fine male of this moth that came from the chrysalis at 6 p.m. on the 3rd of May remained motionless, in a box, till 2.30 the next morning, when it began a noisy fluttering. An imago of *Papilio philenor* came from a chrysalis on the 21st of April.

Eggs of *Catocala cerogama* began hatching April 26th, those of *C. coccinata* on the 29th, and of *C. lacrymosa* on the 8th of May. A pair of *Samia columbia* moths from cocoons, furnished the senior author by Mrs. DeCoster of Buckfield, Maine, emerged April 27th.

Ten half-grown larvæ of *Catocala illecta* were collected from honey locust sprouts, April 29th, others on the 1st and 3rd of May.

The first *Samia gloveri*, a fine female, May 1st came from a cocoon furnished by the junior author, but collected by Tom Spaulding of Utah.

The first larva of *Catocala innubens* was found on the 3rd of May, and the first *illecta* began spinning on the 6th of the same month.

Eggs of several species of hickory-feeding *Catocalæ* began hatching May 5th.

A *Papilio troilus*, ex-pupa, on the same date.

Eggs of *Catocala lacrymosa* began hatching on the 8th of May.

The first luna from cocoon, on the 11th of May, and the first larva of *Catocala innubens* began spinning on the 17th.

A chrysalis of *Ceratonia amyntor* gave an imago on May 18th. Imagos of the larger silk moths usually emerge from the chrysalis in the forenoon, but occasionally later in the day, even to 9 p.m., while the hawk moths and ceratocampians generally emerge in the night time, probably toward morning, the *Catocalæ* making the change before midnight.

The first larva of *Catocala minuta* was found on honey locust May 21st. A pupa of *Smerinthus excæcatus* gave a moth on the following day.

Half-grown larvæ of *Catocala neogama* were found on walnut on the 26th of May.

The heat of the last week of May killed most of the larvæ of *cerogama*, as well as the hickory-feeding *Catocalæ*.

The first *illecta* imagos emerged June 6th, and the first *promethea* moths on the same date.

On June 6th the senior author received larvæ and pupæ of Texas hawk moths and chrysalids of butterflies from Miss Pattie Hutchinson of Beeville, Texas, but for lack of suitable food the hawk larvæ died.

The pupa period of *Catocala illecta* is one month.

The first trip to the woods in search of *Catocalæ* was on the 9th of June, when the senior author took a deformed *polygama* and two fine *iliæ*, one of which was the white spotted variety.

On the evening of the 10th of June Miss Gertrude Wallace took *Catocala whitneyi* at bait. This was the first specimen of this species ever taken here.

Fresh specimens of *Apatura celtis* and *Callidryas eubule* were taken on the 10th.

The second trip to the woods was made on the 11th, and specimens of *Catocala ilia*, *polygama*, *epione*, and one *clintoni* were taken.

A pupa of *Catocala minuta* that as a larva spun on May 27th gave an imago on June 12th.

On June 11th, while wading through underbrush on a heavily wooded hillside, in search of *Catocalæ*, the senior author came upon a great spider web that held entangled twenty-eight struggling specimens of *Thecla calanus*.

On the 13th of June "Catacala hollow," as well as the hillside, was full of "Catos," *polygama*, *clintoni*, *minuta*, and many *ilia*. Took also *Vanessa antiopa*, *Pyrameis huntera*, *Euptoieta claudia* and *Feniseca tarquinius*.

Catocalæ were numerous on the 14th, but fewer on the 15th, due perhaps to the cloudy, cool character of the day. What few moths observed were high on the trees, while on the 7th, 11th and 13th, warm dry days, the "Catos" were abundant and at the very bottoms of the tree trunks.

The first bred imago of *Catocala coccinata* emerged on the 17th; a *minuta* on the 18th, and an *innubens* on the 19th.

In the woods on the afternoon of June 19th, found "Catos," very abundant and low on the trees. The day was warm. Both *ilia* and *epione* were by the hundreds, but wary. Individuals of the latter species were on both the tree trunks and in the brush, flying up at every step, and often as many as four or five would fly off of one tree. *Ilia* was hardly less numerous. *Polygama* was fairly common. On this trip the first *grynea*, as well as the first *innubens*, were taken. *Minuta* and *clintoni* were ragged.

Saw the first of the metallic black and green dragonflies (*Calopteryx*) along the Creek Bank on June 15th, and heard the first green cicada on the 16th.

Great numbers of *Argynnis cybele*, with an occasional *idalia*, were taken at *Asclepias* blooms during the third week of June. At the same time hundreds of individuals of *Pieris protodice* flitted about the fields; in fact, in greater numbers than the senior author ever saw before. *Coliads* were very few.

June 21st was a banner day. Took *Catocala amica*, *scintillans*, *ultronia*, *neogama*, *palæogama*, and two fine *dejecta*. The woods were full of moths, low on the trees, but very wary. Both the hollows and hillsides furnished good collecting. The day was hot and dry and the thermometer at 102°.

The next day, June 22nd, was hot and cloudy, and moths were again abundant, especially *amica*, *polygama*, *ultronia* and *innubens*, mostly along the branch beds. Saw a few *scintillans* and took a fine specimen with a white discal spot and a splendid female *dejecta*.

On the 23rd, after a slight rainfall of the night before, but still sultry, moths were not scarce, but hardly so plentiful as the day

before. Miss Gertrude Wallace was with the collecting party on this trip and took some good "Catos."

On June 25th saw the first *Catocala junctura* of the season, a beautiful new specimen.

On the night of the 25th took at bait in my own yard specimens of *Catocala epione*, *illecta*, *ultronia*, *amica*, *innubens*, and *grynea*.

On the forenoon of the 26th found the woods full of moths, 25 to 30 often flying from one tree trunk, but mostly *epione* and *innubens*. Took two fine *neogama*, three fine *palæogama*, the first *residua* of the season and five *Catocala serena*, the first senior author ever saw in Missouri. These last were taken on elm, hickory and oak, and when disturbed flew around the tree and alighted a little "higher up," like *amica*, *habilis* and other small species. *Catocala* of several species were not uncommon on the shade trees along the streets at Louisiana.

Another good day was the 28th, when the senior author, in company with Frank Caldwell and Lowell Pinkerton, took good specimens of *neogama*, *palæogama*, *residua*, *epione*, *innubens*, *scintillans*, *amica*, *ilia* and one *junctura*, a splendid specimen. The day was somewhat cooler and the moths correspondingly fewer than on the 26th. The best catch was, perhaps, a fine male *subnata*, a rare moth here.

At "Bouncing Bet" flowers, on the same day, took numbers of *Deilephila lineata* of the largest size, and on the 29th took a good specimen of *Hemisesia titan* on the same flowers.

In the woods on the 1st of July, after a steady all-night rain, found no moths on the hillsides, but a few *innubens* and *scintillans* about tree roots in the hollows. Took a perfectly fresh specimen of *Ceratomia amyntor* of as large size as the species attains. The day was cloudy, damp and threatening rain.

July 4th was a hot, damp day and "Catos" were plentiful at the bases of the trees. We took *flebilis*, *relecta*, *cara*, *palæogama*, *neogama*, *residua*, and *phalanga*. Of these *flebilis*, *relecta*, *cara* and *phalanga* were the first of the season. Miss Wallace and John DeGroot accompanied the senior author on this trip.

On the 5th found moths abundant and low on the trees. Weather hot and somewhat damp. Took fine specimens of *cara*, *residua*, *obscura*, *subnata*, *palæogama*, *neogama* and *phalanga*. Other species were poor.

The 6th was hot and close and the *Catocalæ* were abundant on the hillside facing the east and in the branch bed, but were few higher on the hill. The flight of scores of *innubens* and *palæogama*, disturbed by the collector's approach, scared other and better things away. Took a splendid female *subnata* near the head of the hollow, and on the hillside, took the first *viduata* of the season, a male *dejecta* and other good moths. *Residua* were abundant, and *cara* and battered specimens of *ilia* common.

On the afternoon of the 8th found "Catos," especially *palæogama*, *innubens*, and *residua* very abundant and *neogama* fairly common. Among other things, took a fine female *subnata* and a ragged female *isolabilis*. The day was close and hot.

July 12th was a red-letter day in moth collecting. Weather intensely hot and dry. Took the first *nebulosa*, *habilis* and *lacrymosa* of the season. The last named, a variety of singular beauty with both pairs of wings black and the front ones having a broad outer and posterior band of white. The colours much more intense than in *paulina*. Took also three fine *viduata*, *cara*, *neogama*, two faded *serena* and *palæogama*. The *lacrymosa* was a female, and so was the *nebulosa*.

Moths were mostly low on the trees and abundant everywhere, even at the mouth of the hollows where there was but little shade.

The 13th was dry and hot, and moths were not scarce. Took a *paulina*, *cara*, *palæogama*, *neogama*, *resecta*, *phalanga*, *residua* and ragged examples of *ilia* were very abundant. Miss Wallace took a second *junctiona* on this date.

July 15th took six *Catocala viduata*, all males, four *resecta*, one brand-new *ilia* and a ragged *dejecta*.

Weather hot and dry. Few *Catocalæ* in the hollow, more on the hillside. *Viduata* is almost always at rest on white oak trees and usually under the leaves of vines, but rarely nearer the ground than four feet. When scared out of their resting places, they simply fly higher or around to the other side. They seem lazy. *Innubens* and *palæogama* stay near the bottoms of the trees in dry hot weather, and so do *neogama*, *cara*, *innubens*, *nebulosa* and *junctiona* under roots along the little brooks. *Junctiona* rests also under porches, in deserted sheds and under bridges.

(To be continued.)

FIELD NOTES AND QUESTIONS.

THE INSECT FAUNA OF THE NEW JERSEY COAST.

The coastal strip of New Jersey, which is that portion of the state bordering on the Atlantic Ocean, consists of the beach front and the sand hills immediately back of it, the marshlands lying between the beach and the mainland and various islands composed of different types of soil found chiefly in the southern portion of the coastal strip. These islands contain sandy areas, some agricultural land, salt marsh, cedar and sphagnum swamps, and have a varied flora. As a result, their insect fauna is correspondingly rich and many species occur there which are also found throughout the state.

The following information, compiled from Smith's "Insects of New Jersey," gives one an idea of the characteristic insect fauna of the marshlands and beach, both of which have been fairly well collected over. The Odonata of the beach number nine species, representing three families, and of the marshland, two species from two families. In the Homoptera, thirteen species occur on the marshland, seven of which belong to the Jassidæ, five to the Fulgoridæ, and one to the Coccidæ, while none is found on the beach.

The Hemiptera is poorly represented on both beach and marshland, one family and two species being found on the former and two families and two species on the latter. The Orthoptera of the beach number five species and two families, and of the marshland, seven species and two families. Of the Coleoptera, seventy-one species and twenty-two families occur on the beach and fifty-six species and fourteen families on the marshland, this order being the best represented on the coastal strip. Of the seventy-one species on the beach, seventeen belong to the Carabidæ, and of the fifty-six on the marshland, thirty-one belong to the same family.

The Lepidoptera is poorly represented on the beach by one species and one family, but on the marshland, eleven species and five families are found. In the Diptera, six species belonging to the family Tabanidæ are found on the beach, while on the marshland twelve species, representing the two families, Culicidæ and Tabanidæ, occur.

It must be remembered, of course, that overlapping takes place, it being impossible to separate the areas sharply from each other or from the adjoining section of the state.

HARRY B. WEISS,
New Brunswick, N.J.

A EUROPEAN BEETLE, RECENTLY INTRODUCED INTO CANADA.

(*Orchestes scutellaris.*)

This spring, while sweeping on the border of a wood—not far from the city of Ottawa—where small willows and raspberry bushes were growing, I captured an interesting small “Curculionid.” The specimen was sent to the Bureau of Entomology, Washington. Mr. Schwarz, who identified it, sent me the following note: “Your beetle is a European species hitherto not known to occur in North America. It belongs to our jumping Curculionidae (genus *Orchestes*), which have the hind femora incrassate. It is easily known by its brownish coloration, our common species being all black, or black with white markings.”

The specimen has been kept for the U. S. N. M.

Ottawa, July, 1915.

BRO. GERMAIN.

BOOK REVIEWS.

THE BUTTERFLY GUIDE: A Pocket Manual for the ready identification of the common species found in the United States and Canada. By W. J. Holland, LL.D. Doubleday, Page & Co., Garden City, New York. (Price \$1.00.)

This little book is published in the same form as the well-known Bird, Flower and Tree Guides, with flexible covers, and in shape and size convenient for carrying in the pocket. It consists of 237 pages, and is illustrated with 295 coloured figures, representing 255 species and varieties. There are also five plates in explanation of structure, venation, metamorphosis, and the apparatus required for catching, breeding and mounting specimens.

The first sixty pages give an admirable introduction to the scientific study of the Diurnal Lepidoptera, explaining clearly the

external and internal anatomy of Butterflies, the wing-venation, and the life-history during the four stages of metamorphosis. This is followed by full directions for collecting and preserving specimens. A careful study of this introduction, written as it is in simple language, will enable the reader to understand the classification, and to realize that the Butterflies he captures are something more than a collection of pretty objects.

The coloured figures, though they necessarily fail in some cases to represent the splendour of the originals, are true to nature and will enable anyone to identify the larger species almost at a glance; for the Skippers and other small forms it will be necessary to consult also the descriptions and comparisons given in the text. The possession of this handy little book will be a permanent joy to every collector of these lovely "winged flowers of the air," and it ought to find a place among the Nature-study books of every school library, as well as in the pocket of everyone who takes delight in the beauties of the world around him.

Dr. Holland's Butterfly and Moth Books were the first publications which gave coloured illustrations of the insects at a price within the means of those most interested, and deservedly met with a very large sale. Our debt of gratitude to the author is now largely increased by the work before us, which is so much cheaper and handier, and which includes all our Canadian Butterflies, with the exception of a few very rare species.

C. J. S. B.

INDIAN FOREST INSECTS OF ECONOMIC IMPORTANCE. COLEOPTERA.

By Edward Percy Stebbing, London. Eyre & Spottiswoode, Ltd., 1914. Price 15 shillings.

It may come to many as a surprise to see a volume of 648 pages on a single order of Indian forest insects, as we are accustomed to think of the vast insect fauna of India as too little known to render possible the preparation of such a work, and while Prof. Stebbing's book, as the author modestly remarks, "has no pretensions to be more than a pioneer endeavouring to indicate in some small degree the lines upon which the further study of the subject should proceed," there is nevertheless a vast amount of

information contained within it on the life histories and economic relations of the beetles that are more or less destructive to Indian forests.

Some idea of the vastness of the subject may be gained from the author's statement, quoted from J. S. Gamble (Manual of Indian Timbers) that "the Indian forests contain some 5,000 different species of trees, shrubs, climbers and bamboos"; for here, as elsewhere, the number of species of insects corresponds more or less closely upon that of the plants on which they feed.

The material for the present work was chiefly gathered by the author since 1898 while acting in the capacity of Imperial Forest Zoologist and Member of the Forest Research Institute, Dehra Dan, India.

The first five chapters deal with the more general phases of the subject, such as the distribution of forest insects in India (Chap. I), the methods by which the presence of insect pests in the forest can be ascertained, the general methods of control and the characteristics of the order Coleoptera. The special part treating of the various families and species of beetles, which are arranged according to Lefroy's *Indian Insect Life*, comprises the remaining 27 chapters. It deals with a very large number of species, about most of which very little is known; but the life histories of not a few of the more destructive species have been worked out by the author, and their economic relations, methods of control, etc., are given in considerable detail.

A good many of the species noticed are of no economic importance, all species showing any definite relation to trees or tree-products being included, on account of the necessity, on the part of the forester, of being able to recognize such species and distinguish them from the truly injurious forms.

There are no keys, but descriptions of all the species dealt with are given and a very large proportion are figured. Unfortunately a great many new species are described, an undesirable feature in an economic treatise. This was perhaps difficult to avoid, however, in the present work, as it is possible that the publication of so many new species in the regular journals might have caused serious delay in the issue of the book.

The illustrations include 64 plates, of which seven are coloured, and 401 text figures. They are of very variable quality, being the work of several different artists. The great majority are excellent in every respect, some of the plates, such as Plate XV, on which a group of Buprestids is shown in colour, being of great beauty and finish. Some of the coloured plates, however, are poor, and among the text figures are a few exceedingly crude sketches, which look like rough field notes that had never been intended for reproduction.

As a pioneer effort in the study of Indian forest insects, the book is deserving of great praise and will undoubtedly be the most useful work on the subject of Indian forest beetles for many years hence. We look forward with pleasure to the appearance of the next volume in this series.

A PRELIMINARY LIST OF THE INSECTS OF THE PROVINCE OF QUEBEC.

Part II—Diptera (Two-winged Flies). Compiled by Albert F. Winn (Westmount) and Germain Beaulieu (Ottawa). Published as a supplement to the 7th Report of the Quebec Society for the Protection of Plants, 1915.

We received with much pleasure recently a copy of Part II of the Quebec List of Insects, dealing with the Diptera or Two-winged Flies. As so few entomologists in Canada have given any attention to the systematic study of this order, it was with some surprise that we noted the names of nearly 800 species in the list. This number must, of course, be very far short of the actual number of species which inhabit the Province, but it is a very creditable beginning, and sets an example that should be emulated by entomologists in other Provinces.

The same plan is followed in this list as in that of the Lepidoptera, except in the omission of illustrations—an improvement in our opinion.

The localities given for species are naturally fewer than is the case of the Lepidoptera, there being fewer collectors of this order. A large proportion of the species were collected by the junior author and Mr. G. Chagnon, of Montreal.

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POPULAR AND ECONOMIC ENTOMOLOGY.

THE ESTABLISHMENT OF FOREIGN INSECTS IN SPITE OF INSPECTION.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

At Rutherford, N.J., are located two large nurseries which import a considerable quantity of nursery stock from Europe, Asia and South America every year. During the spring of 1914 three thousand seven hundred and forty-four cases of imported stock were consigned to Rutherford; during the fall of 1914 the number of cases was one thousand seven hundred and sixty-five, and during the spring of 1915 two thousand one hundred and ninety-one cases were received. From these figures, representing the combined imports of the two firms, one can get some idea of the enormous numbers of imported plants which are set out in this vicinity and later distributed to various points in the United States and possibly Canada.

During the inspection seasons, one or more men are stationed at Rutherford for the purpose of examining this stock as it comes in, and all possible precautions are taken to see that nothing undesirable is introduced. Yet, in spite of this, the following foreign species have recently become established in that vicinity.

Phytomyza aquifolii Gour. was lately found mining the leaves of English holly. This species has also been taken, mining the leaves, on English holly imported from Holland. In May, 1915, the European pine-shoot moth, *Evetria buoliana* Schiff was taken in *Pinus mughus* growing in the nursery. During August, 1913, *Agrius viridis* Linn. var. *fagi* Ratz. was found infesting rose stems and doing considerable damage in this as well as in other sections of the state.

In January, 1914, *Aspidiotus tsugæ* Marlatt was taken in considerable numbers on Japanese hemlock. Since that time, however, all infested trees found have been destroyed.

Myelophilus piniperda Linn., which often does extensive damage to pine trees in Europe, was also found at Rutherford in *Pinus sylvestris*. In 1909 Dr. J. B. Smith had his attention called

to the European Red Tail, *Dasychira pudibunda* Linn., which had been bred from pupa collected near Rutherford. This insect is widely distributed in Europe and parts of Asia, and ranks as a first-class pest along with the Gipsy and Brown-tail Moths.

During June, 1915, a species of *Pseudococcus*, evidently from Japan, was found doing considerable damage to *Taxus* sp., originally from that country, and in July, 1915, a mole-cricket,* as yet unidentified but supposedly from Europe, was found in comparatively large numbers feeding on the roots of various plants. In addition to the above foreign species, Rutherford has also received unwelcome insects from other states, the most important being the Gipsy Moth and the Florida Fern Caterpillar, *Callopietria floridensis* Guen. The Gipsy Moth infestation has, of course, been entirely destroyed.

With one or two exceptions, the above established infestations are light, but it is only a question of time before they will become more troublesome. On account of the similarity between the climate, animals and plants of North America and the northern parts of Europe and Asia, various European pests do very well in this country, especially when allowed to develop unchecked by parasitic enemies and cultural methods. Imported nursery stock is undoubtedly the greatest source of danger, although some species come over in merchandise, or in the packing around merchandise, while others are accidental passengers on boats. Many of our now common and destructive pests were imported before quarantine laws and inspection systems were in force.

The well known San José scale is probably a native of central China. The Gipsy Moth, *Porthetria dispar* Linn. is a serious pest in Europe, and occurs in Asia and northern Africa. The Brown-tail Moth, *Euproctis chryorrhæa* Linn., is from central and western Europe. The codling moth, *Cydia pomonella* Linn., the pear psylla, *Psylla pyricola* Foerst., the clover leaf weevil, *Phytonomus punctatus* Fab., the clover root-borer, *Hylastinus obscurus* Marsham, the seed corn maggot, *Pegomya fusciceps* Zeit., the pea moth, *Semasia nigricana* Steph., the carrot rust fly, *Psila rosæ* Fab., the imported onion maggot, *Pegomyia ceparum* Bouche., both asparagus

* This has since been determined by Mr. J. A. G. Rehn as *Gryllotalpa gryllotalpa* Linn., the European mole-cricket.

beetles, *Crioceris asparagi* Linn., and *C. 12-punctata* Linn., the strawberry leaf-roller, *Ancylis comptana* Frohl., and the imported cabbage worm, *Pontia rapæ* Linn., are all of European origin.

The alfalfa weevil, *Phytonomus murinus* Fab., is a native of Europe, western Asia and northern Africa; the Mexican cotton boll weevil, *Anthonomus grandis*, came from Central America and Mexico, the sugar beet web-worm, *Loxostege sticticalis* Linn. from Europe and northern Asia, the harlequin cabbage bug, *Murgantia histrionica* Hahn., from Mexico and Central America, the Anguamois grain moth, *Sitotroga cerealella* Oliv. from Europe and the Argentine ant, which has recently become such a pest in the Southern States, from Argentina.

Various other pests have also come to us from abroad, among which are the elm leaf-beetle, *Galerucella luteola* Mull., the wood leopard moth, *Zeuzera pyrina* Linn., the Hessian fly, *Mayetiola destructor* Say., the hop plant-louse, *Phorodon humuli* Schrank, the willow and poplar curculio, *Cryptorhynchus lapathi* Linn., the apple aphid, *Aphis mali* Fabr., the elm bark louse, *Gossyparia ulmi* Geoff., the bed-bug, *Acanthia lectularia* Linn., the Buffalo carpet-beetle, *Anthrenus scrophulariæ* Linn., the larder beetle, *Dermestes lardarius* Linn., and the rice weevils, *Calandra granaria* Linn., and *oryzæ* Linn.

The above list, while not by any means complete, will serve to show the importance of introduced species. The injuries caused by these imported pests are, of course, perfectly enormous, and, running as they do into millions of dollars, are beyond reasonable calculation.

While inspection service is doing considerable to prevent the establishment of foreign insects, it is not by any means complete, and, as has been suggested before, a federal law prohibiting the importation of all nursery stock would be the nearest approach to perfection.

A NEW MIDGE FROM GUATEMALA.

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

Hardly anything is known of the Chironomid fauna of the highlands of Central America, but it cannot be doubted that these regions are rich in species still awaiting discovery and description. When Mrs. Cockerell was in Guatemala City, although not specially concerned with Diptera she obtained a couple of specimens of a new form which is described herewith.

Chironomus gualtemaltecus, n. sp.

♀—Length about 6 mm., wing 4 mm., anterior tarsus 5.75 mm. Antennæ 7-jointed, pale ochraceous, last joint black; length of joints in microns: (2) 64, (3) 144, (4) 136, (5) 128, (6) 96, (7) 224; first joint very broad, cushion-like; second short, cylindrical, slightly swollen apically; 3 to 6 flask-like, bulbous at base, narrow and neck-like apically; 7 narrow and cylindrical, tapering apically; joints 2 to 6 with very long hairs (one hair on 4 fully 336 microns long, one on 6 288 microns); 7 with much shorter (about 65-80 microns) curved hairs. Palpi dusky. Thorax finely hairy, pale ochraceous; mesonotum dull (the bands faintly shining), with three reddish or reddish-fuscous longitudinal bands, the middle one divided into two by a fine median line and ending abruptly posteriorly a little beyond middle of mesonotum; lateral bands very broad, evanescent anteriorly; scutellum pale yellowish; metathorax rufous; halteres with dark knob. Abdominal segments with basal half or rather more (especially on segments of apical half) black, and apical border pale ochraceous. Legs very pale ochraceous, marked with dusky; femora with a suffused dusky sub-apical ring; anterior tibiæ with more than the basal half, as well as the extreme apex, dusky; middle and hind tibiæ dusky at extreme apex, and faintly so at base; tarsal joints dark at apex; anterior tibiæ 1408-1440 microns long, anterior basitarsi 1370-2495. Wings hyaline, iridescent, with very pale veins, a dark spot at cross-vein as in allied species; fork of vein 5 a little beyond level of fork of 3-4; end of vein 3 very near wing tip, about as in *C. fallax*, but wing is narrower in proportion to its length than in that species; three very distinct anals.

Hab.—Guatemala City, Guatemala (*W. P. Cockerell*).

In Johannsen's key (Bull. 86, N. Y. State Museum) it runs to *C. viridicollis*, which differs in many details; in the auxiliary key it falls near *C. albistria* Walker, from Hudson's Bay. In Malloch's key (Bull. Ill. Lab. N. Hist., X, p. 416 et seq.) it falls near *C. serus* or *C. decorus*. It is actually very close to *C. decorus*, differing especially by the dusky anterior tibiæ and lack of greenish colour. I am indebted to Professor Johannsen for specimens of *C. decorus* (as well as a number of other species), and find that the species is undoubtedly distinct.

A CONTRIBUTION TOWARDS THE TAXONOMY OF THE
DELPHACIDÆ.

BY F. MUIR.

Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.

(Continued from Page 302)

*Three New Genera.***Lanaphora**, gen. nov.

Head narrower than thorax; vertex quadrate, the base as broad as the length, apex half the base, a small carina along base and apex; face narrow, sides straight, apex about twice the width of base, a small simple carina down middle; the lateral carinæ of vertex and face developed into deep keels, diminishing in size towards the apex of face; clypeus nearly as long as face, tricarinate. Antennæ longer than face and clypeus together, joints subequal in length, arista apical and long; first joint narrow, slightly flattened, second joint terete with distinct sense organs surrounded with minute hairs; eyes wide with deep antennal emargination on lower edge. Pronotum very slightly emarginate posteriorly, tricarinate, lateral carinæ straight or very slightly convergingly curved, reaching hind margin. Mesonotum tricarinate. First joint of hind tarsus equal to the other two together, spur cultrate, thick, inner surface concave, a minute tooth at apex; no teeth on hind margin, only minute fine hairs; one basal and one median spine on hind tibiæ, five small apical spines. Tegmina pointed at apex, radia not touching media, a short radial cross-vein present, median with two sectors, cubitus touching radia at base of first sector.

This genus differs from *Purohita* in the subequal joints of the antennæ, the basal one of which is not foliaceous, and the lateral carinæ of the face being deeper. If we disregard the spur it comes, along with *Purohita*, next to *Sparnia*.

Type—*L. bakeri*.

Lanaphora bakeri, sp. n.

♂ Light yellow or yellowish white, darker on face, clypeus, coxæ and basal portion of abdominal segments; some darker brown spots on lateral keels of vertex and face, antennæ, especially a ring at base of second joint, and two small irregular rings on tibiæ;
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slightly darker between carinae of pro- and mesonotum. Tegmina hyaline, veins white speckled with brown dots, six irregular light brown spots in basal half, one at end of clavus, one at base of media, one at middle of costa, one at middle of radia and two in median cells; a broad brown mark from end of clavus across tegmina to near costal margin, and along hind margin to near end of cubitus, along second median cell to apex and from end of costal cell to end of radia; wings hyaline with white veins.

Pygophor round, a small pointed process on medio-ventral edge, lateral edges subangularly produced; anal segment a little longer than broad, tubular with anus situate within apex; styles reaching end of anal segment, narrow, flattened, straight on ventral (inner) edge, slightly sinuous on dorsal (outer) edge, narrowing to near apex, where it broadens out and bends at right angle to main part, apex truncate.

♀ Anal segment shorter than in male, anal style narrowly lanceolate.

Length 2.5 mm.; tegmen 4.3 mm.*

Hab.—Mount Maquilin, living at base of leaf-sheath of bamboos among a white, flocculent secretion. Prof. C. F. Baker called my attention to this and the following species when at Los Banos. (Baker and Muir, February.)

Bambucibatus, gen. nov.

Head narrower than thorax base as wide as length, apex much narrower than base, truncate or but slightly curved, lateral carinae large, an exceedingly obscure medio-longitudinal carina; length of face more than double the width, base slightly narrower than apex, the simple median and lateral carinae well developed, clypeus tricarinate; antennae a little longer than face, joints subequal in length, first broad, flattened narrow at base, wide at apex, subtriangular, a keel down middle, second terete, thick.

Pronotum roundly and shallowly emarginate posteriorly, tricarinate, lateral carinae straight or slightly convergently curved, distinctly reaching hind margin; mesonotum tricarinate. Hind tibiae with one basal, one median and five small apical spines;

*Measurements are from apex of vertex to anus and from base to apex of one tegmen.

spur cultrate, solid, convex on inner surface, a small apical tooth but no teeth on hind margin. Tegmina narrowly rounded at apex, media straight, not bent to touch radia, radial cross-vein present, first median sector bent, touching cubitus.

This genus comes next to *Sagotopsis*, but differs in having the first segment of antennæ flattened and triangular. If we disregard the nature of the spur it comes near *Perkinsiella* and *Sagoopsis* near *Sparnia*.

Type—*B. albolineatus*.

Bambucibatus albolineatus, sp. n.

♂ Light brown, ventral surface and legs lighter, dorsum of abdomen darker. A white or light yellow median line from apex of vertex to end of mesonotum, bordered on each side with dark brown or black; antennæ darker brown. Tegmina brown with colourless patches, a large colourless patch in middle of costal cell, a large one at end of clavus extending to media, three from end of costal cell to second median sector, a small one at end of radia; wings hyaline with brown veins. Pygophor laterally compressed, long on ventral surface shortening to the very short dorsal surface, two small spines on medio-ventral edge; anal segment short, tubular, anus in apex; styles very short and narrow, widest at base, slender in middle and narrowly spatulate at apex.

♀ Anal segment very short, tubular, anus in apex, anal style spatulate, short, broad.

Length 2.5 mm.; tegmen 3 mm.

Hab.—Singapore, under the leaf-sheaths of bamboo. (Muir, February.)

Several specimens contain *Stylops* puparia.

Arcofacies, gen. nov.

Vertex at base broader than length, apex narrower than base, truncate with outline broken by facial carina, lateral edges distinctly keeled, no medio-longitudinal carina or exceedingly faint; length of face more than twice the breadth, sides very slightly arcuate, tricarinate, carina deep, especially the median carina at apex; in profile vertex and face at right angles; clypeus strongly curved, at right angles to face, tricarinate; diagonal carina on gena distinct.

Antennæ as long as face, terete, first joint more than half the length of second. Hind margin of pronotum shallowly and roundly emarginate, tricarinate, lateral carinæ convergingly curved, meeting hind margin; mesonotum long, tricarinate. Hind tibiæ only slightly longer than tarsi, one basal, one median and five apical spines; spur cultrate, thick, convex on inner surface, apex with tooth, hind edge without teeth. Tegmina at rest tectiform, sub-acinacicate, radia not quite touching media, a short radial cross-vein below first median sector, cubitus touching first median sector near base, then bent at right angle.

Type—*A. fullawayi*.

This genus comes near to *Tropidocephala*, especially to such forms as *neoamboinensis*, but its quadrate vertex, long antennæ and tectiform tegmina at once distinguish it.

***Arcofacies fullawayi*, sp. n.**

♂ Light green or yellowish, a white median line from apex of face to end of mesonotum bordered with black, antennæ indistinctly ringed with dark brown, a light band bordered with brown across the lateral portions of pronotum, pygophor and apex of abdomen brown; tegmina light brown over basal third, rest hyaline broadly marked with black, the markings extending from hind margin over middle of cubitus, base of first median sector, radial cross-vein, along radia and subcosta to costal margin, and over media and second median sector to apex; in the dark portion the veins bear white spots, a series of black spots along cubitus, semi-hyaline mark along inner margin of clavus; apical edge of tegmen sinuous; wings hyaline with brown veins.

Pygophor slightly compressed, ovate, a small rounded projection on lower edges of sides, anal segment short, anus at apex, below anus roundly emarginate with rounded corners projecting, but no spines; styles long, reaching to anal segment, base broadest and flattened, tapering to fine apex which is slightly curved and flattened.

♀ Styles (ovipositor sheath) compressed laterally above base. Length 2.5 mm.; tegmen 3 mm.

Hab.—Manila (D. T. Fullaway, March; Muir, February).

NOTES AND DESCRIPTIONS OF TENTHREDELLA
(HYM.)

BY M.T. SMULYAN, PH.D., AMHERST, MASS.*

The following descriptions and notes on the Tenthredinid genus *Tenthredella* are offered here preliminary to the publication of a paper on the New England species of this genus.

***Tenthredella nortoni*, n. sp.**

The type is in the collection of the United States National Museum: No. 19093.

Type locality—Massachusetts.

Male—Head: Straw colour; the following parts black: the back of head, a large spot on front above antennæ and vertex distinctly trilobed anteriorly and somewhat less distinctly laterally, extending from the posterior margin of the head to between the bases of the antennæ mesally and connecting rather narrowly about half way between the posterior margin of the eye and the posterior margin of the head with a smaller elongate spot behind the upper part of the eye and which extends back about half way towards the posterior margin of the head; an elongate brownish spot on the posterior half of cheek, the upper portion of which is black; antennæ black, the inside of the basal segment in part rufescent, or straw colour. Head behind eyes distinctly narrower than through them; vertex plate quite convex; supraantennal ridges fairly prominent.

Thorax black; the following parts straw colour: prosternum except medially and longitudinally, a minute spot on the ventral face of the propleura on each side, margin of pronotum (interrupted dorsally), which may broaden out on the posterior dorsal margin of the lobes of collar and on the lower portion of the lateral face of the pronotum, pronotal lobe, a V-spot on prescutum, tegulæ (brownish in part), transverse mesoscutel extensions, upper margin of mesoepimeron, an approximately right-angled band on the lower limit of mesoepisternum (wider on the anterior half) and which may be narrowly interrupted about in the middle, pectus except a rather broad band on each side and more narrowly meso-anterior-

* Contribution from the Entomological Laboratory, Massachusetts Agricultural College.
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ly, a large spot on the metaepisternum, upper margin of metaepimeron narrowly, transverse metascutell extensions, and the upper margin of the metapostscutellum narrowly sometimes. Mesoscutellum fairly strongly convex; mesoepisternum sharply pointed.

Abdomen—From pale to quite pale ferruginous; two basal terga completely and more or less of the third or third and fourth except medially and longitudinally, black; sides of basal tergum and basal half of venter straw colour.

Legs—Straw colour; the following parts black: the outside of the anterior coxæ more or less and the intermediate above or above and outside, the posterior coxæ except the inner face and the inner longitudinal half beneath, a longitudinal band on the anterior and intermediate femora above (it may be abbreviated in greater part towards the base on the former), the posterior femora behind and faintly at base before, a longitudinal line on the anterior and intermediate tibiæ above which broadens out apically, posterior tibiæ entirely or almost entirely, the intermediate tarsi above and the posterior except the apical segment (may be only brownish in both).

Wings—Fore wings hyaline, or faintly clouded; costa may be brown; stigma brown to dark brown; costal cell only slightly translucent and quite strongly beyond costal cross-vein; veins blackish. Hind wings hyaline, apical portion may be very faintly clouded; veins brownish to blackish.

Length—9–10 mm.

Described from one specimen.

This species may be Norton's *angulata*, the type of which is lost. It answers fairly well to the description of *angulata*, except in an important respect in connection with the coloration of the head, viz., the presence of the lobate black spot on the front above the antennæ and vertex. It is possible, of course, that Norton failed to mention this, but he noted it in describing *lobata* and *angulifera*, both of which were described previous to *angulata*. The lobate spot in *lobata* and its relation to the black behind the upper part of the eye, which is the same as in *nortoni*, is accurately noted in a later redescription of *lobata* (Trans. Am. Ent. Soc., II, 1868–9, p. 229), but the redescription of the coloration of the head

of *angulata* in the same publication does not differ materially from the original description.

Habitat—Mass.; N. Y.; N. J.

Tenthredella rohweri (new name).

Allantus tricolor Harris, ms. (nomen nudum).

Allantus tricolor Norton, Bost. Jour. Nat. Hist. VII, 1860, p. 247, n. 22, ♀.

Tenthredo tricolor Norton, Trans. Am. Ent. Soc. II, 1868-9, p. 236, n. 22, ♀ (preoccupied).

The type is in the Harris Collection in the Museum of the Boston Society of Natural History, Boston, Mass., manuscript number 515; in rather poor condition. It was taken by J. W. Randall in 1836, probably in the vicinity of Hallowell, Maine.

Tenthredo tricolor being preoccupied, a new name is necessary for this species.

Tenthredella macgillivrayi, n. sp

Tenthredo mellinus var. *a.* Norton, Trans. Am. Ent. Soc. II, 1868-9, p. 227, n. 2, ♀.

The specimen of *T. mellinus* var. *a.* Norton, which I select as the type of this species is Norton's original specimen, and is in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. Type locality, Norway (Norton), Maine.

A paratype from New Hampshire ("Twin Mt.") is in the collection of the New Hampshire Agricultural Experiment Station, Durham, New Hampshire.

A metatype from New York (Gloversville) is in the New York State Collection, New York State Museum, Albany, New York.

Female—Head: Dark ferruginous; the following parts yellow: clypeus, labrum, mandibles, a small spot at the base of the antennæ near eye, and a very faint, narrow, complete, or partial, inner orbit (in a New York specimen which I have seen the inner orbit was more distinct), a small spot in the anterior portion of the frontal fovea, and the occiput narrowly below and on the sides, black. Head behind eyes only very slightly narrower than through them; supraantennal ridges fairly prominent and sometimes only to about half way towards the anterior ocellus.

Thorax—Dark ferruginous; the following parts black: prosternum, propleura, lateral face of pronotum in part faintly, a large

spot on the mesoscutum on each side, the lower margin of the mesoepimeron in part sometimes, small posterior medial portion of pectus, and the metascutum anterior to cenchri; tegulæ and metaepisternum pale yellow. Mesoscutellum only slightly convex; mesoepisternum from fairly sharply to quite sharply pointed.

Abdomen—Dark ferruginous; sides of basal tergum yellowish-white.

Legs—Darkish ferruginous (paler towards the extremities); anterior pair yellowish before; coxæ sometimes slightly at the base, and approximately the apical half of the posterior femora except beneath, black.

Wings—Front wings pale honey-yellow; stigma brown, basal half paler; costal cell from fairly to quite strongly translucent; veins black, or blackish, brown towards base of wing. Hind wings faintly honey-yellow; veins brown.

Length 10.5—11 mm.

Described from two specimens.

The four specimens which I have seen are quite constant, and are apparently quite distinct from *mellina* (Norton).

Habitat—Norway (Norton), Me.; Twin Mountain, N. H.; Gloversville, N. Y. (Aug.); "Can."

***Tenthredella cinctitibiis abdominalis*, n. subsp.**

The type is in the collection of the United States National Museum; No. 19094.

Type locality—"Carriage Road," Mt. Wasington, N. H. (Mr. Geo. Dimmock).

Female—Differs from *cinctitibiis cinctitibiis* in having the abdomen beyond the fourth segment ferruginous and the mesoscutellum only very slightly convex.

Length 11 mm.

Described from one specimen.

There is another specimen of the same sex in the National Museum, but it bears no locality label.

***Tenthredella lobata maculosa*, n. subsp.**

Allantus lobatus var. *a.* Norton, Bost. Journ. Nat. Hist. VII. 1860, p. 253, n. 32, ♀.

Tenthredo lobatus var. *a.* Norton, Trans. Am. Ent. Soc. II, 1868-9, p. 229, n. 6, ♀.

Norton's specimen of var. *a.*, as far as I know, is lost, but there is an authentic female specimen from "Connecticut" in the Norton Collection in the Peabody Museum, Yale University. Can this specimen be the original one?

Type locality—Farmington, Connecticut.

Female—Differs from *lobata lobata* as follows:

Head—A yellowish, or yellowish-white spot, or longitudinal line usually on the posterior portion of the vertex plate on each side, very often a minute elongate spot at the terminus of each arm of the epicranial suture; the black spot on the posterior half of the cheek sometimes coalesces with that along the upper part of the eye; basal segment of antennæ usually black inside, and the yellowish line outside sometimes absent. Supraantennal ridges from moderately prominent to prominent.

Thorax—Margin of pronotum not interrupted antero-dorsally; V-spot on prescutum very often not complete posteriorly; the following additional parts yellow or yellowish-white; a short longitudinal line on the mesoscutum on each side of the posterior portion of the prescutum a triangular spot at the posterior end of the mesoscutum immediately in front of each anterior angle of the mesoscutellum, the anterior margin of the mesoscutellum in part rarely, a small spot on the metascutum behind and under each cenchrus, and the greater mesal upper half of the metapost-scutellum; as a rule only a small spot at the upper anterior angle of the mesoepisternum, and very often a small yellowish-white, or straw-coloured spot at the posterior end of the pectus on each side of the median longitudinal suture. Mesoscutellum from slightly to moderately convex; mesoepisternum from moderately to fairly sharply pointed.

Abdomen—Venter with only the pleura straw colour.

Legs—Trochanters black above, sometimes almost entirely; anterior femora usually black behind; very frequently intermediate femora black except more or less before; the black on apical portion of posterior tibiæ often more extensive above—about half way up towards base.

Wings—Fore wings sometimes hyaline; costa not brown.

Described from a type and five paratypes, the female in the Peabody Museum referred to above being selected as the type. Two of the paratypes are in the collection of the Boston Society of Natural History, two in the collection of the American Entomological Society at Philadelphia, and the fifth is in the collection of the Conn. Agricultural Experiment Station at New Haven, Conn.

Male—The male differs from the female as follows: Greater part of lateral face of pronotum straw colour; an approximately right-angled band on the mesoepisternum, posterior mesal half of pectus, and basal half of venter entirely, straw colour; intermediate coxæ black only at base above, the posterior coxæ except inside and inner longitudinal half beneath, and the apical two-thirds of the posterior tibiæ black (continued to base above).

Length—Female 11–13 mm.; male 11 mm.

The male is here for the first time described, and is the only one that I have seen. It belongs in the collection of the Boston Society of Natural History.

This subspecies approaches *fisheri* Rohwer from Maryland, and may prove to be the same.

Habitat—Sharon, Auburndale, and Woods Hole, Mass. (June and July); Farmington (Norton) and Westville, Conn. (June). I have records also from New York, New Jersey, and Virginia, but they may refer to *lobata lobata*.

INSECT IMPORTATIONS INTO NEW JERSEY DURING THE SPRING OF 1915.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

The following insects arrived in New Jersey during the spring of 1915 on nursery stock imported from various countries in Europe. Practically all were alive when taken and many came over in numbers sufficient for them to gain quite a foothold. Identifications, for the most part, were made by specialists through the courtesy of the U. S. Bureau of Entomology.

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Homoptera.

Pseudococcus sp. on palms and rubber plants from Belgium and *Taxus* sp. from Japan. *Coccus hesperidum* Linn. on bay trees from Belgium. *Chrysomphalus dictyospermi* Morg. on palms from Belgium. Plant lice on maples from Holland. *Lepidosaphes ulmi* Linn. on boxwood from Holland. *Targionia biformis* Ckll. on orchids from Brazil. *Aulacaspis rosæ* Bouche on rose stocks from France. *Parlatoria pergandei* Ckll. on maples from Japan. *Pseudaonidia pæoniæ* Ckll. on azaleas from Japan and *Chrysomphalus perseæ* Comst. on orchids from Central America.

Lepidoptera.

Evetria buoliana Schiff. on *Pinus montana*, *Pinus mughus*, *Pinus wateriana* from Holland. *Apatela rumicis* (pupæ) on roses from France. *Apatela auricoma* (cocoon) on shrubs from France. *Psychid* cases on azaleas from Japan. Pyralid or Tortricid larva on rhododendrons from Holland. Noctuid larva in packing from France. Lepidopterous larvæ on boxwood tips from Holland.

Coleoptera.

Rhynchophrid larva in soil around roots of blue spruce from Holland. *Agriotes* sp. (larva) in soil around rhododendron roots from Holland. Curculionid larva in soil around rhododendron roots from Holland. *Hister stercorarius* Hoff. in soil around rhododendron roots from Holland. *Cercyon hæmorrhoidalis* Fab. on rhododendrons from Holland. *Trechus* sp. (carabid) on azaleas from Japan.

Hymenoptera.

Isosoma orchidearum punctures in orchids from Brazil, Guatemala, U. S. of Columbia and Venezuela. *Dryophanta longiventris* Hartig (galls) on oaks from France. *Itopectis* and *Brachy-cryptus* spp. from cocoons on azaleas from Japan.

Diptera.

Phytomyza aquifolii Goureau (leaf miner) in English holly

from Holland. Cecidomyid gall on pine from Japan. Larvæ (*Ortalidæ*) in soil around roots of blue spruce from Holland.

Hemiptera.

Tingitid eggs on rhododendrons from Holland.

Acarina.

Notaspis (*Oppia*) sp. on boxwood from Holland.

The only desirable members of this list are *Hister stercorarius*, which is insectivorous and possibly the Hymenopterous parasites *Itopectis* and *Brachycryptus* spp. With the exception of *Cercyon hæmorrhoidalis*, which feeds on decaying vegetable matter and is therefore of no economic importance, most of the other species are, to a greater or lesser extent, injurious. The most unwelcome importation was *Evetria buoliana*, the European Pine Shoot Moth, which came over in the larval stage in surprising numbers on six shipments of pines from Holland. As many as ten infested buds were found on numerous plants. Two shipments were burned entirely and all buds on the remainder trimmed off and destroyed.

In point of numbers, the Homoptera as usual occupy the first place. The following table shows how the different orders have been represented on imported stock during the past three seasons in New Jersey.

	Spring, 1915	Spring, 1914	Fall, 1914
Acarina.....	1	1	0
Lepidoptera.....	7	3	2
Coleoptera.....	6	6	0
Hymenoptera.....	4	3	1
Homoptera.....	9	18	11
Hemiptera.....	1	2	1
Diptera.....	3	0	0
Orthoptera.....	0	1	1

Insect importations will undoubtedly continue just as long as nursery stock is imported and the protection afforded by inspection is necessarily only partial and sometimes ineffective, depending, as it does, on the ability and carefulness of the individual inspector.

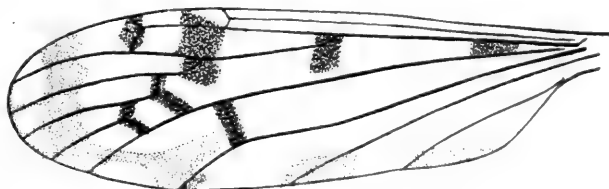
TWO NEW TIPULIDÆ FROM NORTHERN ALBERTA.

BY W. G. DIETZ, M.D., HAZLETON, PA.

Among a small collection of Tipulidæ, collected in the Athabasca country in Northern Alberta, Canada, and sent me by Dr. C. Gordon Hewitt, Dominion Entomologist of Canada, for determination, are two species new to science, the description of which herewith follows. I wish to state that the types of all are in the Entomological Collection of the National Museum at Ottawa, Canada.

***Limnobia gracilis*, sp. n. (Fig. 27)**

Wings spotted; marginal cross-vein at tip of first longitudinal vein, the fuscous spot at this point suboval. Halteres pale; knob dark fuscous, pale at apex; femora with two brown bands before the apex.

Fig. 27. *Limnobia gracilis*, wing.

Male—Length of body 8.5 mm., of wings 9.5 mm.

Legs—Middle leg: femur 7 mm., tibia 6 mm., tarsus 5.5 mm.;
Posterior leg: femur 7.5 mm., tibia 7.5 mm., tarsus 6 mm.

Head fuscous, rostrum dark brown, shining above; palpi slender, fuscous, third joint yellowish, the second joint shorter than the others. Antennæ short, not reaching the anterior margin of the mesonotum, joints one and two yellowish, stout, the former longer than the latter; flagellum very slender, joints elongate, each with a few very long and some short hairs, but without whorls. Head above and beneath beset with short, anteclypeal blackish hair. Occiput somewhat shining and more grayish posteriorly; orbits edged with pale yellow. Eyes large, rather narrowly separated above and almost contiguous beneath.

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Thorax above sordid yellow, prolonged into a long slender neck with a brown line each side of median line. Collare somewhat infusate at middle. Mesonotum with four dark fuscous stripes, the median pair reaching from the transverse suture to the anterior margin and narrowly separated by a yellowish line; the lateral stripes abbreviated anteriorly. Pleura yellowish fuscous, with a silvery sheen. Legs sordid yellow; femora with two fuscous bands before the apex, separated by a pale band; tibiæ slightly infusate towards the apex; outer tarsal joints fuscous; the entire leg, except the coxæ, beset with short, black pubescence.

Wings moderately wide, grayish, marked with four fuscous spots near the costal margin and nebulosities along the posterior-apical margin, as follows: A rounded spot at base of first basal cell; a trapezoidal spot at beginning of præfurca, extending from the first longitudinal vein, but not quite attaining the fourth longitudinal vein; a large subquadrate spot at end of subcostal vein; a suboval spot at end of first vein; transverse veins in apical part of wing edged with fuscous. A nebulous fascia extends across the apical part of the wing and within the wing margin into the fifth posterior cell; a nebulous patch at end of vein six and another large one in the axillary cells. The space between the third and fourth costal spots is yellowish. The marginal cross-vein is at the apex of vein one; the subcostal vein ends somewhat anterior to the proximate end of the submarginal cell, and its cross-vein runs obliquely with vein one. Halteres pale; knob dark fuscous, its apex pale.

Abdomen somewhat shining; first tergite fuscous, yellow at the sides; tergites 2-4 yellow, banded with fuscous posteriorly; fifth tergite yellowish fuscous, tergites 6-8 fuscous; underside similar to the upper. The whole abdomen clothed with short, pale pubescence. Hypopygium ferruginous, pleural lobes large, appendages recurved, beaklike, acute.

Holotype—Tsolinoi Lake—about five miles north of Athabasca Lake. July 5th, 1914.—F. Harper.

Its nearest ally is *L. cinctipes* Say, from which it differs by its smaller size and the fuscous spot at end of vein one is not circular as in that species. It resembles somewhat in coloration *L. cali-*

fornica O. S., but is very much smaller and lacks the limpid spaces in the wing markings of that species.

Dicranomyia aquita, sp. n. (Fig. 28).

Yellowish fuscous. The subcostal vein ends before or but little beyond the origin of the præfurca, its cross-vein at some distance from its apex; stigma light fuscous; discal cell closed.



Fig. 28. *Dicranomyia aquita*, wing.

Male—Length 7 mm.; wing 9.5 mm.

Head gray; rostrum yellowish, more than one-half the length of the head. Palpi and antennæ fuscous, basal joints of flagellum incrassate ovoidal, outer joints elongate, beset with short hairs, but no whorls; occiput beset with short blackish hairs.

Thorax—Collare sordid yellow and, like the neck, brown above; mesonotum grayish fuscous; three broad, but ill-defined, darker stripes; scutel and metanotum grayish; pleura sordid yellow; sterno- and upper part of pteropleura infuscate. Halteres pale, knob fuscous. Legs yellowish, apical part of femora slightly, of tibiæ markedly, fuscous; first two joints of tarsi light fuscous, remaining joints darker. Wings hyaline with faint grayish tinge, immaculate, stigma slightly infuscate, the subcostal vein ending same distance before—in some specimens almost opposite or at most very little beyond—the origin of the præfurca, its cross-vein rather remote from the apex, præfurca longer than vein three from beginning to anterior cross-vein, discal cell closed, the costal margin very closely beset with short, blackish hairs. Abdomen yellowish, with broad median, fuscous stripe, the lateral margin indistinctly margined with fuscous; hypopygium concolorous, the part supporting the large pleural lobes velvety brown.

Female—Length 8 mm.; wing 8.5 mm., similar to male; basal joints of antennal flagellum scarcely incrassate; the lateral margins

of abdomen more distinctly margined, ovipositor concolorous, upper valves robust, greatly attenuated towards the apex, which projects slightly beyond the lower valves.

Holotype—Fort Resolution—Aug 24th, 1914. (F. Harper.)

Allotype—Topotypic.

Paratypes—2 ♂♂, 3 ♀♀, topotypic; 1 ♀, Island at mouth of Rocker River, Aug. 16th, 1914. (F. Harper.)

The variation in the length of the subcostal vein gave me the impression at first that I had two distinct species to deal with. Its nearest ally appears to be *D. distans* O. S., but the subcostal cross-vein is less remote from the apex of the subcostal vein.

THE 1914 RECORD OF CATOCALÆ AND OTHER LEPIDOPTERA.

BY R. R. ROWLEY AND L. BERRY, LOUISIANA, MO.

(Continued from page 307.)

On the 17th took a *nebulosa*, a female *subnata*, *cara* and others. As the 18th was cool, "Catos" were few and mostly high on the trees.

July 19th—In the woods with George Dulaney and Lowell Pinkerton. Took one *viduata*, six *lacrymosa* (one of these was a *paulina*), *habilis*, *neogama*, one *nebulosa*, *palæogama*, two *piatrix*, the first of the season, *cara* and other moths. Temperature 90°. No "Catos" in the hollows, and not plentiful on the hillside. They were resting both high and low.

July 20th was close and warm, above 90°. Took nine *lacrymosa*, four *viduata* and the first *vidua* of the season, *resecta*, *habilis*, *neogama*, *palæogama* and ragged specimens of *junctura*.

The 21st was cloudy and drizzling all day. Took one *lacrymosa*, one *nebulosa*, four *cara*, five *viduata*, five female *resecta*, one *flabilis*, and saw other species taken on the 20th. The moths were under leaves and bark and usually high in the trees. George Dulaney accompanied the senior author on both the 20th and 21st.

The temperature of the 24th was over 100°. Found every tree trunk, stump and hole in the bank full of *Catocalæ*. Drove them up the branch in a perfect swarm. Saw *cara*, *nebulosa*,
October, 1915.

neogama, *vidua*, *palæogama*, *resecta* and *innubens* in numbers. They flew from the roots and tree trunks by the scores. Took ten *viduata*, and saw many more. Moths were very scary and hard to take, flying at our approach. Everything was at the bases of the trees and flew low. Even *viduata* flew from tree to tree, which is unusual, as they fly from side to side of the same tree, and all were within one and a half feet of the tree bases, and several were seen on other than white oak. Took three *vidua*, and saw more. Saw many *habilis*, and took one *lacrymosa*.

Compared with the 19th, 20th and 21st July, there were ten *Catocalæ* on the 24th to one, and they were in the hollow and on the hillside alike. Never saw so many *Catocalæ* in one day before.

On the 25th the senior author visited "Catocala hollow" in the forenoon, starting at seven and returning at noon. Found the hollow and hillsides full of moths, fully as plentiful as on the 24th. Saw a number of *nebulosa*, taking two. Saw a very large red moth with front wings lighter than those of *cara*. It looked larger than any other "Cato" the senior author ever saw. It was probably *amatrix*. One *nebulosa* that escaped the collector was larger than *cara*. On the hillside took ten *viduata* and seven *vidua*, three *lacrymosa*, and saw specimens of other species in abundance. The moths were at the base of every tree and very numerous. *Relecta* was everywhere and *palæogama* by the hundreds. A few "Catos" were three or four feet above the tree bases, and all were wary as on the 24th, although the days were very unlike, the 24th being sunny and the 25th close, cloudy and threatening rain. *Vidua* was on almost all kinds of trees, white and black oak, sugar maple and hickory. *Lacrymosa* was usually on black oak, *palæogama* and *relecta* everywhere. *Viduata* almost always on white oak. *Habilis* everywhere.

On the 20th of July observed a *Limenitis astyanax* ovipositing on wild crab. An egg that was taken home hatched on the 25th of July and the young larva readily fed on apple. It pupated Aug. 16th, and gave an imago August 21st.

July 27th, p.m., thermometer above 100°. *Catocalæ* as plentiful as on previous days. Along the hollow, took four fine *nebulosa*, four *cara*, four *lacrymosa*. On the hillside took seven *viduata*, three *vidua*, and saw many *habilis*, *ilia*, *palæogama* and

neogama. Took a beautiful variety of *palæogama* with much white on the wings. Moths both high and low on the trees, but mostly low. Took three *viduata* on the body of the same white oak. Of the seven specimens of this species taken on this date, five were on white oak, and two on hickory. *Nebulosa* has the habit of flying before you and alighting on dry leaves, the ground or grass, apparently spurning concealment. At rest it is usually found under leaning tree trunks, or logs above the ground. Not very difficult to take after alighting.

The last collecting trip in July was on the 29th and the temperature was under 90°. The party consisted of the senior author, John Degroodt and Misses Gertrude Wallace and Charline Parks. We took eleven *viduata*, two *vidua*, six *lacrymosa*, three *phalanga*, one *nebulosa*, one *junctura*, and the first *angusi* of the season. Moths were not so plentiful as when the temperature was higher. Of the *lacrymosa* specimens two were *paulina* and one *evelina*. The last *viduata* taken on this date was resting on shag-bark hickory, and was a brand new female, the first female of the entire season, and the sixty-second taken in the past 23 days. The two *paulina* specimens and that of *evelina* were also females. The first *viduata* was taken on the 6th of July and the first *lacrymosa*, a female, on July 12th.

At 7.30, August 1st, the thermometer registered 80°. At 1.30 p.m. 90°. In a five-hours tramp did not see 25 *Catocalæ*, and they were high on the trees. Hard to account for this decrease in the number of moths. Took three *vidua* and one *lacrymosa*. Did not see a single *viduata*.

August 3rd, p.m., 90°; clear, with a slight breeze. There were some *Catocalæ* both in the valley and on the hillside. Everything scary. Took five *viduata*, but three of them were battered specimens, one *nebulosa* with bad hind wings, one ragged female *junctura*. Saw a few *residua*, *relecta*, *vidua* and more of *habilis* and *palæogama*. Nearly everything ragged. Saw a *lucetta* and a few wily *lacrymosa*.

Aug. 6th—Temperature 95° and threatening rain. *Catocalæ* fairly abundant both in the valley and on the hillside. Took a fair *nebulosa* and a battered *junctura*, an immense but ragged *cara*, eight *viduata*, but three were unfit for cabinet purposes and all were males, four male *lacrymosa*, one *lucetta* and one *angusi*. Saw

numbers of *neogama*, *vidua*, *palæogama*, *habilis*, *residua*, *relecta*, and a few *innubens*, all ragged. Moths were mostly at the bottom of the tree trunks. Everything hard to approach.

August 8th, 95°—dry. *Catocalæ* fairly common, but out of date. No new species. Took five *viduata*. Two were ragged and one was a female, the second of the year. Captured three fine *vidua*, one *lacrymosa*, two *habilis*, one *phalanga*, one *flebilis* one *lucetta*. The last two were somewhat damaged. Took a brand-new *neogama* and a new *cara*.

Aug. 12th—Warm, clear, woods dry and bare. No water in the creek. *Catocalæ* not numerous. Took three *viduata*, four *lacrymosa*, six *vidua*, *relecta*, *habilis*. Saw *neogama*, *palæogama*, *innubens* one *nebulosa*, *cara*, *residua* and *angusi*.

Aug. 14th—Imagos of *Callidryas eubule*, *Terias lisa* and *Nathalis iola* fairly common.

Aug. 15th—The sun rose with the thermometer at 56°. Temperature warmed up to 90° by mid-afternoon. Saw few *Catocalæ* in the woods. Took one *viduata*, one *lacrymosa* and one *neogama*. Saw a number of *lacrymosa*, but everything was scary and went "sky-high" when approached.

On August 19th Miss Gertrude Wallace took a fine fresh *piatrix* on a window screen.

August 26th—66° at 7 a.m., 82° at noon. Up "Catocala hollow" in the afternoon and in three hours saw but 29 moths, three *habilis*, two *relecta*, one *innubens*, two *neogama*, and the rest *vidua*. Moths high on the trees and on the sunny side.

The senior author did not see a single specimen of *Catocala robinsoni* in 1914, and this is the more surprising, as moths of that species were so plentiful in August and September, 1913.

Aug. 30th—Temperature nearly 90°. In the woods in the afternoon found moths few, and none of those taken were even passable specimens. Captured one *lacrymosa*, one *neogama*, three *habilis*, two *vidua* and one *scintillans*.

Sept. 6th—Saw a few *vidua* one *neogama*, and one *lacrymosa*.

Sept. 19th—Saw two *vidua* and one *palæogama*, but all were ragged.

On Oct. 5th and 11th took five new specimens of *Junonia*

cænia, *Colias eurytheme*, *Pyrameis cardui* and *huntera*, *Danais archippus*.

This *Catocala* record for 1914 is remarkable for the abundance of *viduata* and *lacrymosa*, species usually rare; the over-abundance of *amica*, *palæogama*, *relecta*, *neogama*, and *residua*, always fairly common; the re-appearance of *serena* not reported from here since 1901; the presence of *subnata*, never more than rare here; the appearance in increased numbers of those splendid species, *junctura*, *nebulosa* and *dejecta*; the falling off in the numbers of *angusi* and its variety, *lucetta*, *vidua*, *cara* and *amatrix*; in the entire absence of *robinsoni* fairly common here, *parta* and *cerogama*, always rare.

Of the earlier moths, *ilia* and *polygama* were common as usual, *grynea* and *insolabilis* much rarer than usual, *ultronia* more abundant than ever seen here before, *clintoni* and *minuta* fairly common, and both rare here of late years, *innubens* and its variety, *scintillans*, common as usual; *illecta* always common, *flebilis* always rare, *habilis* unusually numerous and *epione* in greater numbers than ever known here before. No *coccinata*, *judith* nor *consors* reported in this year. *Whitneyi* was added to our fauna for the first time this season.

Mr. Ernst Schwarz and other St. Louis collectors report the taking of *titania*; E. A. Dodge found *luciana*, *somnus*, *parta* and *meskei* fairly common in Nebraska in late July and August. Mrs. O. F. Hiser found *coccinata* common about Nevada, Iowa, in the early summer; Perry Glick and A. L. Porter took hundreds of *Catocalæ* at Hamilton, Mo., in late July, and Miss Pattie Hutchinson gathered data for the study of the 1915 crop of Texas *Catocalæ*.

Eggs of *Catocala coccinata* began hatching on the 29th of April. The young larvæ were dark, cross-banded by smoky brown and dirty green. Head black, small. Took readily to bur-oak leaves. On May 3rd the larvæ were one-fourth of an inch long, gray with cross-bands of black. Head small, black. Larvæ very active, like those of *ilia*. On the 8th of May larvæ over half an inch long, brownish gray, indistinctly striped longitudinally. A line of small mid-lateral black dots. True legs black, head small, dark colour. A slight hump over the third pair of prolegs.

May 17th—Larvæ one and one-fourth inches long, light gray, with yellowish tubercles in small dark basal patches. Both true

and prolegs gray. A sublateral row of short setæ. A rather strong mid-dorsal, blunt tubercle over the third pair of prolegs. A rather strong double tubercular ridge over the 8th abdominal segment. Head flattened in front, gray with yellow, *cara*-like spots at upper lobes (of the head), bounded outside by a black dash.

May 20th—Larvæ just after moult, one and one-half inches long, light bluish gray with light brown tubercles and light brown prolegs and cross-dorsal patches on the 5th and 8th abdominal segments, of the same colour. Head dished in front with light brown lobes above, and outer bounding black dash. A strong tubercle on dorsum of 5th abdominal segment and a pair of lesser tubercles on dorsum of the 8th abdominal segment. All three of these tubercles are brown, the one on the 5th with whitish tip. True legs gray. Sublateral row of short setæ. Prolegs rather long.

May 23rd—Larvæ full grown, two and two and one-fourth inches long, ashen (the exact colour of the gray branches of bur oak). The strong tubercle over the 5th abdominal segment, the pair of strong tubercles over the 8th abdominal segment and the roughness of body, due to the other tubercles, give a strong case of mimicry (like the knotty twigs of bur oak).

The general body tubercles yellow-brown, as also the dorsal pair over the 8th abdominal segment, but the latter are set on a bifid ashen ridge. The tip of the tubercle over the 5th abdominal segment has the body colour, but a little lighter at the tip. Enclosing and extending downward to the ventral surface from the 5th abdominal dorsal tubercle is an irregular band of brown and a similar patch either side of the 8th abdominal dorsal ridge.

A sublateral row of short setæ. Head as in *cara*, bifid above with lighter lobes flanked outside by a black dash. Ventral side pale pink with strong central black spots. There is a slight white patch either side of the first abdominal segment.

Larvæ began spinning May 27th. Just before spinning the larvæ evacuate a bright red fluid.

The first imago was on June 17th. Pupal period, 15 to 18 days.

Catocala lacrymosa.

Eggs of this species hatched on the 8th and 9th of May, and the larvæ were very small, slender, dirty-green, indistinctly lined longitudinally. Head small, dark green. Had grown little up to the 14th. Were feeding on pecan leaves. May 16th, larvæ small, light and striped longitudinally. Head small and light brown. Some of the larvæ moulted for the first time on this date, or eight days from hatching. May 20th—Larvæ at second moult one-third of an inch long, steel-gray, lined longitudinally with white. Head gray and striped. May 24th—Larvæ two-thirds of an inch long, light gray with double elongate dorsal black lunules on the first, second and indistinctly on the third abdominal segments. Head a little darker than the body.

May 31st—Larvæ nearly an inch long, light ashen gray, streaked with broken dark lines longitudinally. A pair each of black spot-like markings over the first and second abdominal segments. True and prolegs whitish. Head coloured as the rest of the body. No stigmal band and no row of sublateral setæ. Ventral side of body whitish with large black spots. At this date most of the larvæ had succumbed to the excessive heat.

June 19th—The last and only larva left from a hundred that hatched on the 8th and 9th of May passed its third moult. Feeding on pecan. June 26th—Larva passed 4th moult, was over one and one-half inches long, light bluish gray, traversed longitudinally by fine lines of black dots. Head lighter than body colour, with brown longitudinal markings. A short lateral mouth dash of black. Tubercles white, sometimes in black basal patches. True and prolegs light gray. Head shaped as in other black-winged hickory feeders, large. Row of short sparse lateral setæ. No humps. July 3rd—Larva about one and three-fourths inches long, light bluish gray, with fine longitudinal streaks, white tubercles, lateral row of short sparse setæ. Short black streaks about the bases of the tubercles. Underside of body lighter than above, a little greenish and with brown median spots. No humps. Head as in other black under-wings. July 7th—Larva passed 5th moult, and was about two inches long, light bluish-gray with white tubercles. Head large, round and of body colour, with brown lines or streaks

and with a curved black streak on each side of the dorsal part of the head, reaching from the first thoracic segment nearly half the head length. Either side of the mouth is a short, black curved line. Both true and prolegs body colour. No hump.

June 9th—The larva died this morning, two months from hatching. The larval life of this species is either unusually long or pecan is not its proper food plant. A number of the hickory feeders are of slow growth.

NOTES ON A COLLECTION OF ORTHOPTERA FROM
PRINCE EDWARD ISLAND AND THE
MAGDALEN ISLANDS, QUE.

BY E. M. WALKER, TORONTO.

Through the kindness of Mr. James A. G. Rehn, of Philadelphia, I had the privilege recently of examining a small collection of Orthoptera taken by Mr. Bayard Long on Prince Edward Island, the Magdalen Islands, and certain other localities in Eastern Quebec and New Brunswick. The specimens from Prince Edward Island and New Brunswick were collected during the summer of 1912, those from the other Quebec localities during 1910.

The collection is of interest mainly on account of the localities, Prince Edward Island and the Magdalens having been hitherto quite unknown from an orthopterological standpoint. Only 14 species are represented among the 256 specimens in the collection, and although this small number is probably far short of the total number of species that inhabit these regions, it is doubtless indicative of a restricted boreal fauna, all of the species being well-known inhabitants of the Canadian Zone and most of them of wide distribution in the latter.

The most interesting features of the collection are the occurrence of an extremely large form of *Melanoplus extremus* Walk. in the Magdalen Islands and of the typical race of *Podisma glacialis* Scudd. in Prince Edward Island and Quebec, this race not having been definitely recorded before from Canada, though from its occurrence in Northern New England it was to be expected here.

The following is a list of the localities and dates of capture as given on the labels:—

PRINCE EDWARD ISLAND.

Bloomfield, August 7.	Souris, July 28, August 24.
Brackley Point, August 31.	Southport, August 9.
Bunbury, August 28.	St. Andrews, August 26.
Cape Aylesbury, August 29.	Summerside, August 7.
Charlottetown, September 1.	Tignish, August 6.
Douglas, August 26.	Tracadie, August 31.
Dundee, August 26.	West River, Bothwell,
Lake Verde, August 9.	August 24.
Malpeque, August 29.	
Mt. Stewart, July 30.	

NEW BRUNSWICK.

Moncton, September 4.	Point du Chene, August 11.
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QUEBEC.

Bic, July 14-27.	Glin House, July 10.
Cacouna, July 26.	St. Fabien, July 23.
Father Point, July 21.	

MAGDALEN ISLANDS, QUE.

Alright Island, August 21.	Grindstone Island, August 23.
Basin Island.	Grosse Island, August 16.
Coffin Island, August 17.	Wolfe Island, August 21.

LIST OF SPECIES.

Chorthippus curtipennis (Harris).—Bloomfield, 1 ♂, 2 ♀; Bunbury, 4 ♂, 4 ♀; Charlottetown, 1 ♂, 2 ♀; Dundee, 4 ♂, 1 ♀ (1 ♂, juv.); Souris, 1 ♂, 2 ♀; Southport, 1 ♂, 1 ♀; St. Andrews, 1 ♀; Tignish, 1 ♂; West River, Bothwell, 1 ♂, 3 ♀; Moncton, 2 ♀; Bic, 2 ♂, 4 ♀; Cacouna, (dry roadside), 1 ♂; Alright Island, 7 ♂, 5 ♀ (1 ♂, juv.); Coffin Island, 1 ♂; Grindstone Island, 2 ♂, ♀; Grosse Island, 2 ♂.

The series shows the usual amount of variation in colour-

pattern and length of tegnium, though all the species from the Magdalen Islands are brachypterous. One of the females from Bloomfield, a macropterous individual, is strikingly marked, the antennæ, dorsum of head and pronotum being rose-red, the face and lateral lobes of the pronotum grass-green and the tegmina and femora tinged with pinkish.

Mecostethus lineatus (Scudd.)—Bloomfield, 2♂; Bunbury, 1♂, 1♀; Charlottetown, 1♂ (juv.); Tracadie, 1♀ (on sphagnum bog); Alright Island, 1♂.

The two males from Bloomfield are less distinctly marked than usual, the pale costal streak of the tegmina being less distinct, the dorsum of the head and the entire pronotum concolorous, without pale lines along the lateral carinæ.

Mecostethus gracilis (Scudd.)—Dundee, 1♂.

Camnula peelucida (Scudd.)—Charlottetown, 1♂, 2♀; Dundee, 1♂, 1♀; Lake Verde, 1♀; Mt. Stewart, 1♂; Souris, 1♂; Tignish, 1♀; West R., Bothwell, 1♂; Bic, 10♂, 16♀; Father Pt., 2♂, 2♀; Glin House, 1♂, 2♀; Coffin Island, 1♀ (juv.); Grindstone Island, 4♂, 1♀ (♀ juv.).

The labels of the Bic specimens bear the following notes: "Dry shaly shore and rocks at head of Ha Ha Bay," "dry shaly fields near Cap Gurgé," "dry rocks" and "dry grassy rocky fields." The specimens from Father Point are labelled "Rocky shores of St. Lawrence River."

Dissosteira carolina (L.)—Point du Chene (2♂, juv.)

Circotettix verruculatus (Kirby)—Moncton, 1♂; Bic, P. Q., 6♂

The Bic specimens are labelled as occurring on "dry exposures," "dry rocky clearing" and "dry grassy limestone exposures."

These specimens are rather pale, resembling *D. carolina*, though one example is rather dark and mottled. The Moncton specimen is almost black.

Podisma glacialis glacialis (Scudd.)—Dundee, "east on P.E.I. Ry. toward Douglas," 1♀ ("black spruce swamp"). St. Fabien, 1♂ ("bog east of Lac de St. Fabien").

These specimens are quite typical, showing no variation toward the race *canadensis* E. Walk.

Melanoplus fasciatus (Barnston-Walk.)—Dundee, 2♂, 2♀; West River, Bothwell, 1♂; Wolfe Island, 1♂; Alright Island,

near the Narrows, 4 ♂, 3 ♀; Coffin Island, 1 ♂, 4 ♀; Grosse Island, 1 ♀.

The only macropterous individual is a female from Alright Island, in which the tegmina extend slightly beyond the apices of the hind femora. In the other specimens from the Magdalen Islands the tegmina reach about the end of the abdomen in the males and in one of the females; in the others they are somewhat shorter. The specimens from this group of islands are large, and are, for the most part, dark and heavily banded. Six characteristic specimens (3 ♂, 3 ♀) from Alright Island measure as follows:—

MALES.

Length of Body	Length of Tegmina	Length of Hind Femora
23 mm.	14 mm.	12.5 mm.
19 mm.	11 mm.	11.5 mm.
20 mm.	12 mm.	11.8 mm.

FEMALES

Length of Body	Length of Tegmina	Length of Hind Femora
24.5 mm.	6.5 mm.	12.5 mm.
26.0 mm.	14.0 mm.	12.5 mm.
28.5 mm.	19.5 mm.	13.5 mm.

The female from Grosse Island bears a marked resemblance to *M. altitudinum* in the large size, nearly uniform speckling of the tegmina and broken piceous band on the lateral lobes of the pronotum.

Melanoplus extremus Walk.—Souris, 2 ♂; Southport, 1 ♀; Bic, (July 14 and 27), 1 ♂, 1 ♀; Basin Island, 2 ♂, 2 ♀; Coffin Island, 1 ♂, 3 ♀; Grindstone Island, 3 ♂, 2 ♀; Wolfe Island, 2 ♂.

The specimens from the Magdalen Islands are remarkable for their extremely large size, while those from Bic and Prince Edward Island are rather small.

The following measurements show the range in size of the specimens in this series:—

MALES.

Locality	Length of Body	Length of Tegmina	Length of Hind Femora
Basin Is.....	21.0 mm.	14.5 mm.	12.5 mm.
Basin Is.....	24.0 mm.	16.0 mm.	13.5 mm.
Coffin Is.....	24.0 mm.	16.0 mm.	14.0 mm.
Grindstone Is.....	22.0 mm.	14.5 mm.	12.0 mm.
Grindstone Is.....	22.0 mm.	14.0 mm.	13.0 mm.
Souris, P. E. I.....	16.0 mm.	10.0 mm.	10.5 mm.
Souris, P. E. I.....	16.0 mm.	14.7 mm.	10.0 mm.

FEMALES

Locality	Length of Body	Length of Tegmina	Length of Hind Femora
Alright Is.....	28.0 mm.	16.0 mm.	15.0 mm.
Basin Is.....	25.5 mm.	15.5 mm.	14.0 mm.
Basin Is.....	28.0 mm.	16.7 mm.	15.0 mm.
Coffin Is.....	26.0 mm.	15.0 mm.	14.0 mm.
Coffin Is.....	28.4 mm.	17.0 mm.	15.0 mm.
Grindstone Is.....	27.0 mm.	15.0 mm.	14.5 mm.
Grindstone Is.....	27.0 mm.	18.0 mm.	15.0 mm.

One of the males from Souris and the female from Bic are macropterous, the others are all brachypterous.

The large specimens from the Magdalens have the appearance of quite a different insect from the typical *extremus*, but differ from the latter only in size.

Melanoplus femur-rubrum (De Geer).—Bunbury, 2 ♂, 3 ♀; Malpeque, 1 ♀; Moncton, 1 ♂, 4 ♀.

Melanoplus atlans (Riley).—Cape Aylesbury (sand dunes), 4 ♂, 5 ♀; Charlottetown, 1 ♂, 1 ♀; Douglas, 1 ♂, 1 ♀; Dundee, 5 ♂, 4 ♀; Lake Verde, 2 ♂, 1 ♀; Mt. Stewart, 1 ♀; Souris, 2 ♂, 2 ♀; Southport, 1 ♂; West River, Bothwell, 1 ♂, 3 ♀; Tignish, 2 ♂, 2 ♀; Moncton, 1 ♂, 1 ♀; Bic, 3 ♂, 1 ♀; Cacouna, 1 ♀; Father Point, 1 ♂, 1 ♀; Coffin Island, 1 ♂, 3 ♀.

The series is on the whole of typical size and appearance. The pair from Moncton are small and the series from the sand dunes at Cape Aylesbury are rather small and pale, as is usual in specimens from such stations. The specimens from Father Point were taken with *C. pellucida* from the "rocky shores of the St. Lawrence River."

Melanoplus bivittatus Say.—Bloomfield, 1 ♂; Bunbury, 2 ♂; Cape Aylesbury (sand dunes), 1 ♂; Charlottetown, 3 ♂, 2 ♀; Douglas, 1 ♂; Dundee, 2 ♂, 1 ♀; Malpeque, 1 ♂, 1 ♀; Souris (Basel Pond), 9 ♂, 2 ♀; Southport, 3 ♀; St. Andrew's, 2 ♂, 1 ♀; Summerside, 1 ♀; Tignish, 1 ♂, 1 ♀; West River, Bothwell, 2 ♂, 1 ♀; Moncton, 1 ♀.

All the specimens have red hind tibiae. In the Prince Edward Island series the dark streak on the dorsal half of the outer side of the hind femora is heavy and conspicuous, the pale streaks in the lateral canthi of the pronotum are indistinct, while those on the tegmina are faint or absent. One of the males from Dundee is very small, measuring as follows: Length of body, 20 mm.; length of tegmina, 16 mm.; length of hind femora, 12.5 mm.

Conocephalus fasciatus (Say.)—(= *Xiphidion fasciatum*)—
Moncton, 1 ♂.

Gryllus pennsylvanicus Burm.—Brackley Point, (boggy clearing), 1 ♂; Charlottetown, 1 ♂, 1 ♀; Dundee, 1 ♀.

A REMARKABLE MONOPHLEBINE COCCID FROM THE PHILIPPINE ISLANDS.

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

A few months ago Prof. C. F. Baker sent me a box of Philippine insects, among which I was surprised to see a male Monophlebid, remarkable for having the costal area of the wings broadly bright red. This feature has long been known to occur in a species, *Monophlebus raddoni* Westwood, from the Gold Coast, W. Africa. The Philippine insect is readily known from the African one by the longer caudal appendages.

Llaveia sanguinea, n. sp.

Male.—Length about 5 mm.; length of wings about 7; antennæ rather thick, middle joints with three whorls of long reddish hairs; eyes dark red, strongly faceted, very prominent, on stout stalks, like a young mushroom; behind each eye is a prominent shining red tubercle; anterior part of thorax dull black, forming a lobe extending over head; posteriorly to this the thorax is shining black, with a broad transverse bracket-shaped reddish-ochreous band; abdomen broad, red, with six long fleshy processes, all much more than half as long as breadth of abdomen, the terminal ones longest, but not very much so; penis long, with a very large raspberry-pink knob; legs red, hairy; wings ample, black with the two hyaline lines as usual, but the extreme base, and the costal region very broadly to within about 1.75 mm. of apex, very bright red.

Hab.—P. Princesa, Palawan, Philippine Is. (Baker 3878.)

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POPULAR AND ECONOMIC ENTOMOLOGY.

INSECT FRIENDS AND FOES OF AGRICULTURE.*

BY LAWSON CAESAR, GUELPH, ONT.

Every farmer is forced to come in contact with his insect foes, and, therefore, knows something about them, but very few farmers know that there is a large number of insects that are not foes at all, but are friends. We shall, therefore, discuss these friends first.

Insect Friends.

The first class of friends we shall treat of is composed of those insects which aid agriculture by acting as pollenizers of plants. Almost everyone knows that before a plant can produce a fruit or seed some of the pollen must first be placed on the sticky tip of the pistil. This act fertilizes the plant and is called "pollination." In this work honey bees are the most important insect agents, but bumble bees and numerous other wild bees help greatly, as do also wasps, various kinds of flies, moths, butterflies and many other insects. Many of the lower kinds of plants, or plants with inconspicuous flowers, are pollinated in other ways, such as by the wind, but nearly all plants with conspicuous bloom require the aid of insects for proper and full fertilization. What would happen if we had none of this class of insect friends? We should not have more than one apple, or pear, or plum, or peach or any of our other much loved fruit to the one hundred or more we now enjoy. Moreover, there would be practically no fields of tomatoes, peas or beans, or of several other crops that are so necessary to us as foods.

The second class of insect friends consists of those insects that supply us with food, either directly or indirectly, through serving as food for the fish and birds that we use as food. Many tons of honey are produced in every country by the honey bee. A large part of the food of fresh-water fishes consists of the water insects

*An address delivered before the School for Rural Leadership.

that live about the shores of the lakes and rivers that these fish frequent. Even the larvæ of the troublesome mosquito serve in this way a useful purpose. Both domesticated and wild fowl feed to a great extent upon insects, the latter especially during the nesting season. So without taking time to go more into details we see that many insects may be friends in this important matter of providing food for us.

A third manner in which insects may act as our friends is as scavengers. If all the dead animals and plants, including trees, of course, were to lie undestroyed on the surface of the earth, they would soon make an intolerable condition of affairs. But in the summer no sooner does an animal or plant die than there gather to it various insects that quickly hasten the process of decay. Some of the insects that feed on dead animals are carrion beetles, rove beetles, blow-flies and flesh-flies. Any one who has watched how quickly a dead horse or smaller animal becomes a seething mass of insect life will readily understand why it has been said that a blow-fly can destroy a dead ox as quickly as a lion.

In the case of trees we have all seen beautiful pines that have been cut down or fallen and allowed to lie for a year or two in the forest, and then, when they are examined, are found to be perforated in numerous places by borers. These borers are the larvæ of certain kinds of beetles, chiefly long-horned beetles. We feel disappointed at the injury to the tree, but in nature the insects while feeding themselves on the wood are at the same time serving a useful purpose, because these holes allow the more rapid and deep entrance of diseases and so hasten greatly the rate of disintegration of the tree. We see, therefore, that insects help us greatly by removing dead animals and plants, and thereby giving back to the earth the substances of which they are composed and at the same time making room for other animals and plants to take their place.

The fourth way in which insects serve as friends is by many useful kinds helping to control injurious kinds. One class of insect that helps in this way is known as parasites, and another as predaceous insects. The latter merely capture their victims and feed on them as a lion would capture and devour a smaller animal, but the former kind pass all their larval stage either in or

attached to their victims, finally killing them. There are many kinds of parasitic insects, some, the Tachina Flies, resembling very closely house-flies; others, the Ichneumon-flies, Chalcis-flies, etc., resembling wasps. Some of the Ichneumon-flies are quite large and sometimes have a very long ovipositor or egg-laying apparatus, while the Chalcis-flies and Proctotrupids may be extremely small, so small in fact, that one can scarcely see them with the naked eye. Some of these very small parasites attack insect eggs, laying their own eggs in these. A single tiny egg is large enough to supply all the nourishment necessary to carry one of these little creatures through all its stages to maturity. Some parasites lay their eggs on the back of their hosts, but many lay them inside the body. A few species deposit not eggs, but living maggots upon or near the victims. The larvæ of a parasite does not, as a rule, kill the thing it feeds upon until it is itself full grown and ready to transform into an adult.

How useful parasites are can be seen when we remember the severe outbreak of the Army Worm last summer. Towards the end of this outbreak examination in the field showed that there was scarcely one of these caterpillars that was not parasitized. This year I have seen only one Army Worm. Now, the parasites may not be the only cause of the disappearance of this pest, but they are certainly one of the great causes and probably the chief one.

There are many useful predaceous insects, but I shall mention only two: namely, Ladybird beetles and Syrphus-fly larvæ. Everyone knows the pretty little Ladybird beetles with their hemispherical shape and often brilliant colours. The larvæ of these look like little alligators and are just as fond of destroying other insects as are the adults. Syrphus-fly adults usually resemble small bees or wasps, but they have only two wings. They may often be seen feeding upon flowers or hovering above them. Their larvæ are legless, taper towards one end and are stout and usually grayish or brown in colour. The Ladybird beetles and the Syrphus-fly larvæ are the two most helpful insects we have in the control of aphids or plant lice. Without their aid it would often be almost impossible to save our crops from these prolific and very destructive little pests. This is, however, only a single il-

illustration of many that could be used to show the good predaceous insects do.

The more one studies insects and thinks over what takes place, the more inclined he is to feel that were it not for our insect friends our insect foes would make this earth almost or quite uninhabitable for man. I do not mean, however, that insects are the only forces at work in controlling our foes, because disease also plays a great part, as do also extremes of heat and cold and several other things.

We must pass on now to consider briefly our insect foes.

Insect Foes.

There is no doubt that injurious insects every year take a large toll from farmers and especially from fruitgrowers. As there is not time to discuss many of these insects, we shall devote our attention first to our worst two orchard insects, and then to a few of the chief pests of the field crops.

There are many insects that attack fruit trees, but two of these stand out prominently for their powers of destruction. These are the San José Scale and the Codling Moth. The former is the most destructive insect pest ever introduced into the province, but fortunately, though it has been here for twenty years, it has not spread beyond the south-western counties. It is a very small insect, circular, and when full grown, has about the same diameter as the head of a pin. Its powers of reproduction are wonderful: from a single female there may be more than a million offspring by the end of the year. As all of these attach themselves to the trunk, branches, twigs, leaves or fruit and suck the juices, they soon do a great deal of harm. Any orchard that becomes infested with this pest in the warmer parts of the Province, and is not sprayed, is doomed to complete destruction in a few years, even the largest apple trees being killed. An exception to this statement should be made in the case of sour cherries and to some extent of Kieffer pears, the former being immune and the latter not often severely attacked. Up to the present time there have been only a few parasites attacking this scale in Ontario, but we are hopeful that these will become abundant in a few years. We have endeavoured to hasten the process by introducing parasites from Pennsylvania, where they are doing much good. In the meantime

there is a very satisfactory remedy against the insect, and no man who uses it intelligently need lose a single tree or have his fruit discoloured and rendered unsaleable by the scale. Even the worst infested orchards, provided the trees are not too nearly dead, can be taken in hand and brought back into perfect condition. Fortunately, the spraying necessary for this pest kills several others also, and is very valuable against certain diseases of fruit trees.

The Codling Moth does no injury to the trees themselves, but attacks the fruit of the apple and pear. It is the insect that causes the apple to be wormy. It is found all over the province and in unsprayed or poorly sprayed orchards does a great deal of harm. In the warm part of the province, where there is a larger percentage of a second brood, the amount of injury to the fruit varies from 40% to 90%. In the colder portions it is less and runs from about 5% to 50%.

We can easily see, therefore, that the growing of clean apples is by no means an easy job. The fact is that insects and fungus diseases make it impossible to grow apples successfully on a commercial scale without spraying. It is, however, most gratifying to know that thorough spraying at the right time and with the right mixtures (see the Spray Calendar) not only completely controls these two insects, but practically all other orchard insects and diseases; so that in an average year it is not uncommon to find orchards in any of the fruit districts where over 95% of the fruit is free from insect injuries or fungus diseases.

We shall not devote further attention to orchard insect pests, but pass on to a brief discussion of the common insects of field crops.

The chief insects attacking such crops are grasshoppers, cutworms (including the army worm), wireworms and white grubs. These are familiar insects to almost every one. Each kind is capable of doing an enormous amount of injury, the amount depending partly upon the weather conditions. For grasshoppers we have at last in the so-called "Kansas Remedy" found a most satisfactory and cheap remedy, so that no crop need be severely injured by these insects if the owner uses this treatment. The same remedy, sometimes, however, with slight modifications, will usually prove quite satisfactory against cutworms and army worms.

It is interesting to know that attacks from grasshoppers, wireworms, white grubs and often from cutworms, too, can be prevented by simply following the practices of good up-to-date farming in which a short rotation of crops with fall ploughing and thorough preparation of the soil before seeding play a very important part. This is a great source of encouragement to the man who is trying to do his best. A short rotation of crops means that there will be no old pasture fields on the farm. These are the favourite breeding places of grasshoppers, wireworms and white grubs. It is a rare thing to find serious outbreaks of these pests on farms where no old pasture fields exist. Again, a short rotation of crops means that the insects in any particular field are deprived of their special food and either have to starve or seek this food elsewhere, often failing to reach it; for instance, wireworms and white grubs attack grasses and such cereals as wheat, oats and barley, but seldom do any injury to peas or clover; hence a short rotation of crops in which clover or peas play a part will help to starve them out. Good farming, moreover, means careful preparation of the soil for the seed and the selection of good plump seed, with the natural result that the plants will be more vigorous and thus better able to withstand the attacks of insects than weaker plants on poorly farmed land. An illustration of this is seen in the case of the Hessian fly. This insect delights in attacking weak or unthrifty wheat plants. I have counted as many as 1000 of the pupæ in a single square yard in a poor field of wheat. It is not at all uncommon to see two fields close together, one scarcely at all injured by the Hessian fly and the other severely injured; the chief reason for the difference being the better seed and condition of the soil in the former. I am not speaking now of the value of late sowing to prevent Hessian fly attack, though this is often very helpful. My aim has been to show that the better a man farms, whether he knows anything about insects or not, the less injury will be done by these to his field crops.

It is impossible to go into this subject now in fuller detail, but, in conclusion, it may be well to say that we should never get into a panic about insects and fear that some day some new and terrible pest will come to our country that will do incredible damage. New pests are not arriving so frequently as most people think,

and even if some do come, there is very little fear that methods of controlling them will not be found. Many of the insects that are thought to be new have been here for years, but have seldom been noticed because of the controlling influences mentioned above.

A NEW FLY OF THE FAMILY PHORIDÆ FROM CALIFORNIA.

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

When recently (August, 1915) at La Jolla, California, I captured on the grounds of the Scripps Institution for Biological Research a Phorid fly remarkable for its relatively large size, and interesting to me on account of the armature of its legs, which recalled one of the fossil species from Florissant. The species is new, and may be called:

Dohrniphora gaudialis, n. sp.

♀—Length about 4 mm., wings over 3.5 mm.; dull black, the front and thorax above anteriorly somewhat polished; third antennal joint ferruginous, blackened above; palpi clear bright red, the spines strong and black; wings pale greenish, the heavy veins sepia; trochanters and immediately adjacent parts pale reddish; knees reddened; anterior tibiae pale dull ochreous, and middle ones brownish in front; tarsi dusky brownish; extreme apex of abdomen light ferruginous. Head small; proboscis stout, longer than head; arista long, minutely plumose; front with the usual strong bristles, directed backward; ocellar region scarcely elevated; four scutellar bristles, the posterior ones longest; halteres black; wings with the two heavy veins running closely parallel, with a narrow interval between them, the second one (third vein of authors) minutely branched before the apex, which is about half way from base to apex of wing; costa bristly; first thin vein (fourth of authors) gently and evenly curved, not bent, failing at extreme base; third thin vein failing at end, but fourth reaching margin; hind femora high and flattened; anterior tibiae with a bristle on inner anterior face at about end of first third, and a row of minute black setae on apical half; middle tibiae with two very long bristles on basal part,

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and several apical ones; the middle tibiæ also have two black lines consisting of minute setæ, one running the length of the tibia, the other only reaching middle, when it is interrupted by a shining patch of about ten rows of minute setæ, arranged transversely, comb-like; hind tibiæ very minutely hairy, but with no large bristles except the long apical spur, and a series of four small black apical spine-like bristles, the only other armature being on the anterior side, the end of which is fringed with minute black spinules, while just above is a weak patch of about four transverse rows of setæ, like those on mid-tibiæ; basitarsi on inner or anterior side with very well developed transverse rows of setæ.

This is readily known from the other described American species by its large size and the armature of the legs. On account of the transverse rows of setulæ on the legs it resembles *Phora multiseriata* Aldrich and *Phora laminarum* Brues, the latter being a Miocene fossil. I have ascertained that the middle tibiæ of *P. laminarum* have a pair of long bristles on the basal part, exactly as on the insect now described. In the characters of the venation and the armature of the scutellum *P. multiseriata* is quite distinct from *D. gaudialis*, but the fossil species has four scutellar bristles, as in the La Jolla one. Thus it appears that our insect is actually more nearly related to a Florissant fossil than to any living species.

The specific name is derived from the name of the locality.

JEAN HENRI FABRE

A few days before the present issue of our magazine went to press, a telegram from Orange, France, appeared in the daily papers announcing the death on Oct. 11, 1915, of Jean Henri Fabre, one of the greatest entomological observers the world has ever known. Owing to his extremely secluded life, his intense aversion to publicity in any form, and his dislike of human society, it is only within recent years that Fabre's genius has been generally recognized, and among English speaking nations this recognition has been largely due to the publication of English translations of certain selections from his "Souvenirs Entomologiques," and to Miall's translation of Legro's beautiful work "Fabre, Poet of Science."

A more extended notice of Fabre's life and work will appear in our December number. An appreciative account of his writings by Prof. Wm. Lockhead was published in the 45th Annual Report of the Entomological Society of Ontario (1914).

A NEW DIASTROPHUS ON STRAWBERRY.

BY WILLIAM BEUTENMULLER, NEW YORK, N. Y.

Diastrophus fragariæ, n. sp.

Head jet black, face rufous and coarsely rugose, vertex and cheeks smooth and very highly polished. Antennæ 14-jointed,

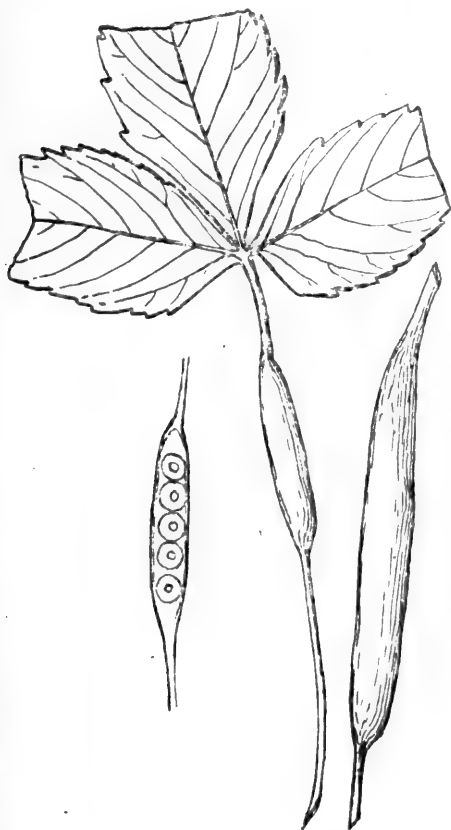


Fig. 29. *Diastrophus fragariæ* Beutm., galls on petioles of strawberry.

basal joints rufous, the following joints gradually becoming darker. Thorax jet black, smooth and highly polished, collar rugose, pleuræ somewhat shining. Parnsidal grooves broad and well defined, continuous and rather widely separated at the scutellum. Lateral grooves indistinct and scarcely perceptible. Median groove wanting. Scutellum coarsely rugose, obtusely pointed at the tip, foveæ at base shining and close together. Abdomen pitchy black, microscopically punctate, petiole rufous. Legs yellowish brown, claws black. Wings hyaline, ciliate, radial area closed, cubitus continuous, cross-veins heavy, all veins dark brown. Length, 2 mm.

Gall—On the petiole of Strawberry: Polythalamous, elongate cylindrical swelling tapering at each end. Red and villose like

the rest of the petiole. The internal structure is spongy and

contains a single row of 5-20 larval chambers. Length from about 25 to 50 mm. Width 3-5 mm.

Habitat—Toronto, Canada (A. Cosens).

The gall of this species has long been known. Saunders mentions it in his "Insects Injurious to Fruits," 1887, p. 331, and calls it the Strawberry Leaf-Stem Gall. Prof. S. A. Forbes also mentions the gall in the 22nd Report of the State Entomologist of Illinois, 1883 (1884), p. 97. H. F. Bassett speaks of a Cynipidous gall occasionally seen on the petiole of strawberry leaves (Trans. Am. Ent. Soc., Vol. XXVI, 1900, p. 325). Mr. L. H. Weld found the galls at Ithaca, New York and Evanston, Illinois and I found the same in the vicinity of New York City for some years past. In August, 1913, Mr. A. Cosens collected the gall on wild strawberry in Toronto, Canada. He transplanted some of the infested plants into pots and managed to mature the galls from which he reared five males, being the first one to succeed in obtaining the flies.

The illustration is from a sketch made by Mr. Weld and re-drawn by Mrs. E. L. Beutenmuller.

NOTES ON THE STRAWBERRY LEAF PETIOLE GALL (*DIASTROPHUS FRAGARIÆ* BEUTM.)

BY A. COSENS, PH.D., TORONTO, ONT.

A cylindrical enlargement of the leaf petiole of *Fragaria virginiana* Duch. constitutes the gall. It has a somewhat segmented appearance owing to the separation of each larval cell from the adjoining one by a shallow annular constriction. The surface is usually coloured a rich reddish brown and bears a pubescence, varying with that of the petiole from which the gall originates. The species from which the producers were obtained was glabrous.

Length 10-50 mm. Diam. 3 mm.

In comparison with *Diastrophus fusiformans* Ashmead on *Potentilla monspeliensis* var. *norvegica* (L) Rydb. this species differs in the following particulars: The arrangement of its

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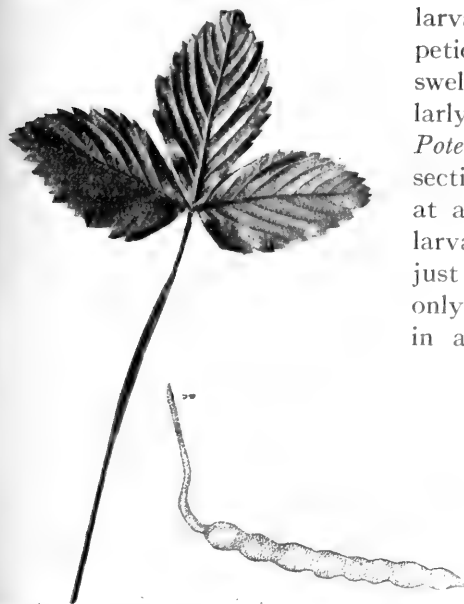


Fig. 30. Galls of *Diastrophus fragariae* Beutm. Upper figure, an immature gall; lower figure, gall from which the producers emerged. (Natural size.)

larval cells in a row, along the petiole, produces a symmetrical swelling quite unlike the irregularly nodular deformity of the *Potentilla* gall. While a cross section of this latter species, at any level, will show several larval cells in the stem pith, just inside the ring of wood, only one will of necessity be cut in a similar section from the strawberry gall.

As the infected leaves wither prematurely, it is difficult to find the mature galls, although the young specimens are quite noticeable. The producers were secured by transplanting host plants so that they could be kept under ob-

serva-tion. The galls were removed after the leaves had withered, and were kept on earth, out of doors, during the winter. The producers emerged from May 12-14.

DESCRIPTIONS OF NEW SPECIES OF IPIDÆ (COLEOPTERA).*

BY J. M. SWAINE, ENTOMOLOGICAL BRANCH, DEPARTMENT OF
AGRICULTURE, OTTAWA.

Ips knausi, n. sp.—A large elongate species, length 5.8 mm., width 2.1 mm.; the sides parallel, thickly clothed with long light hairs in front, on the sides and behind. Allied to *emarginatus* Lec., but distinct in the punctuation of the discal interspaces of the elytra, and the characters of the declivity.

Description of the male: The *head* has the front densely

*Contribution from the Entomological Branch, Department of Apiculture, Ottawa.
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granulate-punctate, rather densely hairy, with a wide, shallow, transverse impression between the eyes, and a shining median space towards the vertex; the eyes oblique, very narrow, and broadly emarginate in front; the antennal scape sparsely hairy without, the club wide, marked with three distinct, bisinuate sutures which are densely fringed with long bristle-like hairs; as broadly rounded at the tip as at the base, rather densely punctured below.

The *pronotum* is very slightly longer than wide, 10:9; with the base very broadly rounded; the hind angles broadly rounded; the sides slightly arcuately narrowed or nearly parallel for over two-thirds their length, then obliquely narrowed and slightly bisinuate in front; rounded on the front margin; the asperities of the cephalic half of varying size, the largest more or less concentrically arranged; the caudal half coarsely, closely and deeply, but not roughly punctured; thickly clothed with long hairs in front and about the sides.

The *scutellum* is minute, elongate, faintly channelled and shining.

The *elytra* are parallel for the greater part of the length, then rounded to the strongly produced, dehiscent and submucronate tip; densely clothed with long light hairs about the sides and around the margin of the declivity; with the elytral striae distinctly impressed, narrow, with deeply impressed, closely placed punctures of median size; the sutural striae a little more strongly impressed than the others, strongly divergent and widened behind; the interspaces very wide, not distinctly convex, except the first two, which are also more strongly granulate near the declivity; *the wide interspaces all confusedly punctured*, more sparsely on the disc towards the base, very densely and roughly on the sides and about the declivity; the declivity oblique, deeply concave, with the tip strongly produced; the first tooth, on the second interspace, acute, distinct and preceded by a row of granules; the third interspace with a row of granules at the top of the declivity; the second tooth, on the fourth interspace, large, conical, acute, adjacent but not united to the third; the third tooth very long, wide, compressed, with the sides parallel and the tip deeply emarginate, representing the united teeth of the 5th and 6th interspaces; the fourth tooth smaller than the second, conical, blunt, nearer to the third than

to the acute apical margin; the declivital margin, viewed from the side, straight and vertical from the base of the third tooth to the base of the acute apical margin; the acute apical margin elongated towards the tip so that the apex of the declivity becomes sub-acuminate, and the edge with two deep emarginations on each side; the depth of the declivity closely punctured and dull from numerous minute wrinklins of the chitin, the punctures bearing short, slender hairs throughout. The pubescence is long, light and prominent about the side and margin of the declivity.

The venter is densely punctured and clothed with long hairs.

This species was obtained through the kindness of Mr. W. Knaus. The type bears the labels, Cloudercroft, 9000 f., N. M., W. Knaus, 8-8-03, 197.

Ips perroti, n. sp.—Description of the type, a male: A slender species, dark reddish-brown in all my specimens; length 4 mm., width $1\frac{1}{2}$ mm., relative proportions, length of pronotum 29, length of elytra 46, width of pronotum behind 27, width of elytra in front 26, width of elytra behind 28.

The *head* has the front convex, somewhat flattened in front, rather closely punctured, more coarsely and roughly towards the eyes, sparsely granulate on the disc, more densely towards the epistoma, with a short, blunt median tubercle on the epistoma, and a row of smaller blunt tubercles along the epistomal margin; the disc rather sparsely clothed with slender hairs, and the epistoma densely fringed as usual; the genae moderately closely and deeply punctured; the eyes with a very broad, shallow emargination in front; the antennal club with the first two sutures slightly bisinuate at the middle, strongly bent distad at the sides.

The *pronotum* is slightly longer than the width, with the caudal margin strongly rounded; the sides nearly straight and parallel for two-thirds the length, rather strongly narrowed on the distal third and rounded in front; rather densely hairy on the sides and in front, glabrous on the disc; irregularly, not very coarsely asperate in front; smooth and shining behind and finely sparsely punctured, very finely towards the middle line and much more coarsely towards the sides; the median smooth space nearly obsolete, more distinct and somewhat impressed at the middle of the disc.

The *elytra* are one-half longer than the pronotum; a little narrower at the base than the pronotum, very slightly wider behind; the sides nearly parallel for about four-fifths the length, then rounded to the declivity, which is steep and truncate as viewed from above, with the tips dehiscent and slightly tuberculate; the elytral striæ regular, distinctly, but slightly, impressed on the disc, except the sutural striæ, which are much wider and deeper than the others and widened behind; the lateral striæ not impressed; the strial punctures rather small and closely placed, more closely on the first two and the lateral striæ; the first interspace convex, finely granulate near the declivity; the second convex, faintly granulate near the declivity; the remaining discal interspaces flat; all the discal striæ uniseriately punctured throughout their length, closely towards the declivity, very sparsely towards the base; the lateral interspaces more closely punctured, uniseriately above, confused near the lateral margin, with the punctures nearly as coarse as those of the striæ; the *declivity* very abrupt, deeply concave, not closely punctured, more coarsely than the disc; the suture elevated, and smooth on the lower two-thirds; the margin strongly elevated and armed with four teeth on each side; the tooth of the second interspace well developed, acute, recurved, preceded by a few minute granules; that of the third obsolete, or represented by the largest of a row of small granules; those of the fourth and fifth interspaces united at the base, the connecting ridge nearly vertical; the tooth of the fourth interspace acute, recurved; that of the fifth stout, capitate, acute-pointed; the fourth tooth conical, in the type occupying nearly all the short space between the raised apical margin and the third tooth; the raised apical margin wide, moderately produced and entire; the pubescence of the elytra long, erect, fine, rather dense on sides below and about the declivity; the discal pubescence fine and sparse.

The *female type* differs from the above only by the less strongly developed epistomal armature, and the different declivital teeth. The teeth are all acute and less strongly developed than in the male; the second and third teeth are similar in shape, conical, united at the base and but little larger than the first and fourth.

Labels with the male type: I. Perrot, Que. 1912; ♂ 218; ♂ type. Labels with the female type: I. Perrot, Que. 1912, ♀ 218; ♀ type. Host of type series *Pinus resinosa*.

Variations: The pubescence is somewhat abraded on the disc of the elytra in the type; and in some specimens the interstrial punctures of the disc are more numerous; the third discal interspace is frequently impunctate on the basal two-thirds; the frontal tubercle varies greatly in size, being nearly obsolete in some females; the strial punctures of the elytra vary considerably in size; the length varies from 3.5 mm. to 4.25 mm.

This species differs from *tridens*, *borealis*, and *interrupus* by the characters of the front which lie between the much sparser granulation of one sex of *borealis* and the extremely dense granulation of *interrupus*; from *borealis* in the longer, much more finely punctured pronotum, more sparsely punctured elytral interspaces and distinctly much more strongly developed declivital armature; from *interrupus* in the usually much smaller size and more slender form, finer and sparser pronotal punctuation, the much more abrupt declivity with strongly marked sexual variation, and the fewer and smaller granules on the first and second interspaces.

Dryocoetes sechelti, n. sp.— A very small species, with a subcircular, strongly convex pronotum, coarse elytral punctures and a flattened declivity. Length 2.1 mm.; comparative measurements: Pronotum, length 9, width 9; Elytra, length 15, width 9.

The head is more deeply embedded in the pronotum than usual; with the front convex, rather coarsely, closely granulate-punctate, with erect hairs from the punctures; the median carina narrow but distinctly elevated and shining, from epistoma to vertex; the epistomal fringe dense, longer and bright yellow on the middle third; the eyes wide, coarsely granulate and rather broadly emarginate in front; the antennal club much longer than the funicle; the pedicel as long as the outer four segments; the last segment as wide as the last four are long and the second very narrow; the club nearly as wide as long; with the distal densely pubescent part projecting strongly beyond the truncate tip of the basal corneous part which covers about four-fifths of the under surface, and is bounded distally by a distally convex suture, the distal fifth densely pubescent, the basal corneous part with a few

long hairs irregularly placed; the upper surface with the basal half corneous with the distal margin nearly straight, sparsely hairy, the distal half densely pubescent, obliquely subtruncate, with two sutures, the first of which is straight, and the second arcuate.

The pronotum is subcircular, as wide as long, rather strongly produced over the head, very broadly arcuate behind, strongly arcuate on the sides and in front, very strongly convex with the summit slightly behind the centre; very densely, rather finely and somewhat regularly asperate in front of the summit and on the sides behind, coarsely and densely granulate-punctate on the disc behind with the asperities there reduced to granules on the margin of the punctures; the pubescence rather thick and erect, longer in front and on the sides.

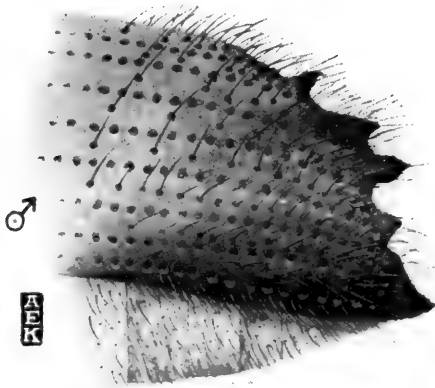
The elytra are as wide as the pronotum, the sides parallel well beyond the middle, then moderately arcuately narrowed and broadly subtruncate behind as viewed from above; the sutural striae wide and rather strongly impressed, the remaining discal striae slightly impressed, the last three on the sides strongly impressed; the striae punctures coarse, deep, subquadrate, and very densely placed; the interspaces a little convex, very little wider than the striae, closely, deeply uniseriately punctured, the punctures deep, but much smaller than those of the striae, a little coarser on the sides than on the disc; the declivity very steep, flattened from above, with the suture elevated, the sutural striae strongly impressed, the second striae distinctly impressed; the striae punctures as coarse as on the disc, the interspaces uniseriately granulate-punctate; rather thickly clothed with erect greyish-pubescence of moderate length. The venter is closely, coarsely, and roughly punctured.

There is no apparent sexual difference in our specimens, but the front is usually entirely retracted.

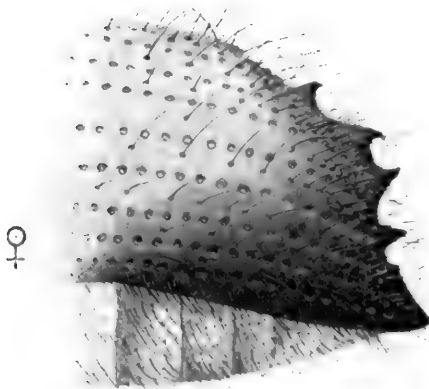
The pronotal asperities are sometimes coarser than in the type and always very dense; the elytral striae from the second outward are in some hardly perceptibly impressed on the disc, although distinctly impressed in the type.

Type locality: Sechelt, B. C., Canada; Type number, 2170.

Dryocoetes pseudotsugae, n. sp.—Description of the female type: Length 4.7 mm.; width 1.5 mm.; reddish-brown (not



IPS PERROTI, N. SP.; SIDE VIEW OF THE DECLIVITY OF THE MALE.
ENLARGED. ORIGINAL.



IPS PERROTI, N. SP.; SIDE VIEW OF THE DECLIVITY OF THE
FEMALE. ENLARGED. ORIGINAL.



fully chitinized); closely allied to *septentrionis*, but distinct in the confused small punctures of the interspaces, and the more flattened elytral declivity.

The front is as in *septentrionis*; but more densely granulate and hairy, with the postepistomal smooth space and median pit, and finely carinate above. The *pronotum* is as in *septentrionis*, but usually more densely punctured and more strongly granulate behind on the sides; the median carina narrow, distinct behind. The elytra are much as in *septentrionis*; but much more broadly rounded behind and with the declivity very distinctly flattened when viewed from above; though not so strongly as in *confusus* Swaine and *betulae* Hopk.; with the striae only lightly and narrowly impressed on the disc; the sutural striae rather strongly impressed on the basal third; the striae punctures small and moderately deep; the interspaces wide and flat; the interstriae punctures smaller than those of the striae and rather numerous, uniseriate on the 1st, 2nd and 4th interspaces, on the 3rd and 5th and the outer interspaces confused with usually smaller additional punctures; the declivity shining, distinctly flattened with the first two striae distinctly impressed, the 2nd interspace impressed at the tip, the interspaces on the declivity uniseriately very finely and rather closely granulate-punctate in both sexes.

The *male* has the front very wide, nearly as hairy as in the female, with the median area at the base of the epistoma widely impressed and shining.

Variations: The size is fairly constant, as represented in our collection, the length varying from 4 mm. to 4.8 mm. The most important variation is in the interstriae punctuation. The first, second and fourth discal interstriae are usually uniseriately punctured but often variably confused towards the base and declivity, the other interspaces are usually decidedly confusedly punctured from the base to the top of the declivity with punctures of large and smaller size.

It is apparently a good species, distinct from *septentrionis* by its flattened declivity and confused interstriae punctures.

It is very abundant on the coast of British Columbia in the bark of Douglas fir, and probably occurs also in other conifers. We have specimens from as far north as Inverness and Queen Charlotte Islands.

Type labels: Stanley Park, Vanc.; Douglas fir; 2639.

Phloeosinus pini, n. sp.—A small black species, with the front strongly carinate; the pronotum shining; the declivity without conspicuous sculpture; length 2.5 mm.; width 1.25 mm.

The *head* has the front flattened, densely, coarsely rugulose-punctate, with a fine, acute median carina on the cephalic half; the rugulose area extending backwards across the vertex as a roughly punctured area with its caudal margin converging from the eyes to the middle line on the occiput; the pubescence short, reddish, inconspicuous; the genæ densely punctulate with a few scattered moderate, finely setose punctures; the eyes narrowly emarginate, one-half divided; the antennal club nearly twice as long as wide, with the first two sutures moderately oblique, and with a well developed septum on the dorsal half, the third suture more strongly oblique and indistinct.

The *pronotum* is wider than long, 10.5:8; brightly polished; with the hind margin strongly bisinuate and obtusely angled at the middle; the sides very strongly arcuate on the caudal half, nearly straight on the caudal fourth, then strongly arcuately narrowed so as to be very strongly constricted behind the broadly rounded front margin, the constriction extending across the dorsum as an impression; the disc finely punctured, more densely behind, sparsely in front except along the front margin, coarsely punctured on the sides; the punctures finely granulate, more distinctly so on the sides and in front; the pubescence short and not very distinct; the median line very fine, smooth, more distinct along the middle third. A shallow, oblique impression extends latero-cephalad on the caudal half of the disc.

The *elytra* are wider than the pronotum, 12:10, stout, one-third longer than wide, 16:12 (at the base), one-twelfth wider behind than at the base; the front margins strongly arcuate and serrate, the serrations isolated on the sides; impressed about the minute scutellum; the hind margin, from above, broadly rounded; the striae very narrow; the strial punctures indistinct, fine and separated; the interspaces very wide, the second interspace much wider at the base, causing the remaining discal striae to be out-curved at the base; the interspaces slightly convex on the disc,

strongly convex on the sides; strongly rugulose-punctate, with larger transverse, subacute asperities intermixed with numerous smaller granules, the asperities numerous and dense towards the base, becoming uniseriate towards and upon the declivity; the declivital interspaces moderately convex, closely, finely punctured and uniseriately moderately asperate; the second more finely, the third more coarsely and wider; the ninth subcarinate on the sides; the pubescence very short, reddish, stout, stouter and a little more evident on the declivity.

The *male* has the front with a similar rugulose-punctate area, but with the region between the eyes less densely though coarsely rugulose and rather strongly and broadly impressed, with a well developed acute median carina on the cephalic half, ending in a small concave median epistomal lobe as in the female; with an obtuse elevation on each side opposite the middle of the eyes; the pronotum a little more strongly constricted in front, with the sides nearly straight behind; the declivity similar to that of the female, except that the second interspace appears slightly flattened, with the asperities smaller than on the others, and the asperities on the third are less numerous and rather distinctly coarser than those on the first. This may be individual, or may indicate the sexual differences so distinct in other species.

I have taken it only in twigs of *Pinus divaricata*, in the Riding Mountains, Manitoba. The occurrence of *Phloeosinus* in *Pinus* is unusual. Type series number, 2008.

Phloeosinus utahensis, n. sp.—A large species; length $3\frac{1}{8}$ mm., width 2 mm., colour black, with the elytra reddish.

The *head* has the front flattened in the female, densely coarsely rugose-punctate and rather densely clothed with short yellow hairs; with a faint, curved, transverse impression; the eyes narrowly, very deeply emarginate; the genæ rather densely, coarsely punctured; the antennal club elongate with the sutures oblique.

The *pronotum* is one-half wider than long, 16:11, widest behind, the hind margin bisinuate, the sides rounded and strongly narrowed towards the broadly rounded, reddish front margin, moderately constricted near the front with the constriction extending across the dorsum; finely, densely, deeply and evenly punctured

above, with the median carina very fine and nearly obsolete; the pubescence very short and indistinct.

The *elytra* are one-half longer than wide, 25:17.5; slightly wider than the pronotum; the base strongly arcuate, raised and serrate as usual with lunar asperities becoming acute and isolated on the sides; with the striæ narrow, deep, distinctly and closely punctured; the interspaces wide, granulate-punctate and asperate as usual, more densely and coarsely towards the base; the asperities becoming uniseriate behind; the first and third interspaces strongly raised on the declivity, and the asperities as a row of small teeth with granules intermixed; the second interspace convex but less strongly raised, closely punctured and with a row of very few and much smaller points; the reddish pubescence very short, abundant but indistinct, denser, more evident and scale-like on the declivity, with minute slender hairs from the asperate punctures.

The *male* has the front widely and deeply impressed with a median carina on the cephalic half; the pronotum very broadly arcuate on the caudal half, and very strongly narrowed in front, with the median line fine and slightly elevated; the *elytra* with the discal asperities very sparse, but on the declivity the first and third interspaces bear each a regular row of large, compressed, black-tipped teeth; those of the first interspace are strongly compressed, with the distal edge elongate, the anterior angle rounded, the posterior angle elevated and acute, situated on the lateral half of the interspace, the mesal half of which is smooth and finely punctured; those of the third interspace smaller and more numerous than those of the first; the second interspace as wide as on the disc, flat, finely punctured and entirely without asperities; the fifth, seventh and ninth interspaces each with a row of much smaller but very distinct serrations. The pubescence is slightly longer on the declivity and less scale-like.

One male and one female from Stockton, Utah, through the kindness of Mr. W. Knaus. These are probably sexes of the same species, and are distinct from Leconte's type of *serratus*. Type number, 2182.

Phloeosinus hoppingi, n. sp.—A very small species, with the alternate interspaces on the declivity strongly serrate. The length, 1.9 mm.; width, 1 mm.; the colour black, the basal margin

of the elytra, and the declivity reddish-brown, the antennæ and tarsi yellow.

The *head* has the front and vertex shining, moderately, not very closely, rather roughly punctured, rugosely on the sides; with a rather deep transverse arcuate impression and an acute well developed median carina between the impression and the epistomal margin; the pubescence short, erect, not conspicuous except the yellow dense epistomal fringe; the eyes deeply emarginate, the antennal club wide, six-tenths as wide as long, with the first two segments subequal in length and each nearly as long as the outer part, the first two sutures nearly transverse, the third strongly oblique, a strongly chitinized septum shown on the dorsal third of the first and second sutures.

The *pronotum* is wider than long, 6:5; with the hind margin bisinuate; the sides very strongly arcuate behind, strongly arcuately narrowed in front of the middle and bisinuate behind the broadly rounded front margin, widest near the hind margin; the disc rather coarsely, not densely, punctured, not distinctly granulate; the pubescence short, suberect, forming a conspicuous median line of hairs.

The *elytra* are one-third longer than wide, 13:10; the bases arcuate, elevated and serrate; the sides slightly wider at the middle; the striæ deep and moderately narrow; the stria punctures moderately small but distinct; the interspaces convex, closely coarsely granulate-punctuate, and coarsely uniseriately asperate on the disc near the suture and alternately on the declivity; the first interspace asperate only on the hinder half; the second asperate only on the basal half, more coarsely towards the base; the third asperate throughout, more coarsely towards the base; the fifth and seventh interspaces distinctly asperate on the hinder half; the declivity with the alternate interspaces more strongly convex and moderately, rather closely, acutely serrate; the 1st and 3rd punctured on the mesal side with the row of serrations along the outer side; the second interspace on the declivity hardly convex and narrower than the 1st and 3rd; the 9th carinate behind but hardly serrate; the pubescence fine but distinct, larger on the sides, closer and minutely scale-like on the declivity.

The *male* has the front rather coarsely roughly, closely punc-

tured, with the whole central portion broadly and deeply concave, but with the margins of the concavity rounded; the median carina well developed and acute extending from between the eyes to the nearly obsolete epistomal lobe; the pronotum is of the same relative length and width as in the female, but the sides are more nearly parallel behind and more strongly constricted in front; the elytral declivity with the serrations distinctly coarser, with the acute apices directed obliquely caudad.

Seven females and three males from California, received from Mr. Ralph Hopping; taken in "cedar limbs." Type number, 2171.

Phloeosinus vandykei, n. sp.—A small species, with rather sparsely punctured pronotum and deep narrow striae. Length, 2.2 mm.; width, 1.2 mm.

Description of the *female*: The *head* has the front flattened, coarsely, deeply rather sparsely punctured and granulate; with a low acute median carina becoming prominent on the epistoma; the pubescence short, stiff and erect; the antennal club over half as wide as long, 7.5:11, with the first two segments comprising more than one-half the mass; the first two sutures obliquely arcuate, the third more strongly oblique; the septa strongly developed on the first two sutures.

The *pronotum* is wider than long, 5:4; with the base bisinuate; the sides broadly rounded on the hinder two-thirds, and narrowed towards the front; constricted behind the front margin, which is very broadly rounded; the disc rather coarsely, deeply, rather sparsely punctured, the punctures finely granulate; the pubescence fine; the median line very finely faintly carinate behind.

The *elytra* are 1.4 times as long as wide; the bases arcuate, elevated, and coarsely serrate with the lunar serrations becoming coarser, acute, isolated and strongly oblique on the side; the sides somewhat inflated behind; the hind margin broadly rounded as viewed from above; the striae very narrow and deep, those of the disc outcurved towards the base; the strial punctures very small; the interspaces convex, sparsely rather coarsely asperate-punctate; the asperities uniseriate on the declivity, larger, confused and lunar towards the base, strongly oblique and finally longitudinal

towards and upon the sides at the base, moderately confused on the disc and sides except on the third, fifth, seventh and ninth, which are nearly uniseriate; the ninth interspace carinate; the second wider towards the base; the declivity with the first three sutures nearly equal, the first and third hardly elevated, the second not narrower and hardly impressed, but without asperities, the third uniting with the ninth, the fourth met on the declivity by the fifth, sixth, seventh and eighth; the asperities of the declivity uniseriate, fine and acute, and the surface of the interspaces there smoother and more shining than on the disc; the pubescence very fine, short and indistinct. The discal interspaces are frequently nearly uniseriately asperate; the asperities are reduced to fine granules on the sides.

The *male* has the front broadly and rather deeply concave; the pronotum more broadly rounded on the sides and more sharply constricted in front; and has the declivity smoother and more brightly polished, with the serrations nearly obsolete except for a few sparse granules on the third interspace.

Type locality: Huckleberry Meadow, Fresno Co., Calif.

Received through the kindness of Mr. Ralph Hopping. It was taken in "Cedar limbs." Type number, 2173.

Hylastes ruber, n. sp.—Stouter than usual, the pronotum shorter and nearly as wide as the elytra; the elytra with the striae hardly impressed, narrow, the strial punctures small, the interspaces flat and densely, rather coarsely granulate; length, 4.8 mm.; width, 1.75 mm.

The *head* has the front strongly convex, the middle line evenly moderately convex from epistoma to vertex; closely, moderately, rather rugosely punctured; the transverse impression at the base of the beak very faintly indicated; the epistoma moderately impressed on each side; the median carina acute, fine but well developed, extending to the middle of the front; the epistomal lobe wide, concave at the middle with the sides somewhat tuberculate; the pubescence minute and inconspicuous, nearly obsolete.

The *pronotum* is but very slightly longer than wide; broadly rounded behind; the hind angles rounded; slightly arcuate on the

sides, subparallel for three-fourths the length, then strongly narrowed and rather distinctly constricted; the front margin moderately rounded; considerably narrower than the elytra; the punctures rather small and close on the disc, dense and somewhat rugose on the sides, smaller, closer and somewhat rugose in front; the smooth median line slightly elevated throughout, slightly widest at the middle; the pronotum not acutely margined on the sides behind.

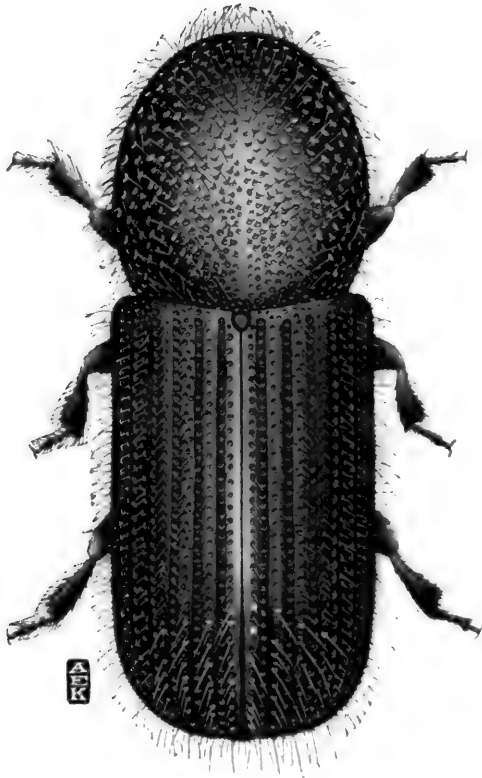
The *elytra* are twice as wide as long; moderately wider than the pronotum, 13 to 10.5; the base truncate, acute; the humeral angles rounded; the sides subparallel for nearly three-fourths the length, then strongly arcuately narrowed and semicircularly rounded behind as viewed from above, with the side margin bisinuate behind; very narrowly rounded at the apex; the striae very narrow and but faintly impressed upon the disc and sides; distinctly impressed on the declivity; the strial punctures small, not larger than those of the pronotum, closely placed, deep and bordered with black, of about the same size throughout; the interspaces flat upon the disc and sides, faintly convex behind on the disc and upon the declivity; densely, and rather coarsely granulate upon the disc, becoming finely asperate upon the declivity and confused throughout; the sides of the declivity impressed before the tip; the pubescence minute, reddish and moderately distinct upon the declivity; the basal third of the first three discal interspaces with the strial septa and interstrial transverse roughenings strongly oblique.

The venter has the last segment densely punctured, very broadly rounded behind, and moderately convex throughout: the prothorax below closely punctured and rugulose with the punctures more distinct than usual. There appears to be no sexual difference in the few specimens available; probably only one sex is represented.

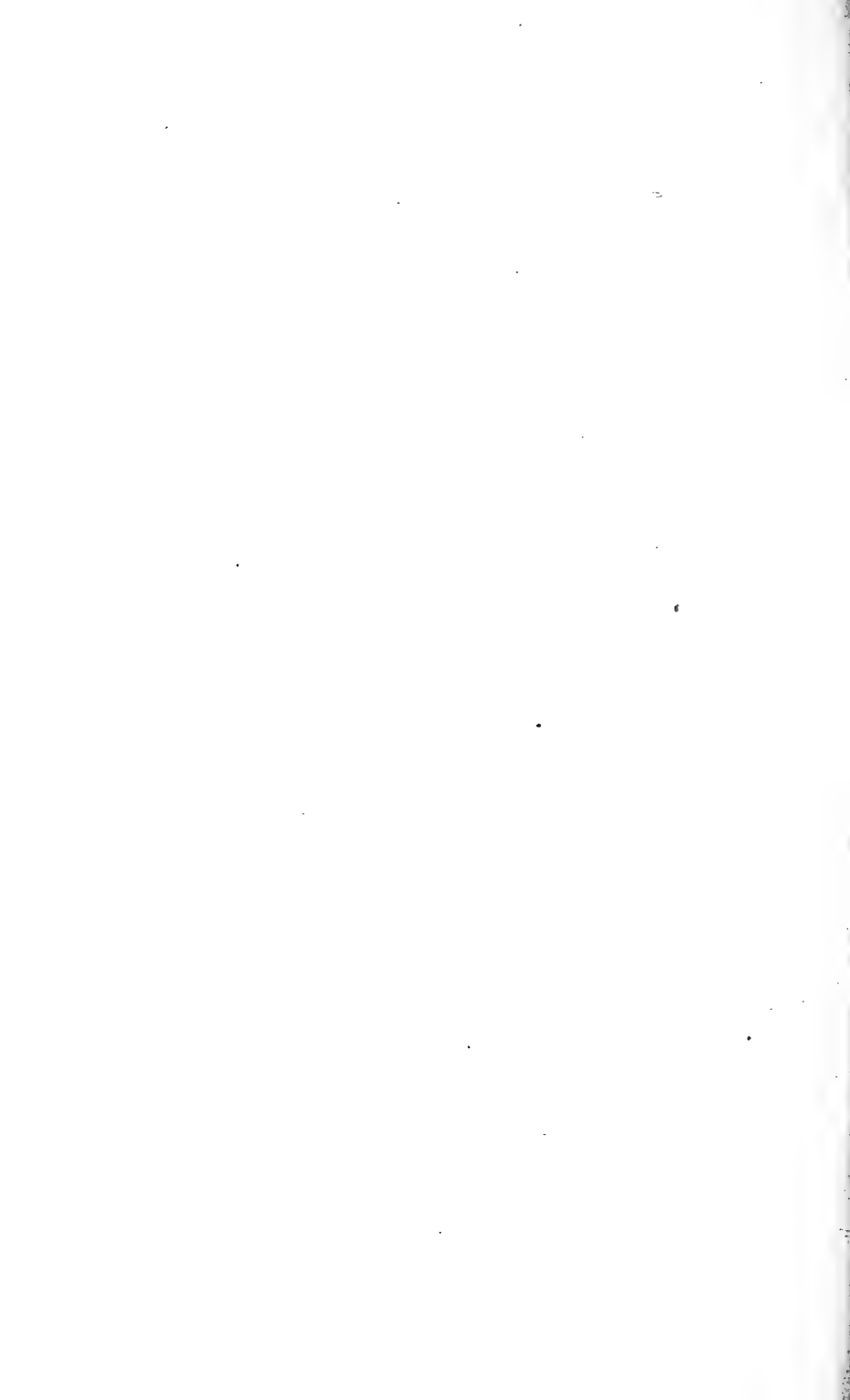
This species is related to *macer* Lec., and differs in the distinctly stouter form; shorter and stouter pronotum, rugose on the sides and in front; and the striae much less distinctly impressed.

Type number, 2310a.

The type is from Golden, B. C.; also taken in the Creighton Valley, B. C., in bark of dying Douglas fir.



DRYOCOETES PSEUDOTSUGAE, N. SP. GREATLY ENLARGED.
ORIGINAL.



Variations in our few examples are slight; the pronotum is arcuately subparallel on the sides for three-fourths the length or more and constricted before the front margin, widest at or before the middle; sometimes slightly more elongate than in the type.

The types of these species are in the collection of the Entomological Branch, Ottawa.

SOME OLD CLASSIFICATIONS OF INSECTS.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

From the time of Aristotle to the present, different naturalists have advanced and advocated various systematic arrangements of insects. Many of the older ones were never generally adopted and only a few in part hold good at the present day. Linnaeus arranged insects in seven orders, but as entomologists became more exacting, the number was gradually increased until thirty-seven are now recognized as set forth in Brues and Melander's "Key to the Families of North American Insects."

It is not the purpose of this paper to deal with the history of the various changes which have taken place, but simply to set forth, as a matter of entomological interest, some of the systems which were proposed several hundreds of years back.

ARISTOTLE'S SYSTEM.

Aristotle (384-322 B.C.), Greek philosopher.

I. Winged insects (*Pterofa* or *Ptilota*)

1. With wing cases—beetles (*Coleoptera*).
2. With coriaceous wings—grasshoppers (*Pedetica*).
3. Without jaws—bugs (*Astomata*).
4. With powdery wings—moths, butterflies (*Psychæ*).
5. With four transparent wings (*Tetraptera*).
Without stings and larger—(dragon-flies).
With stings—bees and wasps (*Opisthocentra*).
6. With two wings (*Diptera*).
Without mouth-piercers and smaller—flies and crane-flies.
With mouth-piercers—gnats and gad-flies (*Emprosthocentra*)

II. Wingless insects:

1. Occasionally acquiring wings,
Ants (*Myrmices*).
Glow-worms (*Pygolampides*).
2. Without wings (*Aptera*).

ALDROVANDI'S SYSTEM.

Aldrovandi, Ulissi (1522-1605), Italian naturalist, studied law and medicine, occupied chair of natural history in 1560 at University at Bologna.

I. Land insects (*Terrestria*):

1. With feet (*Pedata*),
 - a With wings (*Alata*).
Without wing-cases (*Anelytra*).
With membranaceous wings (*Membranacea*).
Honey making ((*Favifica*)).
Not honey making (*Non favifica*).
With scaly wings (*Farinosa*).
With wing cases (*Elytrotata*).
 - b Without wings (*Aptera*).
With few feet (*Paucipeda*).
With many feet (*Multipeda*).
2. Without feet (*Apoda*).

II. Water insects (*Aquatica*).

1. With feet (*Pedata*).
 - a With few feet (*Paucipeda*).
 - b With many feet (*Multipeda*).
2. Without feet (*Apoda*).

RAY AND WILLUGHBY'S SYSTEM.

Ray, John (1628-1705), sometimes called the father of English natural history. Willughby, Francis (1635-1672), English ornithologist and ichthyologist, was pupil, friend, patron and co-worker of John Ray.

I. Insects undergoing no transformations.

1. Without feet.
 - a Land insects, including worms (*Terrestria*).
 - b Water insects, including leeches (*Aquatica*).

2. With feet (*Pedata*),
 - a With six feet (*Hexapoda*).
 - Land insects (*Terrestria*).
 - Larger, including lignivorous larvæ (*Majora*).
 - Less, including lice and springtails (*Minora*).
 - Water insects including the river shrimp (*Aquatica*).
 - b With eight feet (*Octopoda*).
 - With tails—scorpions (*Caudata*).
 - Without tails—spiders, mites (*Non caudata*).
 - c With fourteen feet—woodlice.
 - d With twenty-four feet.
 - e With thirty feet.
 - f With many feet.
 - a Land insects (*Terrestria*).
 - With a roundish body—millipedes (*Tereti seu subrotundi*).
 - With a flat or compressed body—centipedes (*Plano seu compressa*).
 - b Water insects (*Aquatica*).
 - With a round body (*Corpore tereti*).
 - With a flat body (*Corpore plano*).
 - With a double tail (*Bicaudatum*).

II. Insects undergoing transformations.

1. Transformations instantaneous.
 - a Lace-winged flies (*Libellæ seu Perlæ*).
 - b Wild bugs (*Cimices sylvestres*).
 - c Locusts and mantes (*Locustæ*).
 - d Field crickets (*Grylli campestris*).
 - e Hearth crickets (*Grylli domestici*).
 - f Mole crickets (*Grylli talpa*).
 - g Tree hoppers (*Cicadæ*).
 - h Cockroaches (*Blattæ*).
 - i Crane-flies (*Tipulæ*).
 - k Water-scorpion (*Scorpius aquaticus*).
 - l Water flies (*Muscæ aquaticæ*).
 - m May-flies (*Hemerobii*).
 - n Earwigs (*Forficula seu Auricularia*).
2. Transformations twofold, metamorphosis duplex.
 - a With wing-cases—beetles.

b Without wing-cases.

With mealy wings—butterflies and moths (*Alis fare-naceis*).

With membranaceous wings—bees, flies (*Alis mem-branaceis*).

With two wings.

With four wings.

Gregarious (*Gregaria*).

Making honey—bees (*Mellifica*)

Not making honey (*Non mellifica*)

Solitary (*Solitaria*).

Bee-formed (*Apiformia*).

Wasp-formed (*Vespiformia*).

Butterfly-formed (*Papilioniformia*).

With an ovipositor (*Seticaudæ seu Triplia*).

SWAMMERDAM'S SYSTEM.

Swammerdam, Jan (1637-1680), Dutch naturalist.

- I. Transformations immediate, the insects being hatched perfectly formed—fleas, spiders, etc.
- II. Transformations taking place under a covering—locusts, crickets, bugs, dragon-flies, may-flies.
- III. Transformations with a pupa-case intermediate—beetles, wasps, saw-flies, gnats.
Transformations in the pupa state objected—moths, butter-flies.
- IV. Transformations in the pupa state coarctate—ichneumons, flies, etc.

VALLISNIERI'S SYSTEM.

Vallisnieri, Antonio (1661-1730), Italian entomologist.

Vallisnieri arranged insects into the four following groups: Plant insects, Water insects, Insects inhabiting earthy or mineral substances and Insects inhabiting living animals.

LINNAEUS' SYSTEM.

Linnaeus, Carl von Linné (1707-1778), Swedish botanist.

I. Winged insects:

1. With four wings.

a Upper wings more or less crustaceous, the under wings membranaceous.

Upper wings quite crustaceous and not overlapping (*Coleoptera*).

Upper wings semi-crustaceous and overlapping—bugs, grasshoppers (*Hemiptera*).

b Upper and under wings of same texture.

Wings covered with small tiled scales—butterflies and moths (*Lepidoptera*).

Wings membranaceous and naked,

Without a sting—dragon-flies, etc. (*Neuroptera*).

With a sting—wasps, bees (*Hymenoptera*).

2. With two wings—flies, gnats, etc. (*Diptera*).II. Wingless insects (*Aptera*).

LAMARCK'S SYSTEM.

Lamarck, Jean Baptiste Pierre Antoine De Monet, Chevalier de (1744-1829), French naturalist.

I. Insects with jaws:

1. With wing-cases—beetles (*Coleoptera*).

2. With straight wings—crickets, etc. (*Orthoptera*).

3. With four equal wings—dragon-flies (*Neuroptera*.)

II. Insects with jaws and a sort of sucker.

4. With four unequal wings—bees, etc. (*Hymenoptera*).

III. Insects with no jaws but having a sucker.

5. With powdery wings—moths, etc. (*Lepidoptera*).

6. With upper wings of unequal consistence—bugs, etc. (*Hemiptera*).

7. With two wings—flies, etc. (*Diptera*).

8. Without wings (*Aptera*).

LATREILLE'S SYSTEM.

Latreille, Pierre Andre (1762-1833), French naturalist.

I. Insects with more than six feet and without wings (*Myriapoda*).

1. With many jaws—woodlice (*Chilognatha*).

2. With many feet—millipedes (*Chilopoda*).

II. Insects with six feet.

Without wings.

- a With organs of motion like feet (*Thysanura*).
- b Mouth with a retractile sucker (*Parasita*).
- c External mouth with a jointed tube enclosing a sucker (*Suctoria*).

With four wings.

A Upper wings crustaceous or coriaceous, at least at the base.

- a With under wings folded crosswise—beetles (*Coleoptera*).
 - 1, Pentamera; 2, Heteromera; 3, Trimera; 4, Tetramera).
- b With under wings folded lengthwise (*Orthoptera*).
 - Legs formed for running (*Cursoria*).
 - Legs formed for leaping (*Saltatoria*).
- c With sucker enclosing several bristles (*Hemiptera*).
 - 1, Heteroptera; 2, Homoptera.

Upper wings membranaceous.

- a Wings naked and nettled (*Neuroptera*)—1, Subulicornes; 2, Planipennes; 3, Plicipennes.
- b Wings naked and veined (*Hymenoptera*)—1, Terebrantia; 2, Aculeata.
- c Wings with dust-like scales (*Lepidoptera*)—1, Diurna; 2, Crepuscularia; 3, Nocturna.

With two twisted elytra and two wings (*Rhipiptera*)—
1, Xenos; 2, Stylops.

With two wings (*Diptera*).

Latreille also wrote a paper on the Geography of Insects in which he divided the globe into twelve insect zones. His two main divisions were Arctic (all north of the equator) and Antarctic (all south of the equator). The Arctic was sub-divided into the Polar, sub-Polar, Superior, Intermediate, Supra-tropical, Tropical and Equatorial, while the Antarctic embraced the Equatorial, Tropical, Supra-tropical, Intermediate and Superior.

HOME'S SYSTEM.

Home, Everard (1756-1832), English naturalist.

Metamorphogenoa—Having the embryo produced from an egg which is formed in the ovarium, subjected to transformation and breathing by air-tubes (spiracula); heart wanting, blood white.

1. The embryo developed from eggs attached under the tail—lobster (*Cancer*).
2. The embryo developed from eggs carried upon the anterior feet—spider (*Aranea*).
3. The embryo developed from eggs deposited under the cuticle of the skin or stomach—gadfly (*Æstrus*).
4. Embryos developed from eggs for several generations, impregnated at the same time—plant louse (*Aphis*).
5. Embryos produced from eggs of one mother that compose the whole republic—bee (*Apis*).
6. Embryos from eggs deposited under water—water moth (*Phryganea*).

The foregoing classifications are representative of what were known as the wing, locality, transformation, mouth and egg systems; those of Aristotle and Linnaeus being examples of the wing system, those of Swammerdam and Ray & Willughby of the transformation system, those of Aldrovandi and Vallisnieri and one of Latreille's the locality system, and that of Lamarck the cibarian or mouth system. Home's classification represents the egg system and the tabulated one of Latreille's was known at one time as the modern or eclectic system, being a combination of the principles of several of the preceding ones.

De Geer, Louis Gerhard, Baron (1818-1896) Swedish statesman and writer, was also the inventor of a wing system. Cuvier, Georges Leopold Chretien Frederic Dagobert, Baron (1769-1832), French naturalist, and Fabricius, Johann Christian (1745-1808), Danish entomologist and economist, both put forth systems based on mouth structures, while Clairville, J, whose writings were published between 1798 and 1806, Leach, William Elford, who

was at one time connected with the British Museum and died in 1836, and Stephens, James Francis (1792-1852), an English entomologist, were all advocates of the eclectic system and originators of classifications along such lines.

MacLeay, William Sharp, an English entomologist, who published between 1819 and 1838, was the author of what was known as the quinary system, in which insects were arranged in circular groups of fives, so placed as to bring those having the nearest resemblance, contiguous to one another in their several circles. By some authors, insects were also arranged according to the condition of their food, such as those feeding on living substances (*Thalero-phaga*) and those feeding on dead substances (*Sapro-phaga*). These groups were subdivided, but such systems on the whole were never brought to any degree of perfection.

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The Canadian Entomologist.

VOL. XLVII.

LONDON, DECEMBER, 1915

No. 12

FIFTY-SECOND ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

This was undoubtedly the most successful meeting of the Society that has ever taken place. It was held at Ottawa in the large laboratory of the Entomological Branch of the Department of Agriculture on Thursday and Friday, November 4 and 5, 1915, and the President, Dr. C. Gordon Hewitt, Dominion Entomologist, occupied the chair. Throughout the entire sessions the closest interest was evinced in the papers presented, most of which were of decided importance to farmers, horticulturists and others interested in agriculture and forestry. Valuable discussions followed the presentation of many of the papers. Entomologists from nearly every province in Canada were in attendance, as well as visitors from the United States. Among those who were present were Dr. H. T. Fernald, Amherst, Mass., who delivered the popular illustrated lecture on Thursday evening, November 4th, his subject being "Life Zones in Entomology and their Relation to Crops"; Mr. C. P. Lounsbury, Chief of the Division of Entomology of the Union Department of Agriculture, Pretoria, South Africa; Mr. A. F. Burgess, Melrose Highlands, Mass.; Rev. Thos. W. Fyles, Ottawa; Prof. W. Lochhead, and Mr. E. M. Du Porte, Macdonald College, Que.; Rev. Father Leopold, and Prof. F. Letourneau, La Trappe, Que.; Prof. L. Caesar, Provincial Entomologist of Ontario; Prof. E. J. Zavitz, Provincial Forester, and A. W. Baker, Ontario Agricultural College, Guelph, Ont.; A. F. Winn, Westmount, Que.; J. C. Chapais, St. Denis en Bas, Que.; H. G. Crawford, Wilton Grove, Ont.; F. J. A. Morris, Peterboro, Ont.; C. MacNamara, Arnprior, Ont.; Prof. W. H. Brittain, Provincial Entomologist of Nova Scotia, Truro, N. S.; Mr. H. G. Payne, Kentville, N. S.; Sir James Grant, Ottawa; Dr. F. T. Torrance, Veterinary-Director-General; Dr. F. T. Shutt, Dominion Chemist; W. T. Macoun, Dominion Horticulturist; Dr. C. H. Higgins, Pathologist; F. W. L. Sladen, Apiarist of Dominion Experimental Farms; R. H. Campbell,

Director of Forestry; H. T. Gussow, Dominion Botanist; W. Ide, Private Secretary to the Minister, Dept. of Agriculture; D. Johnson, Dominion Fruit Commissioner. The following members of the Entomological Branch were present: Dr. Hewitt; Arthur Gibson, Chief Assistant Entomologist; J. M. Swaine, Assistant Entomologist for Forest Insects. Field Officers: R. C. Treherne, Agassiz, B. C.; G. E. Sanders, Annapolis Royal, N. S.; E. H. Strickland, Lethbridge, Alta.; G. Beaulieu, Ottawa; J. D. Tothill and L. S. McLaine, Fredericton, N. B.; Norman Criddle, Treesbank, Man.; W. A. Ross, Vineland, Ont.; C. E. Petch, Hemmingford, Que.; R. N. Chrystal, Vancouver, B. C.; J. R. Gareau, Strathroy, Ont.; A. E. Kellett, Artist Assistant; J. I. Beaulne, Inspector.

The following papers were presented:

"Insects of the Season in Ontario."

"Willow and Poplar Curculio."

—L. CAESAR.

"Insects of St. Annes, Que., season of 1915."

"Occurrence of *Tychius picirostus* on clover at St. Anne's, Que."

—E. M. DU PORTE.

"The Home of *Gortyna stramentosa*."

—A. F. WINN.

"Observations upon some of the Predaceous and Parasitic Hymenoptera."

—REV. THOS. W. FYLES.

"The Leaf Weevil (*Polydrosus impressifrons* Gyll) in New York."

—P. J. PARROTT AND HUGH GLASGOW.

"Side Worm Injury by the Codling Moth."

—E. P. FELT.

"*Lygus invitus* and its Control in 1915."

—W. BRITAIN

"A Capsid Attacking Apples."

—H. G. CRAWFORD.

"The Founding of the Science of Cecidiology."

—A. COSENS.

- "The Army Cutworm in Southern Alberta."
—E. H. STRICKLAND.
- "Some Notes on Nose and other Bot Flies."
—W. LOCHHEAD.
- "Further Notes on the Warble Fly, *Hypoderma bovis*."
—S. HADWEN.
- "Forest Insect Investigations in Canada "
—J. M. SWAINE.
- "The Life History of *Chermes cooleyi* in Stanley Park, B. C."
R. N. CHRYSTAL.
- "The Cabbage Maggot (*Chortophila brassicae*) in British Columbia" (a) Natural Methods of Control; (b) Autumn development.
—R. C. TREHERNE.
- "Fresh Woods and Pastures New."
—F. J. A. MORRIS.
- "Some of the methods followed in Nova Scotia in Controlling the Brown-tail Moth."
—G. E. SANDERS.
- "Raising Brown-tail Moth Parasites at Melrose Laboratory for Distribution in Canada."
—L. S. McLAINE.
- "Locust Control Work with Poisoned Baits in Eastern Canada, 1915."
—ARTHUR GIBSON.
- "Apple Leaf Rollers In Ontario."
—L. CAESAR.

In addition to the above, brief addresses were given by Dr. Hewitt, by Mr. Charles MacNamara on the Habits of *Thalessa*, and by Mr. J. D. Tothill on the colonization of the parasites of the Gipsy and Brown-tail Moths in eastern Canada. All of the papers presented at the meeting, as well as a full account of the discussion, will be published early in 1916 as the Forty-sixth Annual Report of the Entomological Society of Ontario.

The following were elected officers of the Society for 1915-16:

PRESIDENT—A. F. Winn, Westmount, Que.

VICE-PRESIDENT—Prof. L. Caesar, Ontario Agricultural College, Guelph, Ont.

SECRETARY-TREASURER—Mr. A. W. Baker, B.S.A., Lecturer in Entomology, O. A. College, Guelph, Ont.

CURATOR—Mr. G. J. Spencer, B.S.A., Demonstrator in Entomology, O. A. College, Guelph.

LIBRARIAN—Rev. Prof. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College, Guelph, Ont.

DIRECTORS—Division No. 1, Mr. Arthur Gibson, Entomological Branch, Department of Agriculture, Ottawa; No. 2, Mr. C. E. Grant, Orillia; Division No. 3, Dr. A. Cosens, Parkdale Collegiate Institute, Toronto; Division No. 4, Mr. C. W. Nash, Provincial Biologist, East Toronto; Division No. 5, Mr. F. J. A. Morris, Peterboro; Division No. 6, Mr. J. W. Noble, Essex, Ont.; Division No. 7, Mr. W. A. Ross, Vineland Station, Ont.

On Friday evening, November 5th, a very enjoyable smoker was held. The Entomological Section of the Ottawa Field Naturalists' Club were the hosts, and brief speeches, reminiscent, anecdotal and felicitous, enlivened the proceedings.

A. G.

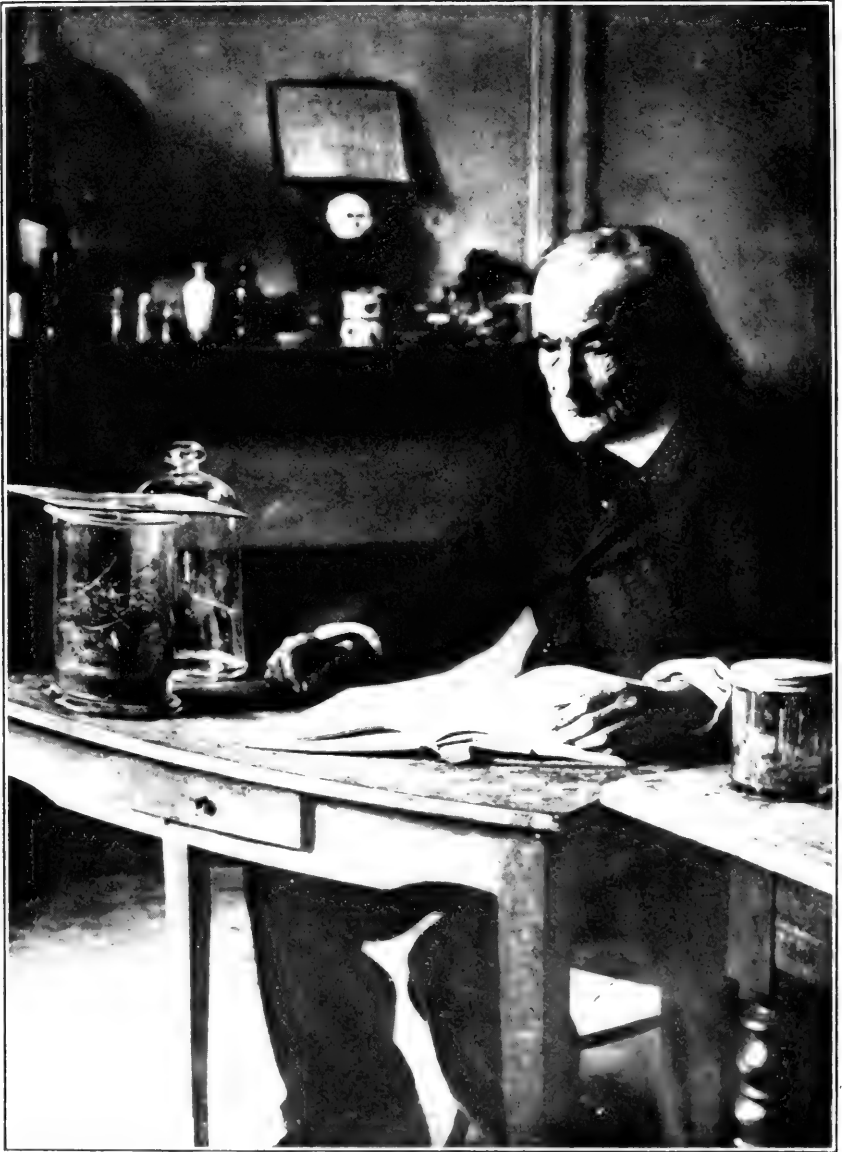
A NEW TABANUS

BY C. P. WHITNEY, MILFORD, N. H.

Tabanus wrighti, n. sp.

Female—Length 11 mm. Face, front and palpi black. Antennæ black, the slightest rufous tinge at base of third joint, which is narrow, the upper angle rounded and hardly raised. Frontal callus round, a short, tapering prolongation above.

Sub-callus denuded, shining (an uncertain character). A prominent ocelligerous tubercle. Eyes (revived) black, four narrow green bands, the interspaces twice as wide. Thorax shining black. Abdomen black, sparsely pilose, segments with narrow



JEAN HENRI FABRE.

In his room and seated at the table where he wrote his "Souvenirs Entomologiques."
(Illustration reproduced from "L'Illustration," to which paper grateful acknowledgments are made.)

posterior whitish bands. Second segment with a small dorso-lateral rufo-fulvous spot reaching posterior margin. Venter black, the whitish bands more distinct. Feet black. Wings dark fuliginous, fading at apex, hinder margin and root. First posterior cell widely open.

A paratype, slightly damaged, is a little larger and lacks the spots on second segment.

Taken in May, at West Palm Beach, Florida, by Dr. H. E. Wright, after whom the species is named.

JEAN-HENRI FABRE.

It is hard to believe as I write that Fabre is dead, for the great age to which he lived and the extraordinary character of the man had, as it were, dulled one's senses to the inexorable facts of life. The photograph before me of "that inimitable observer," as Darwin called him more than half a century ago, showing that keen old face wrinkled with years of the most intense and penetrating observation still intent on the movements of an insect, had instilled into one an idea of permanence. But on October 11th, at Orange, he finished a life of ninety-two years of hard and strenuous toil.

Born of humble parentage at Saint Léons, a little village in the Haute Rouergue, on December 22nd, 1823, he was destined to a life of poverty, through which he struggled with an indomitable perseverance, which was the outstanding characteristic of his entire life and the main cause of the imperishable fame that will be his. His early years were a perpetual struggle for education. Undeterred by disappointment, he laboured on as a teacher, now as a professor of mathematics and physics at Ajaccio in Corsica, where an acquaintance with that brilliant naturalist Moquin-Tandon was responsible for his determination to forswear mathematics for the study of living things, and later at Avignon, always careless of degrees and dignities. The chance discovery in 1854 of a volume of that famous entomologist, Léon Dufour, on the habits of a wasp, *Cerceris*, directed his steps into that path of patient entomological study from which, during the succeeding sixty years of incessant

labour, he never turned. In the following year there appeared in the *Annales des sciences naturelles* his memoir on *Cerceris*, which signals the beginning of his entomological career. While at Avignon he met John Stuart Mill, whose love for botany furnished the basis of their remarkable friendship; incidentally he took his doctor's degree in Natural Sciences at Paris, and his discovery by Victor Drury, the Minister of Public Instruction, was responsible for his distinction as a Chevalier of the Legion of Honour. Little did these honours avail him, for during the twenty years during which he stayed at the University of Avignon his salary never changed from £64 per annum. Disappointed, but clinging more tenaciously than ever to his life's pursuit, he settled down near Orange, in the lower Rhone, and subsequently, "after forty years of desperate struggles," he found his Eden at Sérignan, a little village in Provence.

Here for the rest of his life he dwelt; his laboratory was a small tract of wild land "L'Harmas," a "living laboratory," where he studied "non l'insecte mort, macéré dans le trois-six, mais l'insecte vivant; un laboratoire ayant pour objet l'instinct, les moeurs, la manière de vivre, les travaux, les luttes, la propagation de ce petit monde, avec lequel l'agriculture et la philosophie doivent très sérieusement compter."

The central feature of Fabre's work was that he studied the living insect and its behaviour, and in this fact lies the chief value of his contribution to entomological knowledge. Never since Réaumur has so wide a range of insects been studied so intensively as we find in the *Souvenirs entomologiques*; but while Réaumur described with the greatest precision the objects of his patient study, he did not enter into the lives of his insects and their instinctive behaviour to the extent that Fabre has accustomed us. And how different their respective lives: Fabre carrying on a perpetual struggle to raise a family in the face of poverty and Réaumur in ease and comfort. It is safe to say that no entomologist in the past has accomplished a work of so unique a character as that of Fabre, and it is unlikely that the future will hold another man who will equal his achievement. In 1878 he was able to assemble the results of about twenty-five years' labour in the form of the

first volume of the *Souvenirs*, and the ten volumes he has left us constitute his great contribution to our knowledge.

In an appreciation of this character it is impossible to refer individually to the two hundred and nineteen memoirs, as his chapters really are, in the *Souvenirs*, much less to select from the thousand and one inimitable word pictures he gives us, greatly as one is tempted to do so. As the years passed by, his literary style developed until it reached a beauty of description that cannot be excelled in any language, and to appreciate it fully one must go to the original memoirs, although the translations of the selected essays, which are gradually being published, will serve to bring his work to the attention of a wider audience than it has previously enjoyed.

Undoubtedly the outstanding feature of Fabre's work was his contribution to our knowledge of insect behaviour, as I have already stated. He was not content with mere observation, with anatomical or physiological studies, but searched deeply for the principles underlying the behaviour of the creatures with whom he lived hour by hour and day by day: endeavouring to obtain, as it were, the insect's point of view. He was constantly comparing insects with men, and this anthropocentric attitude, no doubt, was a source of danger. Nevertheless, the evidence he afforded as a result of his painstaking work of the "pervasive mentality and purposiveness," to use the words of a recent writer, is his main contribution to the interpretation of animal behaviour. His belief in instinct as a dominant and underivable factor fundamentally different from intelligence, his strong vitalistic conception of the organism, and his firm opposition to the ideas set forth by Darwin, with whom he corresponded and for whom he conceived a real affection, are leading characteristics of his work. Although he assailed the "vast and luminous balloon" of evolution, as he called it, his criticism lacked the constructive arguments one would have desired from a close observer, and his intense conviction of the fallacy of a mechanistic interpretation appears to have blinded him to the possibility of an alternative interpretation of facts consistent with the idea of evolution.

C. GORDON HEWITT.

POPULAR AND ECONOMIC ENTOMOLOGY.

THE CENTENARY OF KIRBY AND SPENCE'S

"An Introduction to Entomology."

BY F. J. A. MORRIS, PETERBOROUGH, ONT.

To fill the space, which has been kindly put at my service, may I remind our brother entomologists that the current year is the centenary of the first (and still the greatest) popular work in English on Insects? In 1815 was published the first volume of "AN INTRODUCTION TO ENTOMOLOGY," by William Kirby and William Spence.

It is no exaggeration to claim this work as effecting a revolution in Great Britain in the study of Natural History. As a science, Entomology had already had its foundations well and truly laid in the 17th century: in Europe, by masters like Malpighi, Swammerdam, Leeuwenhoek and Redi; in England, by Ray and Willughby. The bright examples of Reaumur and Linnaeus, Fabricius, Latreille and the Hubers, sufficed in the 18th century to keep the torch aflame, and reconcile a little band of devotees to labour unrewarded by public recognition, and often the butt of ridicule and obloquy. But no attempt was made, in English at least, to popularise the science.

The Rev. William Kirby, father of modern British Entomology, was a native of East Anglia. He began his work in Natural History as a botanist, and his name appears among the chartered members of the newly founded Linnean Society in 1788. He was at this time in his 30th year, but having one day found, in his rambles after plants, a very beautiful insect, he diverted his attention to this new branch of Natural History.

The first in the long list of his contributions to the Linnean Society is dated 1793; in 1802 appeared his important monograph on British Bees; in 1811 he established the Insect Order of *Strepsiptera*, which still holds good; and in 1812 (as a note in his commonplace book goes to show) he had identified what in his day was considered a bee-louse, the triungulin or young larva of the Oil-beetle.

When 46, he met for the first time a young and enthusiastic collector of beetles, William Spence. The two became fast friends, and three years later was born the idea of a popular introduction to their favourite pursuit. This was in the year 1808, and it shows how great examples serve to

“inspire posterity,
Fathering their kind, from son to son;”

for it was in 1808 that news had come to them of the death of the great Fabricius.

The “Introduction” consists of a series of letters written in delightful style, the more remarkable that both authors were learned in every branch of the science and profoundly read. They brought to their task the ripe experience of years of active observation and collection, and during nearly 20 years of planning and publishing, they ransacked whole libraries of British and foreign literature.

The letters were originally in four volumes: Vol. I dealing largely with Injuries and Benefits due to Insects, but treating also such interesting topics as Metamorphoses, Care of Young, Food, and Homes; Vol. II chiefly taken up with Insect Societies, but including letters on Weapons, Movements, Emission of Sound and Light, Hibernation, and Instinct; Vols. III and IV were systematic and supplementary; these ceased to be reprinted after the sixth edition, and Vols. I and II came to constitute the now world-famed Introduction.

And what a transformation it effected! Just look before and after. A little over a century before, and the sanity of Lady Glanville had been hotly impugned by British lawyers and the great naturalist Ray dragged to court to testify that the lady, though indeed a collector of Lepidoptera, was not insane.

In the first decades of the 19th century ignorance was widespread and prejudice strong against entomology; but the “Introduction” changed all that, and in a preface to the sixth edition (1843) the authors (Kirby, now an octogenarian) could congratulate themselves on the removal of this public reproach. Moreover, a

number of other works now supplemented their popular Introduction.

In 1815 they had enlisted in their service the genius of a Government clerk, John Curtis, who drew and engraved five plates to illustrate their first two volumes. In 1824, when the "Introduction" was complete, he dedicated to William Kirby the first of his 16 immortal volumes of plates, illustrating British insects on their food plants; the letterpress is of no value now, but the coloured plates remain the *ne plus ultra* of artistic excellence. And the great systematist, J. O. Westwood, won the favour (his crowning ambition, he calls it) of having his magnificent "Introduction to the Classification of Insects" recognised as a sequel to Kirby and Spence; and so it became and is.

The authors of the "Introduction" claim as one of the advantages of their epistolary method that it lends itself to easy digressions. May I close my letter with a little aside in the shape of a personal incident? In 1904 I was visiting an uncle in Chislehurst (Kent, England), and, on the eve of my departure to Scotland on a botany trip, got word that an old family friend of my uncle's was coming to stay with him. I begged my uncle to ask his guest's advice in the choice of a good general treatise on Entomology. A week later I got a note saying that nothing in English had yet displaced Kirby and Spence's Introduction with J. O. Westwood's two volumes on Classification as a sequel. I still treasure the note with its signature—Avebury; for my uncle's friend was none other than the famous author of "Bees, Ants and Wasps," the late Sir John Lubbock.

AESHNA UMBROSA UMBROSA WALK. IN NEWFOUNDLAND.

In the 45th Annual Report Ent. Soc. of Ont., 1914, p. 149, I recorded the finding of the nymph of this dragonfly at Spruce Brook, Newfoundland, on July 27, 1914. Recently I received two male adults from Humbermouth, Bay of Islands, Nfd., taken on August 11, 1915, by Dr. A. G. Huntsman, of the Biological Dept., University of Toronto. They were captured while flying in the vicinity of a small creek flowing partly through dense spruce woods and partly through a natural meadow. These specimens resemble some which I have from Anticosti, being somewhat stouter and a little smaller than usual, this being a general characteristic of the species of *Aeshna* from Newfoundland and other localities having a cool summer climate.—E. M. WALKER.

NOTES ON STAUROPHLEBIA RETICULATA BURM.

BY E. M. WALKER, TORONTO.

Mr. E. B. Williamson, of Bluffton, Ind., recently placed in my hands for study a series of the large Aeshnine dragonfly, *Staurophlebia reticulata* Burm., taken by himself, his father (the late Mr. L. A. Williamson) and Mr. B. J. Rainey in four localities, viz., Los Amates, Guatemala; Baracon, Chaquamas, Trinidad; Rockstone, British Guiana, and Tumatumari, British Guiana.

On handing over the series to me, Mr. Williamson called my attention to the marked difference in coloration between the British Guiana specimens and those from the other localities, and stated that this difference was much more conspicuous in the living insects, being readily recognizable during flight. It seemed, therefore, desirable to make a careful study of the material in order to determine, if possible, the systematic status of the two colour-forms.

While pursuing this object, I have also taken the opportunity of studying the mutual adaptation between the peculiarly specialized structure of the male abdominal appendages and the correlated parts of the head and prothorax of the female, which are held by these appendages during copulation; especially in view of Mr. Williamson's observations on the habits of this species during the copulatory act (*vide inf.*)

Coloration.

On the envelope containing one of the males from Rockstone, British Guiana, is the following field-note: "Thorax and head bright grass green, segments 1 and 2 similar, shading into yellowish; 3-9 golden-brown, clearest on each segment anterior to transverse carina; posterior to transverse carina shaded into brown; 10 largely yellow."

With one of the Trinidad specimens is the following note:—

"Colours like British Guiana specimens, but abdomen distinctly bluish-green, very different from British Guiana specimens, so much so that colours in flight are very different."

The Guatemala specimen bears the following note:—

"Eyes bright green, face greenish-blue, thorax dull green, abdomen after transverse carina on 3 dull blue."

The colour-characters of the males as seen in the dried specimens may be tabulated as follows:—

BRITISH GUIANA	TRINIDAD	GUATEMALA
Face grass green.	Face grey-bluish green.	Face grayish olivaceous.
T-spot, with distinct narrow stem.	T-spot with distinct narrow stem.	T-spot reduced to a narrow streak along frontal margin, no stem.
A dark brown line on fronto-nasal suture and base of labrum.	A dark brown line on fronto-nasal suture, sometimes faint and base of labrum.	Such lines not distinctly present.
Thorax grass-green, a chocolate streak in front of anteoralar sinus and extending along base of mid-dorsal carina.	Thorax of a darker and colder or more bluish-green with similar markings.	Thorax dark reddish-brown, with a dull greenish bloom (dull green in life), scarcely darkened in front of anteoralar sinus and base of median carina.
Green colour of thorax extending on abdomen not beyond sides of seg. 1, shading into ochre yellow on 2 and base of 3, posterior to which abdomen is orange-brown, darker on each segment behind transverse carina (golden-brown in life).	Green colour of thorax extending on abdomen to transverse carina on 2, distal part of 2 and 3 front of transverse carina reddish-brown, shading into dark-greenish brown on the remaining segments (bluish-green in life).	Abd. segs. 1 and 2 apparently concolorous with thorax. Seg. 3 anterior to transverse carina clear reddish-brown, shading into dull dark greenish-brown in the remaining segs. (dull blue in life).

The females in the dried condition are similar in colour to the males from the same localities. In those from Trinidad the brown line on the fronto-nasal suture is faint, as it is in some of the males.

STRUCTURAL CHARACTERS.

A careful search was made for structural characters particularly in the genitalia of both sexes, the abdominal appendages of the male and the wing-venation. The results were entirely negative, except in the venation, and even here no constant differentials were found, nor anything approaching such characters. All that could be detected was the presence of slight differences in the average number of certain cross-veins, cells, etc., as shown in the table below. Only the males from British Guiana and Trinidad were in sufficiently large series to be used for this purpose.

In this analysis the following characters were specially noted and tabulated:—

1. Number of first antecubital veins.
2. Number of first postcubital veins.
3. Number of cubital cross-veins.
4. Number of cross-veins in the triangle.
5. Number of cross-veins in the supratriangle.
6. Number of marginal cells between Rs and Ms.

In this table B. G. = British Guiana (Rockstone) and Tr. = Trinidad (Baracon).- Ten males from the former locality and six from the latter were studied, so that the total number of fore or hind wings was 20 from British Guiana and 12 from Trinidad.

It will be seen from the table that in nearly every case the prevalent number of veins or cells is slightly greater in the British Guiana specimens than in those from Trinidad. In the former, e.g., the number of antecubital veins most often noted is 31 in the fore wings and 21 in the hind wings, while in Trinidad specimens the corresponding numbers are 27 and 20. Similarly in the case of the postcubital veins, the prevalent numbers for the British Guiana specimens are 22 and 26 for the fore and hind wings, respectively, while for the Trinidad specimens they are 21 and 25. The difference is too slight to be conclusive for any one table, but when taken together the results seem to indicate fairly clearly a slightly greater average complexity of venation in the British Guiana specimens than in those from Trinidad.

The Guatemala specimen is well above the average in complexity of venation, but it is impossible to judge from a single specimen how this form compares with the other two in this regard.

In view of the apparent absence of distinctive structural characters, it is improbable that there is more than one species represented in this series. But there are at least two strikingly different types of coloration characteristic of different localities, and it, therefore, seems best to regard these as geographical races. The Guatemala specimen, not being identical with either of the South American forms may be considered for the present as the type of a third race.

The type locality of Burmeister's *Aeschna reticulata* is Surinam and the British Guiana form may therefore be considered the typical race. This is also suggested by the expression "viridi-flava," which occurs in Burmeister's description quoted below.

Staurophlebia reticulata reticulata (Burm.)

Burmeister's description (Handb. der Ent., 1839, p. 837) is as follows:¹—

"5. *A. reticulata*; viridi-flava, post mortem sæpius fusca, tibiis intus nigris, alarum venis nigris, cellulis fusco-limbatis, Long. $3\frac{1}{4}$."

1. Kindly quoted for me by Mr. E. B. Williamson.

"♂. cercis foliaceis, in latere interno basi apiceque gibbiferis s. auritis.

"Aus Surinam, in Sommers Sammlung,"

Staurophlebia magnifica Brauer from Brazil is probably a synonym of this form.

The specimens in the series studied are labeled as follows:—

Rockstone, British Guiana, Feb. 2, 1912, 2 ♂'s; idem, Feb. 12, 1912, 7 ♂'s; idem, Feb. 14, 1912, 4 ♂'s, 2 ♀'s.

Tumatumari, British Guiana, Feb. 9, 1912, 1 ♂.

These specimens measure as follows:—

Males—Length of body, 94.5-100 mm.; of abdomen (including appendages) 73-78 mm.; of hind wing 62-65 mm.

Average measurements of 11 males—Body 96.6 mm.; abdomen 74.8 mm.; hind wing 63.2 mm.

Females (appendages broken in one specimen)—Length of body 92-94 mm.; length of abdomen (excluding appendages) 64-69 mm.; length of hind wing 63-64 mm.; length of appendages 6.5 mm.

Staurophlebia reticulata obscura, n. subsp.

Under this name I include all the specimens in the series from Trinidad. They have been sufficiently characterized above.

These specimens consist of 7 ♂'s and 3 ♀'s from Baracon, Chaquanas, Trinidad, all dated March 7, 1912.

The 6 ♂'s and 2 ♀'s examined measure as follows:—

Males—Length of body, 92-98 mm.; of abdomen (including appendages) 71-76.5 mm.; of hind wing, 60-66.5 mm.

Average measurements of 6 ♂'s—body 94.4 mm.; abdomen 73.5 mm.; hind wing 63.5 mm.

Females—Length of body 88.5-97 mm.; of abdomen (excluding appendages) 63-68.5 mm.; hind wing 65.5-71 mm.; appendages 6.5-7 mm.

Staurophlebia reticulata guatemalteca, n. subsp.

The single specimen of this form examined is a male from Los Amates, Guatemala, taken by Mr. Williamson, on June 21, 1909. It may not represent a valid race, but cannot properly be placed with either of the other two.

The specimen measures as follows:—

Length of body 99 mm.; of abdomen (including appendages) 76 mm.; of hind wing 67.5 mm.

MUTUAL ADAPTATION OF THE SEXES.

I have noted elsewhere* that in *Aeshna constricta* and its allies the abdominal appendages of the male are specialized for a firmer grasp of the head and prothorax of the female than in those species in which these structures have their usual form, and that these modifications are probably correlated with the more erratic nuptial flight of the species of this group. In *Staurophlebia* the general form of the male superior appendages recalls that of *Aeshna constricta*, but is still more highly specialized, having in addition to a very prominent subapical denticulate crest formed by the extreme elevation of the distal part of the superior carina, and the bending upwards of the margin at its termination, a process from the dorsal surface and supero-external margin, just before the middle, directed horizontally inwards and slightly decurved at apex (pl. XVII., fig. 1h). The inferior appendage is also complicated by the presence of a prominent elevation rising almost perpendicularly from the superior surface of the appendage at its extreme base (fig. 1, b. inf.).

The appearance of these appendages suggests a very firm union between the two sexes during copulation, and it is therefore of interest to learn from Mr. Williamson's notes that the nuptial flight is very erratic.

I relaxed the separated abdomen of a male and the head and thorax of a female, and endeavoured to determine the exact nature of this union. This was an easy matter as far as the head of the female was concerned, but with regard to the prothorax, much careful manipulation was necessary. I think, however, the following account will prove substantially correct.

By applying the upper surface of the inferior appendage to the front of the head in the usual position for the Aeshninae the basal elevation was found to fit accurately in a depression on the rear surface of the female's head just below the occipital margin (fig. 1, b. inf.). This feature alone must render the grasp of the male firmer than in those species which lack the prominence. The superior appendages also fell naturally into position at the rear of the head on the slope of the concavity surrounding the occipital foramen, from which their inner margins were but narrowly

*1912, Walker, E. M., Univ. Tor. Stud., Biol. Series 11, pp. 38-42.

separated. In this position they were divergent at an angle of about 35° . The laterally situated apices occupied a position adjacent to the inner surface of the base of the cardo, or first joint of the maxilla (fig. 1, *mx.*).

When the exact position of the prothorax in relation to the head is observed, it will be seen that the posterior margin of the pronotum approximately coincides with the position of the hook-like processes rising from the upper side of the male superior appendages, and there seems little reason to doubt that in copulation these processes hook over the pronotal margin as shown in figs. 1 and 2. The expanded part of the appendages enclose the pronotum, the crest-like elevations of the superior carinæ, which are directed inward, passing beneath and completing the pair of claspers. They appear to fit in a deep depression on the side of the pro-epimerum.

Thus the grasp of the male appendages as compared with those of *Æshna*, etc., is complicated and strengthened by the following specializations of structure:

(a) The basal protuberance of the inferior appendages, serving to support the occipital region of the head.

(b) The hook-like processes of the lateral margins, supporting the hind margin of the pronotum.

(c) The unusual development of the subapical denticulate crest, serving to grasp the neck immediately in front of the pronotum.

NOTES BY E. B. WILLIAMSON.

The first *Staurophlebia* I ever saw came sailing along the railroad track below Los Amates, Guatemala, one sunshiny morning (June 21, 1909) after a heavy night's rain. As he came towards me, I saw him at some distance, a gigantic fellow flying now within a few feet of the ground and now high up in the air, but following the lane or slash made by the railroad through the jungle. As he raised to pass me, the impression was of a dull, dark insect which might be brown or obscure blue or green. To our mutual surprise a despairing, straight backward high-reached sweep of the net overtook him. This was the only specimen I saw in Guatemala during two collecting trips.

On the morning of January 31, 1912, I followed the log-filled stream back of the rest house at Rockstone, British Guiana, for a mile or two. On two occasions I saw for an instant a large brilliant green and golden-brown æschnine which cut across the stream, with only a moment's hesitation above the water. About 1 p.m. my father and I were at the stream, when we saw it again, but this time flying a beat, possibly 75 or 100 feet long. It disappeared over the trees as I approached, and we decided it was some glorified *Anax* to be found at home possibly at some neighbouring pond. The next day father and Mr. Rainey made a search for such a pond, while I again collected on the creek. Their search for a pond was in vain, but they found the home of our shy acquaintance of the day before in a small shallow muddy creek bed, in the woods, and without running water, there being merely pools of greater or less extent.

They saw several specimens, got several fair strokes at the dragonflies and affirmed that in striking from the rear at the dragonflies they were unable to make the net overtake the insect. The next day I visited this creek bed just below the town on the same side of the river. Never have I seen a dragonfly apparently more out of place—the little muddy wet-weather creek, in some places with the jungle crowding it to a scant 2-foot width, with its obscure, leaf-filtered sunlight on dry or damp mud banks and isolated pools of dirty water—and back and forth in this narrow avenue, from shade into sunlight and back into shade again, a great green and golden æschnine which so clearly belonged to the sunny reaches of marsh or lake. After a few futile strokes I caught one, and then another, and *Staurophlebia* does not take its capture tamely or philosophically. They fought, tearing and biting, and attacked the fingers which drew them from the net.

Staurophlebias were seen only rarely elsewhere in British Guiana, and then only along smaller streams. None were seen the two days I collected in Dutch Guiana. On March 7, 1912, Mr. Rainey and I were accompanied by Mr. F. W. Urich to Baracon, Chaquanas, Trinidad. We found the woods near there very dry with the stream beds in many cases without any water. Along such a stream bed we found a dark bluish or greenish dragonfly flying. Till specimens were captured it never occurred to me that

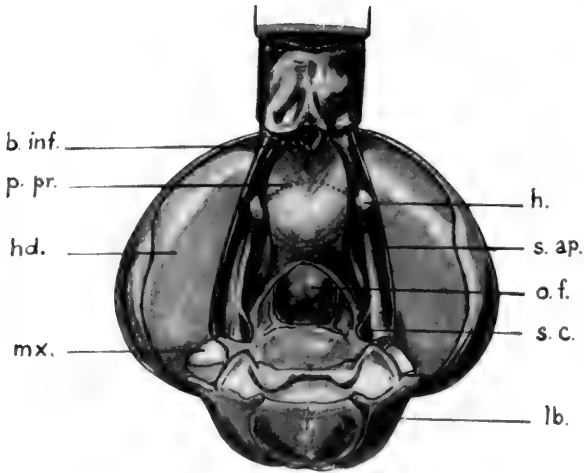


FIG. 1

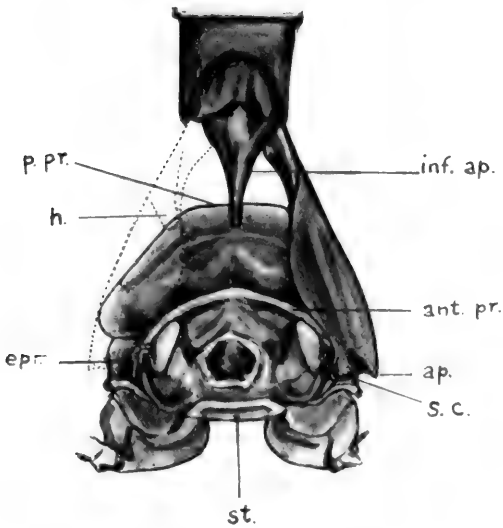


FIG. 2

STAUROPHLEBIA RETICULATA BURM.
 COPULATORY POSITION.

it was the same species we had recently seen in British Guiana. Its appearance was entirely different and the general colour and habits were in keeping with the surroundings which were not strikingly different from those of British Guiana.

On several occasions I saw the male seize an ovipositing female as she thrust her ovipositor in the damp but hard soil. So occupied, the male would find her as he came swiftly along the creek bed. Without hesitation he would plunge down on her, when the liveliest tussle would take place, the two tumbling over and over on the ground among leaves and other debris with a great rustling of wings and a general commotion that indicated a life and death struggle. When the male succeeded in fastening his appendages on the female's head a wild nuptial flight to a great height and distance immediately took place. Females, presumably the same, after a short time returned again to the same spot to oviposit. Such females were more or less stained and sticky, and we believed that in the pre-copulatory conflicts with the males the abdominal integument had been torn at a number of places with a resulting leakage of body fluids.

EXPLANATION OF PLATE XVII.

Fig. 1. *Staurophlebia reticulata* Burm., rear view of head of female, clasped by abdominal appendages of male; *hd.*, rear of head; *mx*, maxilla (cardo); *lb.*, labium; *of.*, occipital foramen; *s. ap.*, superior appendage of male; *h.*, hook-like process on upper side of superior appendage; *s.c.*, elevated distal part of superior carina; *b. inf.*, basal prominence of inferior appendage; *p. pr.*, position of posterior margin of pronotum.

Fig. 2. *Staurophlebia reticulata* Burm., front view of prothorax of female, clasped by appendages of male; *st.*, prosternum; *epm.*, pro-epimerum, showing depression in which the superior appendage fits (this is slightly out of place on the right side); *ant. pr.*, anterior margin of pronotum; *p. pr.*, posterior margin of same; *ap.*, apex of superior appendage; *inf. ap.*, inferior appendage; other lettering as before.

AN EARLY REFERENCE TO THE RELATION OF INSECTS
TO DISEASE.

BY C. GORDON HEWITT, DOMINION ENTOMOLOGIST, OTTAWA, ONT.

In studying the evolution of ideas respecting the control of insect pests, I came across an early reference to the relation of insects to disease which is of interest more from an historical point of view than as a serious contribution to the development of the insect transmission theory of disease. Nevertheless, I believe it is worthy of a place among our entomological documents, and this is one of my reasons for calling attention to it. The other reason is the relation it has to the ideas advanced by Nott (1848) on the mosquito transmission of yellow fever by insects. Nott has been generally accorded the credit of having formulated the insect-transmission idea of yellow fever. Riley (1914)* however, has recently pointed out that when Nott's argument is studied in its entirety it does not support the conclusion usually claimed, but that the term "insect" was used to denominate micro-organisms in general. As the matter is fully discussed by Riley in his paper, I will not repeat his interesting statements here. In the quotations which I am about to give I do not think that there is any ambiguity about the meaning of the term "insect."

In an old volume entitled "New Improvements of Planting and Gardening, both Philosophical and Practical," by Richard Bradley, F.R.S., the fourth edition of which was published in London in 1724 (this is the edition from which the extracts which follow are made) the author quotes a letter from a "worthy Gentleman, Mr. Balle," which begins (page 254):

Upon discoursing with you some time since about Blights upon Trees, you seem'd to be of the opinion that they were the Effect of Insects brought in vast Armies by the Easterly Winds and by lodging upon the Plants proper for their Nourishment, they there produced that Distemper which is called a Blight or Blast.

You was then desirous of what Observations I had made concerning Pestilential Distempers subject to Mankind, which

*Journal of Parasitology, I, p. 37, 1914.

December, 1915

I believ'd to proceed from the same Cause that produced Blights, i.e., from Insects; I have therefore, in answer to your Request endeavour'd to recollect what I have from time to time observ'd relating to that Case.

After five pages of miscellaneous discussion which concludes with the belief "that the most nauseous Vapour of itself will not cause any Distemper that is Epidemical," the letter continues:

It seems that the Plague proceeds from some other Cause, and that I suppose to be Insects of that extraordinary smallness that they are not to be discern'd by the naked Eyes; they are so light that they float in the Air, and so are suck'd in with the Breath. Such insects not being among us commonly, but only when they are either brought to us from some remote place by the Wind, or hatch'd or nourish'd by some Intemperance of Air or from poisonous Vapours rising from Boggs, Ponds, Ditches or some such unwholesome Funds of stagnating Water.

These Insects are various, according to the Nature of the Water or Air they are bred in; their Eggs being first laid by some flying Animals, which are then hatch'd, and passing through the several Changes common to Insects, at length take Wing; and being drawn in with the Breath, may perhaps be either kill'd in our Bodies and cause violent Ferment in the Juices, or else finding proper Nourishment, they breed in the Lungs, Stomach, or other parts within us, and probably may occasion those Biles and Breakings out in the tender parts of the Body that are called Plague-sores.

But these Insects, are some of them so extremely small, that they are only capable of being discern'd with good microscopes; and when they are winged, and so quite perfected, may perhaps in Swarms be carried from one Country to another by the Wind: It is Insects of several Kinds and Colours, which causes the Surface of Waters to appear sometimes Green, Red or Black; which last Colour in Water is observ'd by the Herdsmen to poison the Cattle that drink of it; and

they say causeth the Murrain, which is the Plague in Cattle, and it is very infectious.

It has been observ'd that Plagues, and the most contagious Distempers, have commonly happen'd in those Years when the Easterly Winds have more than ordinary prevail'd in the Spring and Summer Seasons; then the Air comes to be infected, and rarely or ever at other times. These Winds we see bring Caterpillars, and many differing Insects and Flies, which meeting with places fitly adapted to nourish them they are there brought to their winged state, which I conceive is the same in the invisible Animals as in the visible; nor indeed in any part of the Earth, or Waters.

The west winds he considered, carried back "the remainder of these Pestiferous Insects which yet survive, to the Country from whence they came." He continues:

I have not yet found that any Winds, except the East Winds, such as pass over Tartary, bring any Infection with them, nor have I ever heard of Pestilential Distempers in any part of the World, unless in such places only where the Tartarian Winds reach; Tartary being a country full of Woods, Boggs, and Fens it seems the most capable of producing these Creatures in abundance, which may be carry'd by the Wind to certain places in search after their Food, as are Locusts and some certain Birds, which are know to pass from one Country to another.

* * * * *

Experience shews us how much Insects delight in stinking Places, and that they increase much faster in uncleanly Cities, such as London was formerly, than in cleaner Places; but the city of London having been for the most Part burnt the year after the Pestilence, its streets were enlarg'd, many drains were made and good Laws were put in execution for keeping the City clean, and it has not had any Plague ever since.

* * * * *

His reference to the occurrence of "Epidemical Distemper" in Leghorn contains the following:

To the Northward of the Town, towards the Sea-shore, lay very boggy stinking Ground: These Marshes commonly about Autumn causes Agues and Fevers, which may be from vast Swarms of invisible unwholesome Insects, which rise from thence at that Season, but of a different Poison from those which cause the Plague: So the like Places about Civita Vecchia, Scandaroon, and I may mention the Isle of Sheppy likewise, seem to cause Agues. And it is observable, that from the Mouth of the River Magra, which divides Tuscany from Liguria, along the Sea-Coast of Italy, as far as Terracina, is very unhealthy, and subject to Agues and pestilential Fevers, being marshy Ground.

We may also observe that in Turkey, Egypt and Barbary, when the Plague rages, the Franks, the English, etc., are seldom infected with it, which seems to confirm my Opinion, that this Sickness proceeds from Insects, who having their certain natural Nourishments respectively appointed them, do not in those Places infect Strangers, who have differing ways of eating and living from the Natives, and are of a contrary Nature of Body. It would be well worth Enquiry, if the People of those Nations, that were in strange Countries in the Times of Pestilence were also free from Infection.

King Charles the II^d when he was told of the Sickness at Leghorne, said It must have been occasion'd by the new Fortifications which were then building in those marshy Places; And it is very rational to believe, that turning up those unwholesome Muds, and exposing them to the Sun, did much increase the distemper, by infecting the Air, and filling it with greater Supplies of poisonous Insects.

Enough has been quoted of this writer, whose observations cover nineteen pages, to indicate the trend of his ideas and also to show that he was using the term insect in a specific sense and not in the general sense evidently employed by Nott over a hundred years later.

NEW FOSSORIAL HYMENOPTERA.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

Included below are descriptions of several new species of fossorial wasps of the families *Psammocharidæ* and *Philanthidæ*.

PSAMMOCHARIDÆ.

Ageniella hestia, n. sp.

Similar to *A. apicipennis*; clypeus and basal joints of the antennæ yellow; posterior margin of the pronotum whitish; abdomen partly reddish yellow on sides of the second segment, and basal part of the venter; legs partly yellow, but on mid legs the tibiæ are brown and tarsi blackish, and on hind legs black on tip of femur, all of tibia and tarsus; spurs pale. Wings scarcely darker at tip, the third submarginal higher than long, a little narrowed above, receiving the second recurrent before the middle; thorax sericeous; abdomen sessile, slender.

One male from Falls Church, Va., Aug. 30, differs from *A. apicipennis* in pale margin of the pronotum, black on middle and hind legs, heavier venation, and slightly different shape of the third submarginal cell.

Ageniella cupidella, n. sp.

Female resembles *cupida*, but smaller, the first recurrent meeting second submarginal cell plainly before middle, and antennæ shorter, the second and third joints together hardly equal the vertex width. Head and thorax bluish green, abdomen blackish, shining, few long hairs on clypeus and vertex, and tip of the abdomen. Legs black, inner spur of hind tibia one-half the length of the metatarsus; fore wings blackish, third submarginal all long below, much shorter above, receiving the second recurrent at middle; second submarginal plainly shorter than the third, receiving the first recurrent plainly before middle.

Length 7 mm.

From Ridgeway, Ont., Can., July 9 (Van Duzee).

Ageniella tenella, n. sp.

Male black, slightly sericeous, spurs pale, anterior tibiæ and tarsi pale, and sometimes pale on mid and hind legs; abdomen rather

brownish black, hind margins of segments faintly reddish. Body very slender, abdomen sessile; wings faintly dusky, basal transverse veins of fore wings disjointed; second submarginal longer than broad, receiving first recurrent at middle; third submarginal higher than long, narrowed above, receiving the second recurrent before middle, latter vein faintly bent out in middle; these cells nearly as in *atrata*, but in that species the second recurrent is received at middle and the discoidal is consequently longer.

Length 5.8 mm.

From Niagara Falls, July 31, and Boston, Aug. 1, both N. Y. (Van Duzee). Differs from *A. atrata* in white spurs, and more slender body.

Priocnemis hesperus, n. sp.

Very similar to the Eastern *P. subopacus*, the marginal cell blunt at tip as in that species. It is separated by the coarsely striated metanotum. It is black, with few long hairs on vertex and mesonotum, none on the face, pronotum nor metanotum, but some on the venter and apex of the abdomen. The vertex and the ocellar triangle are broader than in *P. subopacus*, the eyes not being as much approximated as in that species; the abdomen is more shining than in *P. subopacus*. The wings are deep black, the venation like that of *subopacus*, but the outer side of marginal cell is more angulate rather than rounded; size the same.

From Stanford Univ., Calif. (Doane).

Priocnemis fortella, n. sp.

This is close to *P. fortis*, but differs in pale wings, much smaller size, in the still shorter antennæ, and longer hind spurs. The body is black and densely hairy, the face and ocelli about as in *P. fortis*; the antennæ short and thick; the fourth and fifth joints hardly twice as long as broad (three times or more in *fortis*); metanotum striate as in *fortis*; the hind tibia, even in female, still less serrate than *fortis*, the serrations scarcely distinguishable; the inner spur of the hind tibia fully one-half the length of the metatarsus (in *fortis* scarcely one-half the length of the metatarsus). Venation about the same, the veins extending out to the margin; the fore wings are scarcely darkened (deep black in *fortis*).

Length 10 mm.

From Great Falls, Va., June 12, 29.

PHILANTHIDÆ.

Cerceris nigrifulus, n. sp.

Male very similar to *C. nigrescens* Sm., but distinct by dark stigma. Markings as in *C. nigrescens*, rather more yellowish, but in only specimen seen no spots on pronotum, nor on basal segment of abdomen, and ventral marks nearly obsolete. The face broader, or rather not so long as in *C. nigrescens*, the clypeus broadly, evenly rounded below, and very strongly convex in the middle, so that when seen from the side it is plainly protuberant, hair lobes not as broad as in *C. nigrescens*, punctation and enclosure as in *C. nigrescens*; pygidial area not as in long as in *C. nigrescens*, and with nearly parallel sides. A size smaller than that species.

From Colden, N. Y., July 3 (M. C. Van Duzee). In my table it runs to 24, and of the species there included it is nearest *C. nigrescens*, but differs from all in dark stigma.

Cerceris dakotensis, n. sp.

Female black; base of mandibles, spot on the clypeal process, large spot each side of face near the eyes, small spot each side on pronotum, tegulæ, postscutellum, broad band on second abdominal segment (slightly narrowed in the middle), narrow bands on other segments (broader at sides), yellow. Legs rufous, or yellowish, front and middle femora dark at base; basal half of antennæ yellowish, or rufous beneath, tip rufous behind. Body moderately coarsely sculptured, clypeal process longer than broad, narrowed toward tip, not horizontal, but very much deflected; enclosure rather strongly striate all over; abdomen slender, basal segment only a little more than one-half as wide as the second at tip; others not wider than the second; pygidial area very long, with subparallel sides. Wings plainly fumose, darker at costal tip, stigma yellowish.

Male similar in size to the female, and the abdomen also slender; face below antennæ all yellow, other marks as in female, small lateral spots on venter yellow; and one specimen shows spots on the metanotum and first abdominal segment; large dark spot near tips of hind femora, and faint dark mark near tips of hind tibiæ. Last joint of antennæ slightly curved, third joint not as long as fourth and fifth together. Clypeus slightly convex in the middle, the anterior margin here black, and with three teeth; clypeal hair

lobes about one and one-half their breadth apart, pygidial area coarsely punctate, sides parallel, about one and a third times as long as broad; enclosure as in female.

Length 11 mm.

From Fargo, N. Dak., July 7 to Sept. 6 (Stevens coll.), on *Solidago serotina*. In Swenk's table it runs to *imitatoria*, but in that species the band on the second segment is no broader than the others.

***Cerceris floridensis*, n. sp.**

The male runs to *C. morata* in my table, but larger, the hair-lobes of clypeus much narrower, and the enclosure different. Head broad, face reddish, clothed with white hair; clypeus prolonged in middle, the hair lobes small, fully three times their width apart; antennæ pale on base, and extreme tip; vertex and back of eyes reddish, pronotum, tegulæ, spot beneath on side, scutellum, postscutellum, large spot on sides of metanotum, first and second segments of abdomen above and below, reddish or yellowish red; legs mostly yellowish red. Wings blackish, marginal cell black, stigma yellowish; second submarginal twice as long as high. Body very coarsely punctate, enclosure large, smooth, faint traces of striation. Abdomen broad, basal segment much broader than long, but little more than one-half as wide as the second. Pygidial area hardly one half as wide at tip as at base, once and a half as long as broad at base, coarsely punctate. Last joint of antenna longer than preceding, curved.

Length 14 mm.

From Gulfport, Fla. (Reynolds). In general it is related to *C. gnarina*.

***Cerceris carrizonensis*, n. sp.**

In the New Mexico table this runs to *C. convexus*; it differs in the marginal cell being not black, but hyaline, and in lacking a spot on pleura behind the tubercles.

Male small, black, face below antennæ yellow, enclosing a black dot each side at angle of clypeus; basal joint of the antennæ yellow, next black, beyond brown. Two spots on the pronotum, tegulæ, two spots on the scutellum, the postscutellum, band across basal segment, rather narrow band at apex of each of the other segments.

Legs yellow, mid femur black on base, hind femora with large black spot near the tip, hind tibiæ also with black spot near tip; hind tarsi dark. Wings infuscated, but not very dark, the stigma dark brown, marginal cell no darker than rest of the wing. Body not very coarsely punctate, face with dense white hair, clypeus slightly, evenly convex; hair lobes rather broad, hardly one and a half their breadth apart; antennæ short, last joint short, not curved. Enclosure roughly punctate, no striation. Abdomen short, hardly longer than thorax, basal segment narrow, longer than broad, not one-half the width of the second segment; pygidial area not much wider at base than at tip, not one and a half times as long as broad; in the wings the first recurrent runs into second submarginal cell before middle. Body densely long haired, especially noticeable on the thorax, the hair here twice as long as in most species.

Length 6 mm.

From Walde, Texas.

Eucerceris apicata, n. sp.

Male reddish, face yellow up to the ocelli; the pronotum, scutellum, postscutellum, two oblique spots on the enclosure, tegulæ, tubercles, two large spots on pleura below tegulæ, large side spot on the metathorax, all yellow. On the anterior part of the mesonotum are four yellow streaks, and between them the surface is blackish. Abdomen yellow, the narrow basal part of each segment reddish to blackish; venter with yellow side spots on the basal segments. Legs reddish, with yellow on front of the femora and tibiæ of anterior and middle pairs. Wings hyaline, a dark cloud from the second submarginal and marginal cell out to tip, this spot not extending basally. Body rather coarsely punctate, but the enclosure smooth; third and fourth ventral segments with erect row of yellow hairs. Related to *E. canaliculatus*; the second submarginal cell more quadrangular, and the smooth enclosure distinctive.

Length 11 mm.

From Yuma, Arizona.

Philanthus assimilis, n. sp.

Male close to *P. bilunatus*; thorax and abdomen smooth as in that species, enclosure with the pit as in *bilunatus*. Markings about

as in that species; the middle face-mark, however, is much larger and broader below, and at this point the head is more protuberant than in *P. bilunatus*; there is a spot behind eye, and below tegulae, yellow. Abdomen with the first segment showing two small spots, the second segment with a very broad band, almost divided in the middle; third and fourth bands narrow, and emarginate each side in front. Last segment more emarginate than in *P. bilunatus*. Legs with femora (except tip) black, rest of legs yellow. Wings infusate, rather broader than *P. bilunatus*, the third submarginal as broad as long; vertex broader than in *P. bilunatus*.

Length 10 mm.

From Boston, N. Y. (Van Duzee).

Philanthus subversus, n. sp.

Male—Face yellow, an oblique black streak up from the base of the antenna, connecting to the black vertex; malar space and the mandibles (except tip) yellow; basal three joints of antennae yellow, rest rufous, darker above, second joint with a black dot above; vertex with curved yellow band and long streak back of eye (as in *sublimis*), collar, tegulae, tubercles, most of pleura, four short streaks on anterior part of mesonotum, two spots on scutellum, and spot each side of it toward base of wing, postscutellum, two oblique spots at side of enclosure, large side stripes on mesonotum reaching down on pleura, all yellow. Abdomen with broad spot each side nearly meeting above; other segments with bands, very broad on the sides, triangular median incision in front of second, emarginations on other bands, last segment all yellow; venter almost all yellow, with two black bands. Wings faintly fumose, stigma yellow, veins brown; legs yellow, last joint of tarsus rufous. Head minutely punctate, the clypeus nearly smooth, acutely produced in the middle below; thorax sparsely punctate, collar and the postscutellum smooth, metathorax more densely punctate; enclosure finely, transversely striate; abdomen broad, rather coarsely punctate, last segment smooth. In wing the third submarginal cell no broader above than second, basal sides of the second submarginal cell subequal.

Length 8.5 mm.

From Palmerlee, Arizona (Biederman).

***Philanthus vertilabris* var. *completus*, n. var.**

Male similar in markings to type, but the bands of abdomen beyond that on the second segment are all much broader than in normal eastern form. Sculptured as in typical form; the upper yellow face mark much larger than *vertilabris*, and its upper edge not so much emarginate; in the wings the second submarginal cell has its upper basal side twice as long as the lower basal side. In the new Mexico table it runs to *P. cockerelli*, from which it is separated by different markings.

Length 12 mm.

From San Diego Co., California (Van Duzee).

FIELD NOTES AND QUESTIONS.

MIGRATING NOTES ON THE MILKWEED BUTTERFLY.

Anosia plexippus.

BY F. M. WEBSTER, WASHINGTON, D. C.

For a number of years the writer has been able to record the banding together of this butterfly as observed by him at various points in the United States. Supposedly these gatherings are preparatory to the annual southward autumnal migration of the species.

The present year, 1915, my son, R. L. Webster, observed one of these gatherings near Ames, Iowa, on August 30th; an exceptionally early record, as such assemblings together do not usually occur until September or October.

The writer observed a swarm of these butterflies near Waterman, DeKalb County, Illinois, on September 18, a little north of the latitude of Ames, but some two hundred and seventy-five miles farther east.

It would seem that there is no general uniformity in the dates of the congregating together of these detachments and it would be exceedingly interesting to learn just what laws, if any, regulate the collecting together and of the different swarms, and if they resemble in any way the systematic migrations of birds.

BOOK REVIEWS.

THE MOSQUITOES OF NEW JERSEY AND THEIR CONTROL. By Thomas J. Headlee, Ph.D. Bull. No. 276, New Jersey Agricultural Experiment Stations. Issued Jan. 30, 1915. 135 pp., 94 figures.

The notoriety of the New Jersey mosquito is known to all, and probably every American entomologist has some acquaintance with the extensive work that has been done by the New Jersey Agricultural Experiment Stations, under the direction of the late Dr. J. B. Smith towards the control of these really serious pests.

The present account is the outcome of a need that has been felt for a "popular, yet accurate and easily available, manual on the important mosquito life of New Jersey," the other publications on this subject issued by the New Jersey Agricultural Experiment Stations being now out of print or the supply practically exhausted.

The first pages contain a brief account of the habits, life-history, structure and classification of mosquitoes in general, in which the author lays emphasis on the importance to anyone who undertakes the control of these insects, of knowing exactly the species with which he has to deal. This is followed by tables, republished from the work of Messrs. H. B. Weiss and R. S. Patterson, for the determination of the forty species of mosquitoes, both in the adult and larval stages, that are known to occur in New Jersey.

Of these species sixteen are considered sufficiently important to be treated in some detail, while of the remainder brief notes on habits and distribution are given. The sixteen troublesome species, only six of which are regarded as first-class pests, are divided into four groups; the salt-marsh, house, swamp and woodland groups. The six members of the salt-marsh group are the species that are responsible for New Jersey's fame as a mosquito-infested state, and these species naturally receive first consideration.

The author describes at some length the methods of control of the salt-marsh mosquitoes, now in operation by the state, of draining the marshes or stocking the pools in localities where draining into the sea presents serious difficulties, with killifish (*Fundulus*), various species of which are most important natural factors in the control of these mosquitoes. Gratifying progress in

this work has already been attained, and it was found as the result of an investigation made during the summer of 1912-13 that the shore line property values between Jersey City and Rumson had increased by \$5,600,000. Incidentally the drainage operations have greatly increased the production of marsh hay on the lands treated.

Next in importance to the salt-marsh group is the house group, to which the House Mosquito (*Culex pipiens* L.) and the Malarial Mosquito (*Anopheles quadrimaculatus* Say) belong. The control of these forms is considered together with that of the woodland and swamp group, the problem in all such fresh-water forms consisting in finding the breeding-places and in one way or another, according to circumstances, rendering them uninhabitable for the larvæ, either by draining, filling, stocking with fish, or, if these methods cannot be carried out, by oiling the surface or using a substance (larvicide), which will mix with the water and kill the larvæ by contact.

This excellent report is copiously illustrated, the greater number of figures having been taken from Dr. J. B. Smith's elaborate work. In addition to the figures of the various species of mosquitoes and their larval characters, the methods employed in draining the salt-marshes, characteristic breeding-places and the kinds of fish useful in mosquito control are also well illustrated.

COLEOPTERA ILLUSTRATA. By Howard Notman, Vol. I, No. 1. Carabidæ, 136 Joralemon Street, Brooklyn, N.Y. (Price \$1.00).

This is a very peculiar little book, consisting, as it does, of fifty outline drawings of beetles, forty-one belonging to the genus *Carabus*, and the remaining nine to *Calosoma*, *Damaster*, *Procerus* and *Procrustes*. None of the species figured are North American. There are no descriptions, but merely an index to genera and sub-genera, species and sub-species. The drawings are clear and well-executed, each species depicted occupying a single page. As there is no introduction, we are unable to form any conjecture as to the author's object in issuing this publication.

C. J. S. B

THE LONDON NATURAL HISTORY SOCIETY. From the Transactions of this Society for the year 1914, we learn that the organization has been formed by the amalgamation of the City of London Entomological and Natural History Society (founded in 1858) with the North London Natural History Society. The union has enabled the new organization to meet the war-time difficulties with a strength and resource which could not have been furnished by either of the old Societies by itself.

In addition to the official records of meetings and reports, the Transactions contain some very interesting papers. The President, Mr. L. B. Prout, in his address, discusses various theories respecting genera and species, with particular reference to Pierce's work on "The Genitalia of the Geometridæ." Mr. L. W. Newman describes his methods of collecting and breeding the Sesiidæ, which will be found useful in this country. Dr. E. A. Cockayne contributes a paper on "Gynandromorphism," in which he describes the various forms that are met with, and gives some remarkable examples. Other papers cover a wider range, such as "The Middle Ages in the Wey Valley," "British-breeding Ducks," and a short history of "The City of London Society."

THE ENTOMOLOGICAL SOCIETY OF AMERICA.-- TENTH ANNUAL MEETING.

The Tenth Annual Meeting of the Entomological Society of America will be held in Columbus, Ohio, Wednesday and Thursday, December 29 and 30, and if necessary to complete programme, on Friday, December 31st, in affiliation with the meetings of the American Association for the Advancement of Science and other affiliated societies. Meetings will begin at 2.00 p.m. on Wednesday. The meetings of the American Association of Economic Entomologists will begin Monday afternoon with other meetings on Tuesday and Wednesday and Thursday evenings.

The Annual Public Address will be given on Wednesday evening, December 29th, by Dr. C. Gordon Hewitt, Dominion Entomologist, Ottawa, Canada. His subject will be "A Review of Applied Entomology in the British Empire." The entomologists of Ohio are planning a smoker for visiting entomologists, which will be held on Wednesday evening after the address.--(From Announcement.)

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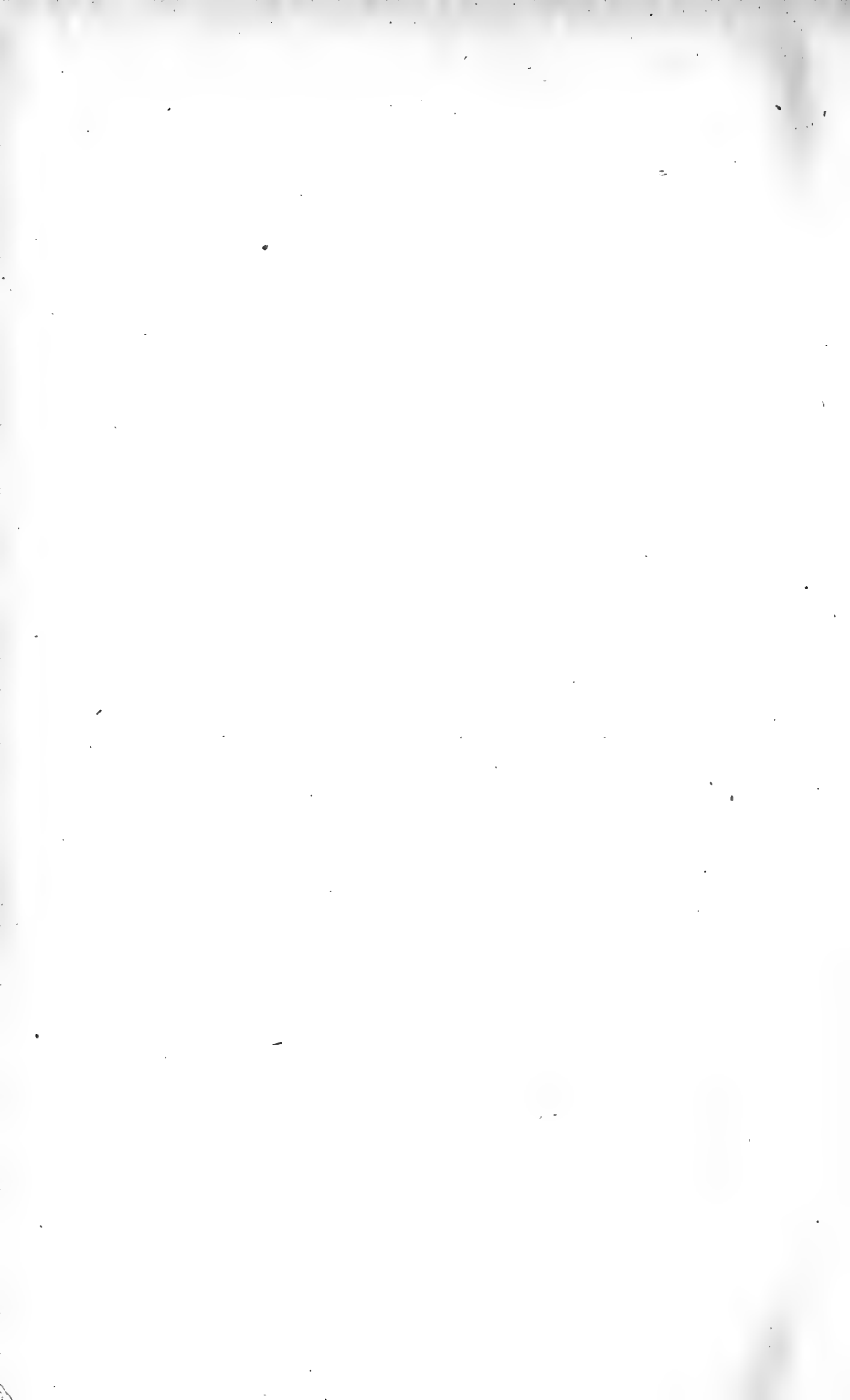
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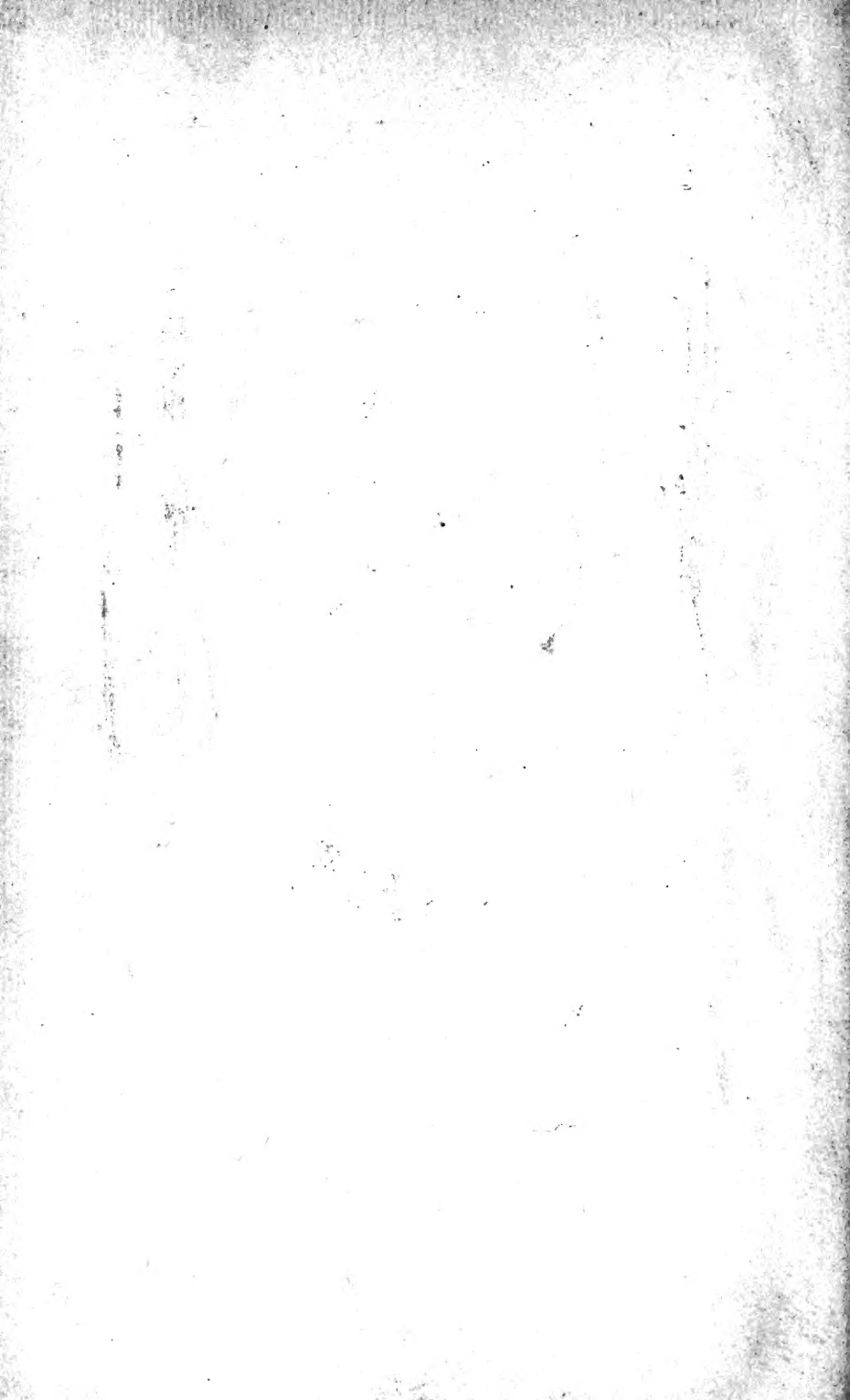
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