

INCISALIA NIPHON.—LARVAE AND EGGS.

# The Canadian Entomologist.

VOL. XXXIX.

LONDON, AUGUST, 1907.

No. 8.

## STUDIES IN THE GENUS INCISALIA.

BY JOHN H. COOK, ALBANY, N. Y.

### IV.—INCISALIA NIPHON.

(Continued from page 235.)

The life-history of *niphon* has been known in part for many years. The egg, newborn larva, mature larva and chrysalis have been studied and described with minute exactness, but the literature contains no mention of the transitional larval stages, and I have been unable to find any record of the species having been successfully carried through from egg to imago. I first bred this insect in 1903 from caterpillars taken at Albany, and during that and the two succeeding years worked out the entire life-history; but before the text was ready for publication all my notes, drawings and preserved material (including exuviae, egg-shells, etc.) were destroyed by fire. In 1906 other work prevented my devoting to the species as much time and attention as was desirable, and the material secured for study consisted of a single egg and a larva in the penultimate stage. This season eggs were obtained from a female taken at Lakewood, N. J., and confined over pitch pine; some of the larvæ from these have already pupated, and once again the record is complete.

The above statements are made because what follows, while drawn mostly from notes and sketches, is, in part, based upon my memory of observations made some years ago.

*Time of Flight.*—Species single-brooded, the butterflies appearing about a week later than *irus* and *Henrici* (at Albany not before the 10th of May). They become abundant in a few days, and practically disappear before the end of the first week in June, though I have the record of a female which had not yet disposed of her eggs captured at Albany as late as the 24th of June. Two males were taken at Lakewood as early as the 4th of May (1907), and on the 18th the females were observed ovipositing. All other exact data on this point were lost.

*Oviposition.*—Eggs are laid from the middle of May to early June and perhaps (exceptionally) later. They are placed singly on the new growth of the food-plant, *Pinus rigida* (pitch pine), either on the upper surface of the scale leaves or tucked deeply among the still sheathed bundles of needle leaves. All the eggs found in nature were in the former position near the base of the new shoot, where the first elongation of the stem occurs, never toward the apex (Plate 6, fig. 1). The female selects young trees from two to six feet in height, and apparently never oviposits on those of larger growth. She lays from 25 to 40 eggs. I have found several eggs by searching the young shoots with a pocket lens, and twice have been fortunate enough to witness a female in the act of ovipositing. One of these placed an egg only fourteen inches above the ground on a pine just beginning its third year of growth.

I have never found an egg or a caterpillar on *P. strobus* (which has been considered the favourite food-plant), nor have I observed the butterfly in the neighbourhood of that tree except where *rigida* was also abundant.

*The Egg.*—Considerably larger than the egg of any of the congeneric species; echinoid, top flattened, at micropyle depressed, pale green. The primary ornamentation of the shell consists (as in *irus*, *Henrici* and *augustus*) of a raised reticulation, the meshes of which form fairly regular equilateral triangles, and at each angle, except on the top and bottom, a low rounded boss or knob. There is also a secondary ornamentation difficult to describe, but giving the egg a frosted appearance and a superficial similarity to the egg of *Henrici*. This ornamentation is in the two eggs of much the same character, but in *niphon* is not so pronounced, does not render the shell so opaque, and presents other differences easier illustrated than described. Figures 5 and 6 give the side and top views of the egg of *niphon*. The illustrations are from photomicrographs of an empty shell, from which the larva very conveniently made its exit near the bottom on the side, which appears to be somewhat flattened in fig. 6. The magnification is the same as was used in representing the shells of *irus* and *Henrici* (CANADIAN ENTOMOLOGIST, Vol. XXXIX, Plate 4, June, 1907).

*Period of Incubation*—Of thirty-three eggs laid by a confined female on May 19<sup>th</sup>, 1907, between 9.30 a.m. and 1.30 p.m., the first hatched at 10.20 p.m. on May 28<sup>th</sup>, the last at 2 p.m. on June 1<sup>st</sup>. The period,

therefore, varies from 9 days 12 hours to 13 days 2 hours, though the average (10 days 8 hours) is represented by the minimum more nearly than by the maximum.

*Larval Life.*—The newly-hatched larva does not make a meal of the deserted egg-shell, though in eating its way out it may devour the entire top. More frequently, however, it is satisfied to make a hole only large enough to crawl through, usually in the top, thus destroying a part of the micropyle.

The little caterpillars are stronger and more vigorous than those of the related species, and crawl about at a speed that argues well for their future good health. Making their way among the tough hairs (?) which bind together the sheaths containing the needle clusters, they fasten upon the side of a sheath and bore through it a minute hole, enabling them to reach the tender tissue of the needles upon which they feed (fig. 2). Into this hole the head is thrust, and the larva excavates as much of the interior as it can reach without getting its body inside.\* It makes a new puncture whenever necessary, and by these the presence of the caterpillar may often be detected. The excrement is usually in the form of pellets, which occasionally lodge among the scale leaves, and so serve to indicate that a larva is at work. Sometimes the excrement is in strings, and if these lodge on the shoots one may find the caterpillar without difficulty.

When first born the caterpillar is yellowish-green or gray-green, but soon becomes brown, marked with a creamy white line on the latero-dorsal ridge. This is an excellent protection at this time while the larva is feeding on the brown needle bundles, and the same colour marks it with very little change until after the second moult. When the needles begin to thrust their tips beyond the sheath the caterpillar ascends to the lowest visible green tissue, and bores into it in a manner which causes the tip to drop away. This wastefulness possibly protects the insect from enemies other than the entomologist, but for him is a good guide in the search for caterpillars. (Fig. 3.)

Soon after the second moult the larva becomes green, with pronounced white stripes, and at the same time alters its method of feeding. Ascending to the tip of a young needle, it begins to devour this, and

\*With the first larvæ raised in the laboratory I experienced some difficulty. Several of them insisted on boring into the exposed stem, and were promptly drowned in the sap which flowed from the wound. Dr. Jas. Fletcher writes me that he has lost young caterpillars from the same cause. This can hardly be regarded as a natural point of attack, as it is invariably fatal.

gradually works downward until it encounters the brown sheath. It then begins on a new needle. In the laboratory the caterpillars frequently ate all the needles of a cluster, and showed no disposition to wander from the first shoot supplied to them, frequently cleaning up the very last bit of food before they sought another shoot. In nature I have never found more than three or four neighbouring bundles which showed signs of attack, and when the needles had grown to a length of an inch or more and had begun to diverge, seldom more than one of them in any bundle had been eaten. This would argue that the larvæ move about so that their depredations, by not being too marked in any one place, may be the less easily noticed.

My records show some discrepancy in the number of moults. The larvæ brought from Lakewood moulted four times before pupating, and yet I am certain that I had a memorandum of only three moults passed by the Albany larvæ raised some years ago. The loss of my material makes it impossible to compare the size of the heads of the two sets of caterpillars, but I shall endeavour to verify this observation at some future time. In the last two stages the feeding habit is quite unique, and has resulted in a structural modification. The caterpillar clings to the side of a needle and bends its head and first segment at right angles to its body, as illustrated in fig. 4. The structure of the first thoracic segment of most of the *Lycanide* is rather peculiar, the anterior edge being greatly swollen, the posterior half partially concealed by the segment behind. Just in front of the thoracic shield the segment is deeply creased. In *niphon* this crease is almost obliterated, and the white shield is drawn out from the protecting second segment so as to be entirely visible.

(To be continued.)

#### NOTICE OF NEW NAME.

*Ceratina Cockerelli*, new name for *C. lunata*, H. S. Smith (*non* Friese), Trans. Am. Ent. Soc., XXXIII, p. 119, April, 1907. The name *lunata* is preoccupied by Friese for an African species, in Wiener Entomologische Zeitung, XXIV, 1905, p. 10.

HARRY S. SMITH, Lincoln, Neb.

## PRACTICAL AND POPULAR ENTOMOLOGY.—No. 22.

THE WALKING-STICK INSECT (*DIAPHEROMERA FEMORATA*).

BY J. B. WILLIAMS, F. Z. S., TORONTO.

We are all familiar with examples of protective colouring among the Lepidoptera. Moths on the upper side and butterflies on the under side of the wings frequently show a close resemblance to the bark and leaves of the trees and shrubs on which they settle.

In two families of the Orthoptera this principle is carried to a remarkable extent, and many of the Mantidæ or "Praying Insects," and of the Phasmidæ or "Stick Insects," are strikingly modified, both in form and colour, so as to resemble the natural objects with which they are surrounded.

The Mantidæ are carnivorous insects, and their leaf-like appearance assists them in the work of destroying other insects. The large front legs, armed along their edges with rows of terribly destructive spines, are generally held up in front as if in an attitude of supplication or prayer.

The Phasmidæ, on the other hand, live altogether on vegetable food, and their resemblance to vegetable forms serves only for protection against their enemies, and not for destruction.

Their eggs are laid each separately in or on the ground, while those of the Mantidæ are laid in clusters attached by an adhesive gum to the stalk of a plant.

Some of the tropical Stick Insects are nearly a foot in length, and almost as thick as one's little finger, but our Canadian species (*Diapheromera femorata*) is a little over three inches long and about the thickness of a small twig.

My acquaintance with this "Walking-stick Insect" began nearly twenty years ago, when a friend near Toronto sent me about a dozen live specimens. I kept them during the summer in a glass-sided case with a woven-wire top, and they laid a number of eggs, some of which I sent to the Zoological Society of London. These were hatched and successfully reared in the insect-house at the Regent's Park Gardens.

From a short account published in the Society's Proceedings for 1890, it appears that the first specimen emerged on the 11th of June, and others from time to time during the summer. They were fed upon hazel-leaves, and changed their skins four times before reaching maturity.

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Since then I have kept and reared a number of them at different times, and though they feed on a variety of leaves, hazel-nut bushes seem to be their favourite resort, at any rate, in Canada.

The young ones at first just nibble off the green upper surface, but after a few days are strong enough to eat along the edge of the leaf. They are of a pale green colour when first hatched, and do not altogether lose this tint until the last change of skin, when they alter a good deal in appearance and gain considerably in size. Some of the females retain the green colour through life, but most of them take some shade of brown when they reach maturity.

They are rather "thirsty souls," and always seem glad to bend their heads down and drink if water is sprinkled on the leaves where they are feeding.

Their feet are furnished with hooks and pads, so that they can walk along rough or smooth surfaces in any position, and they hold on very tenaciously, so that a sudden jerk or pull will often break off a limb; but such a loss does not seem to trouble them, and if this occurs before the final moult, a new limb will come at the next change of skin, though the new one is rather smaller than its predecessor.

When resting, the front legs are generally stretched out on either side of their long antennæ, and the legs and antennæ together greatly resemble a tuft of spicules fallen from the fir trees, that often grow over the bushes where they feed.

They take about six weeks to arrive at the adult state, and lead very harmless and inoffensive lives. The males have a well-developed spur on their centre and rear legs, but I never saw them make any use of it. They sometimes wave their front legs at each other when they meet face to face, but whether this is an angry or peaceful salutation I do not know.

Females sometimes emit a drop of fluid from the mouth, or rather from glands behind the mouth, when suddenly taken hold of; and when alarmed they frequently feign death—dropping to the ground and lying on their backs, with their legs standing out stiffly at all sorts of angles—and they will sometimes lie in this way for a quarter of an hour, or twenty minutes.

Their eggs look very like hemp seeds, and the females make no effort to deposit them in any particular spot, just letting them drop on the ground beneath where they are feeding.

The often feed during the night, but take meals in the daytime as well. In fact, they are enormous eaters, though they make but a poor show for it all, and hardly look as if they had any stomach to put food into.

All of them die off about the end of October, so that one generation never sees anything of its successors, and the males begin to go first. I have seen females late in the fall, when egg-laying was over, with the abdomen split open like a dried up seed-pod. Thus their preparation for death, their appearance in life, and the eggs from which they are produced, all bear some odd resemblance to the vegetable kingdom.

They are not generally very plentiful in Ontario; about a dozen are as many as one can usually find in an afternoon's search around Toronto, and sometimes that number is not seen during a whole summer.

In 1904 they were unusually numerous, and at Niagara Glen they became quite a plague. I was at the Glen on Sept. 23rd, and could have taken them in hundreds. At the north end, where they were most plentiful, many of the bushes were quite stripped of foliage, and even some large trees had been altogether denuded of their leaves. On one lofty tree, whose top still retained a little foliage, a mass of them, almost covering one side of the trunk, reached from the ground as far up as the eye could see. Some constantly ran across the paths, so that it was difficult to avoid treading upon them, and a continual dropping could be heard as they, or their eggs, fell from trees and bushes. They were nearly as numerous in 1906, and again did a great deal of damage to the trees and shrubs.

A female that I kept at Montreal from Sept. 3, 1894, to Oct. 8, when she died, laid in that short time 112 eggs.

Some eggs that I obtained in 1904 came to nothing in the following summer, though I watched them till the middle of August. I then put them away in a box, and only on looking at them again, about a year after, did I discover that they had hatched the second year, for the box was full of the remains of infant Stick Insects, that had, of course, all perished for lack of food. I had quite forgotten the occasional occurrence of this delay in hatching, but it was vividly impressed upon my mind by the untimely end of these poor little creatures.

The illustration, I think, hardly needs further explanation; the specimens were all taken at Niagara Glen. Unfortunately, the photograph makes the pale green female look darker than the brown ones, instead of lighter, as in the actual specimens.



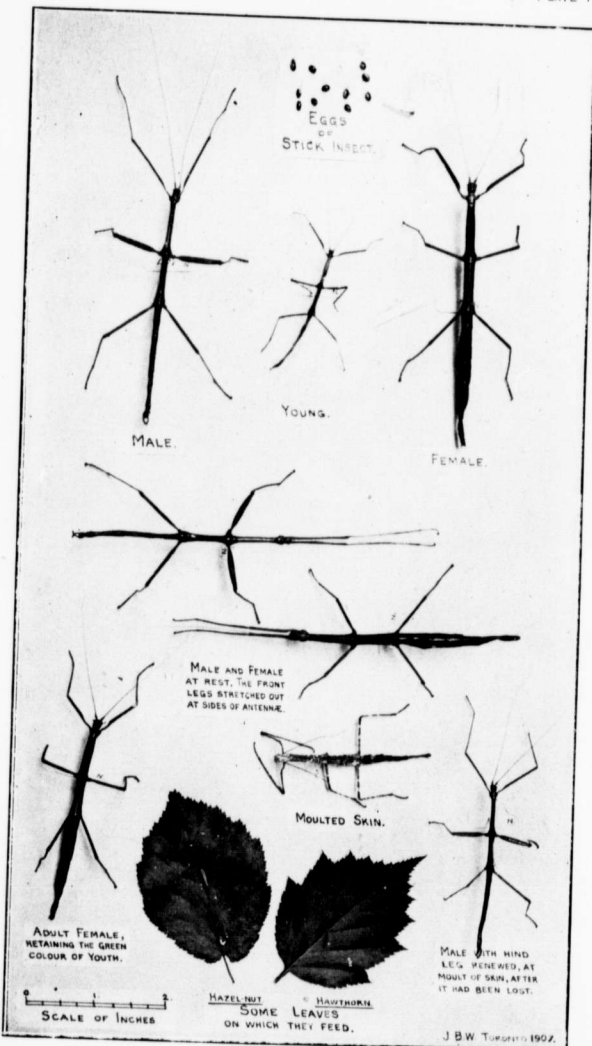
## INTERNATIONAL CONGRESS OF ENTOMOLOGISTS.

A number of eminent Entomologists in various countries have agreed upon the issue of an invitation to Entomologists in Europe and America to attend an International Congress of Entomologists to meet in 1908. The purpose of the Congress is to promote the interests of entomological research and of Biology in general, by furthering cordial co-operation between the Entomologists of different countries; stimulating research and directing it into channels where it may be most fruitful, or where special research is most needed. Questions of Applied Entomology will likewise be dealt with in the discussions and lectures, the large experience of pure Entomology being applicable with profit to Economic and Hygienic Entomology. All interested are cordially invited to advise and assist in the organization of the Congress. Communications should be addressed to Dr. K. Jordan, Zoological Museum, Tring (Herts), England. The following Entomologists have already signified their support of this movement, and are desirous that the officers and members of the Entomological Society of Ontario should co-operate in the work :

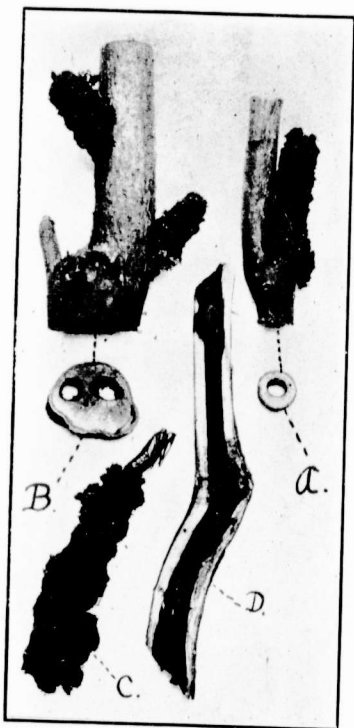
Chr. Aurivillius, E. L. Bouvier, L. Bedel, Th. Becker, I. Bolivar, M. Bezzi, S. Bengtassen, C. T. Bingham, J. C. Bradley, W. Beutenmuller, C. J. S. Bethune, C. H. Carpenter, G. C. Champion, T. A. Chapman, T. D. A. Cockerell, Ph. P. Calvert, K. Daniel, F. A. Dixey, E. C. Van Dyke, Ed. Everts, A. Förel, J. Fletcher, H. C. Fall, C. G. Gahan, A. Giard, R. Gostro, L. Ganglbauer, F. Ducane Godman, W. Horn, A. Handlirsch, H. Druce, W. L. Distant, K. M. Heller, Sir F. G. Hampson, G. von Horvath, F. Klapalek, P. Mabille, J. C. U. de Mejeré, A. L. Montandon, P. Magretti, P. Merrifield, L. W. Mengel, Ch. Oberthür, R. Oberthür, H. Osborn, P. Pavesi, H. Rebel, F. Ris, R. B. Poulton, W. Rothschild, H. Schoutenden, F. Silvestri, M. Standfuss, G. Severin, Y. Sjöstedt, A. von Schulthess-Rechberg, J. B. Smith, H. Skinner, J. W. Tutt, G. H. Verrall, E. Wassmann, Chas. O. Waterhouse.

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ERRATUM.—Page 228, line 13 from the bottom, for "Blanfort, S. C.," read "Beaufort, N. C."



THE WALKING-STICK INSECT, *Diaperomera femorata*.



PERSIMMON BORER, *Sannina uroceriformis*.

Work of the larva: a, cross-section of the stem above; b, cross-section of stem; c, cocoon,  $2\frac{1}{2}$  inches long; d, portion of stem showing burrow. (Photo. by author, reduced one-third.)

## NOTES ON SANNINA UROCERIFORMIS.

BY GLENN W. HERRICK, AGRICULTURAL COLLEGE, MISS.

During the spring of 1906 one of my correspondents sent me two battered and broken female moths of the family *Sesiidae* from Ocean Springs, Miss. Supposing them to be from the Peach tree, and from their battered condition not being able to make out their markings distinctly, I called them *S. exitiosa*. Having occasion to visit the fruit farm of this correspondent this spring, I was surprised to find that the moths in question were collected from pupæ on wild Persimmon trees. It was therefore with a good deal of interest that I began a careful examination of the few wild Persimmon trees on his place, and other trees of the same kind in the vicinity. This was on May 4. We were much disappointed at first in our search, because we found only empty pupa-cases, from which the adults had already and very lately flown. We found over twenty empty cases on about a dozen trees, from one inch to two inches in diameter. We were finally rewarded, however, by finding three or four fresh pupæ in some trees which had their bases heaped about with dead straw. From these we went to adjoining fields, where there were a great many small Persimmons, from one-half an inch to an inch and a half in diameter, that had been allowed to grow up in abandoned waste fields. Here among the deep grass around the bases of the trees we found twenty-odd living pupæ.

The larvæ of this moth bore into the solid wood of the taproot and stem of the Persimmon. I was unable to trace their burrows farther than eight or ten inches below the surface, but this was probably due to the small size of the trees, for Dr. Riley says they bore from 16 to 18 inches below the ground.

In most of the trees examined, one borer only was present, and in this case it usually bored directly up the centre of the tree (Plate 8, a and d). In larger trees two or more borers might be present, depending upon the size of the trees. In such instances they divide the space between them (Plate 8, b).

When ready to pupate, the larva extends its burrow two to four inches above the ground, turns it outward, cutting through the bark, and constructs a large cocoon on the side of the tree, usually at an angle of about 45° to the stem (Plate 8, c). The cocoons are dark in colour, and vary all the way from one inch to two and a half inches in length. The cocoon at c is two and one-half inches long.

The pupæ possess the power of movement to an astonishing degree, and when disturbed back quickly downward into their burrows. This is so characteristic of them that we were obliged to approach a tree rather carefully, and quietly tear away the grass and debris around the base without disturbing the cocoon if we wanted to be sure of our specimen. I lost some entirely, and cut others in two just as they were backing from their cocoon into the burrow in the tree. Again, so many pupæ backed out of their cocoons after the latter were removed that they dried out and failed to transform.

The records of the appearance of the moths are as follows :

Many empty pupa-cases found May 4.

One male May 8.

One female May 8.

One male May 9.

One female May 10.

One female May 11.

One male May 13.

Some are yet to transform (May 18).

These borers must injure the native Persimmon much more than a Peach-tree borer does a Peach tree, although I found no borers in large trees. They seemed to be confined to the young and small trees.

It is also an interesting fact that we were unable to find a single borer in the cultivated Japanese Persimmon trees standing in close proximity to the wild infested trees.

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#### MOSQUITO NOTES.—No. 5.—CONTINUED.

BY C. S. LUDLOW, M. SC.

Laboratory of the Office of the Surgeon-General, U. S. Army, Washington, D. C.

Among the mosquitoes sent in during the collecting period of 1906 in the U. S., was an *Anophelina* which has caused me some perplexity. The general colouring at once suggested one of the *sinensis* group, and it occurred to me that some joke had been perpetrated, so I wrote the collector, asking if it were possible that any Philippine mosquitoes had gotten in with these. He, however, said it was quite impossible, as he had no P. I. mosquitoes with him when this collection was made. No specimens resembling this had previously been received from the U. S., so that I was somewhat reluctant at first to accept it, but as closer study shows it

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to be an *Anopheles* (as restricted by Theobald), and none of that genus has been received from the P. I., I have decided to publish it.

*Anopheles perplexens*, n. sp.—(Female).—Head dark, with dark brown and white fork scales, the latter nearer the vertex, and a heavy tuft of slender, long curved white scales projecting cephalad between the eyes; antennæ dark brown, verticels and pubescence dark, basal joint brown; palpi dark, covered with dark brown scales, a small tuft of white hairs at the very tip; proboscis dark with dark brown scales, tip testaceous; clypeus dark, eyes brown.

Thorax: prothoracic lobes testaceous, with dark hairs; mesonotum with broad, light median stripe, covered with white "frost," and white hairs arranged so as to suggest a "part," a dark median line extending half way to the scutellum, and two dark lateral bordering lines; more or less of a tuft of these hairs at the nape; laterad the dorsum is dark brown, with dark brown hairs; pleura brown; scutellum testaceous, "frosty," with brown bristles; metanotum dark brown.

Abdomen dark brown, with light hairs (no scales).

Legs: coxæ and trochanters light, mostly light scaled; femora ventrally light scaled, and extreme tips of femora and tibiæ ochraceous, remainder of legs dark brown; ungues simple.

Wings clear, and rather heavily clothed with dark brown scales, except a few small ochraceous spots—one on the costa, just interior to a line drawn through the junction of the branches of the fork cells, a second tiny spot at the junction of the first long vein with the costa, extending a tiny bit on the long vein, and two very small faint light spots on the forks of the fourth long vein, also a tiny fringe spot at the distal end of the third long vein; halteres with light stems and fuscous knobs.

Length, 2.5–3 mm. Habitat, Camp Roosevelt, Mt. Gretna, Pa. Taken August 25, 1906.

This interesting species was sent by Capt. E. B. Whittemore, Asst. Surg. U. S. Army, and, as will be seen from the description, bears a closer resemblance to tropical *Anophelina* than to those so far reported from the U. S., but as the group it most closely resembles has abdominal scales and rather broader wing-scales it cannot be referred to it.

It seems wise to call attention to some variations occurring in Philippine mosquitoes. Among the *Myzomyia Ludlowii*, Theob., from the Province of Batan, Luzon, and in some collections sent from the southern islands, come specimens showing much more extended speckling

of the legs than in those I took in Batan in 1901, or in those taken in Abra, and which were sent to Mr. Theobald for identification. In these earlier specimens the yellow spots on the legs are practically confined to the femora, tibiae and metatarsi, and this is the case in many specimens still sent in, but in the collections referred to the spots extend well on to the tarsal joints, so that the last two are often the only ones lacking them. The femoral spots are in some specimens nearly white, and all of the legs are marked, the fore legs as prominently as the others. This difference is so noticeable as to be misleading, but there can hardly be doubt that, as the insect in other respects corresponds closely to *Ludlowii*, it must be regarded as merely an individual variation, not even worthy of place as a "variety."

Some of the specimens of *Aedeomyia squammipenna*, Arribalzaga, coming from the P. I., show marked variation from the type, and yet, as these differences vary, can only be counted as individual differences; the palpi in some specimens have ochraceous instead of white scales near the base; the wing markings vary much as to size, and, incidentally, a little in position; the white leg-bands are often broader, and the distal tarsal joint on the hind leg is frequently pure white. Of course, if these differences ran true, they would suggest a new species, but as they do not, are only of general interest.

Some time since my attention was called to a general resemblance between *Teniorhynchus argenteus*, mihi, and *Culex gelidus*, Theobald. I have therefore compared the two carefully and find the following differences: As to proboscis, *C. gelidus* yellow, with a brown band near the apex; *T. argenteus* brown, with broad white band. As to thorax, *C. gelidus* has a heavy white marking extending about two-thirds the length of the dorsum, the caudad third being of the yellowish-brown of the scutellum. *T. argenteus* has the white marking extending over the whole mesonotum and scutellum, with the exception of two oblong spots near the caudad end of the mesonotum. These seem to differentiate the insects, and there are besides these some scale differences which seem to throw it into *Teniorhynchus* instead of *Culex*.

*Megarhinus LeWaldii*, mihi, to conform to the binomial nomenclature, must be written *M. Lewaldii*.

Long study and acquaintance with *Myzomyia Rossii*, var. *indefinita*, mihi, has convinced me that it should never have been referred to *Rossii*, and that it must stand as a distinct species—*indefinita*, Ludlow.

## NEW HISTORIES AND SPECIES IN PAPAPEMA (HYDRICEIA).

BY HENRY BIRD, RYE, N. Y.

(Continued from Vol. XXXIX, p. 141.)

The quest of unknown larval histories in *Papaipema* caused a trip to extend over the Alleghanies in 1905, as that elusive Noctuid, *P. furcata*, Smith, had been reported in several mature examples from the Pittsburg district, and we found a subtle enticement in the direction of possible clues. An offer of hospitalities by the genial F. A. Merrick in order to explore the New Brighton section, from whence so much that is good and rare obtains, met with a hearty acceptance. So, one happy July day, we were introduced to the beautiful woodland glades of Western Pennsylvania that are favourite haunts of our host. The rich soil of the valleys supports a luxuriant flora, and the new varieties of plant-life gave a welcome opportunity for examining unfamiliar forms suitable for the boring of *Papaipema* larvæ. A very few minutes afield sufficed to disclose an unknown desideratum, and its abundant occurrence in a plant never before examined soon made it apparent that another preferred food-plant can be added to the already extensive list. Of course, it was hoped that the newly-found larva might prove to be the desired *furcata*, though there was no surprise ultimately when this did not occur, nor was there disappointment that we never met with it in this or the succeeding year's search. To go out and pick up in five minutes the desired larva of a species, whose life-history is unknown, in no way accords with previous experience, and there was only an added zest upon each failure, as to whether we will meet it in five years or ten. This new food-plant which has furnished an unknown larva is *Podophyllum peltatum*, commonly known as May-apple or Mandrake. It is widely common in rich woods in the east, but through a proximity to the seaboard it had never been noticed at Rye. The absence of the plant here is the excuse for overlooking what appears to be a very prevalent *Papaipema* species. The plant is of a noxious character, shunned by cattle, and sends up from a running rootstock large five- to seven fingered leaves, borne singly upon fleshy stems. Its foliage seems very free from any insect ravages, being, in fact, poisonous; the root has drastic medicinal properties, while an anomaly is shown in the edible fruit. One other good thing to its credit is the sheltering of a *Papaipema* species.

About forty half-grown larvæ were transported to the home colony, from which four imagoes appeared. The following year the larvæ seemed less numerous, yet Mr. Merrick secured a number of the moths.

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It was fancied at first that some relationship could be established with *Harrisii* or *rutila*, but this failed in a careful study of details, and it therefore becomes necessary to advance a distinguishing name.

*Papaipema Merricata*, n. sp.—Form and habitus normal; ground colour sordid chrome-yellow, or tawny. Head, thorax and primaries heavily powdered with purplish-brown scales. Abdomen and secondaries much lighter and devoid of the pronounced yellow tint. Head and collar of the same shade of purplish-brown, the latter edged above with yellow. Anterior tuft and patagia heavily scaled in the same colours. Primaries not contrastingly marked, a white scale at base; basal area tawny-yellow, never white; t. a. line of the usual irregular course, enclosing a dull purplish area; t. p. line plainly geminate, always broadly out-curved over the cell. The median field shows the yellow ground colour most strongly; the median shade line is brown, most distinct in lighter specimens, and is traceable to the lower end of reniform. S. t. line as usual, irregularly dentate, the subterminal space entirely purplish, though tempered from much contrast by the general powdering of brown scales. Outwardly this line is illumined by yellow scales defining the terminal space, which is lighter than the subterminal, excepting the usual light yellowish patch at the apex. Reniform moderate, broken by the veins and white, except the upper outward portion and the central lunulate mark, which are of the ground colour. Orbicular rounded and white; claviform separate, double, the lower half about the size of the orbicular. The veins are discernible on the secondaries, being outlined by darker scales; occasionally a median line may be traced, followed by a faint clouded band. The male structures, while typical, offer some points of individuality; the clasper is not prominently toothed outward, as with *rutila* and others, and the lower lobe of the harpes is bare of the usual spinules. Expanse, 34-43 mm.; 1.34-1.75 in. Thirteen examples, embracing both sexes, are at hand. Co-types will be placed in the British, the U. S. National and the Merrick Museums.

The species approaches *rutila* closest superficially, and might easily be considered a variation of the imago at first glance. It is presumed, of course, that we have the *rutila* of Guenée properly identified in the form occurring commonly in the Montreal section, and which has been repeatedly confirmed by comparisons with the type. Had Guenée only known and have given the name of its food-plant, how little else would be needed! In any event, *Merricata* is distinct from that species, being relatively larger, less brightly coloured, structurally different in the male

and separable in the larva. The natural food-plant of *rutila* has not been determined, but it flourishes in burdock and thistle, and did the New Brighton species subsist in such commodious plant-stems we should certainly meet with moths having a greater expanse. As it is, Mandrake roots are so small, larvæ have been seen stalled and unable to survive, so tightly were they wedged in their galleries. The young larvæ evidently emerge about the second week of June, and mature from ten days to two weeks later than *rutila* and *Harrisii*. Entrance is easily made at any part of the juicy stem, and work soon gets down to the root proper. The original aperture is preserved and enlarged, being used long after a lengthy tunnel has been made in the root. The larvæ belong to that major section wherein the dorsal line is alone continuous and unbroken. The following is descriptive of the three final stages, which are the more important ones :

Stage V.—Form cylindrical, characteristics typical. Head 1.8 mm. wide, a faint dark line extends from ocelli to edges of thoracic plate, and is there dimly continued. Body colour pink; dorsal, subdorsal and substigmatal lines pale yellowish, the last two broken at the first four abdominal segments. Tubercles normal, the accessory tubercle *IVa* occurs on joint ten, above the line of the spiracles. On joint twelve the large anal plate is preceded by an elongate plate, the merging of I and II from both sides. The tubercles are brownish, the spiracles black.

Stage VI.—Similar, the colour a little faded. Head, 2.5 mm. wide, side marking lost. Tubercles I and II are concolorous, and definable only by their setæ to joint eleven, where they appear in the usual quadrate setting. On joint ten, *IVa*, as before. This stage is reached about July 23, when such early species as *purifascia*, *circumlucens* and *nelita* have left their plants for pupation.

Stage VII.—Little change, except that the colour fades to a flesh-tint and the lines are lost. Head, 2.7 mm. in width. Tubercle *IVa* on joint ten the same as before; does not bear a seta. Length from 38 to 43 mm.

These larvæ became mature about Aug. 10, and left their burrows in order to change to pupæ. The latter offer no individual features. Dates for emergence range from Sept. 8 to 30.

In the season of 1906 *Papaipema* studies received a local impetus through the discovery on the home preserves of an unknown, distinctive, and never-before-seen species, that savoured of interest the moment its larva was observed. Of course there are plenty of species whose larvæ

are unknown, and it might be any of these, but its peculiar workings and choice of food-plant at once suggested the unusual, which was finally borne out at emergence. In choosing *Collinsonia Canadensis*, the larva takes up with a common and generally accessible plant, and why the moth has not been observed before is one of the mysteries. How an insect of its size and appearance, with larvæ actually at work within the confines of New York City, and whose range must extend widely over the Eastern United States, could have escaped notice until this late day is most remarkable, for it does not appear in collections standing erroneously under some other label, as do the other species here brought forth. It simply does not occur at all. Some recent discussion over what is a rare butterfly, etc., recalls that inaccessibility or remoteness of habitat are often the main features of so-called rarity. In this case we certainly cannot make any excuse for inaccessibility, and while there is no claim made for its rarity in nature, we do say it has proved our most elusive Noctuid.

*Collinsonia* sends up a modest stem to the height of a couple of feet, from a very peculiar rootstock. It has very aptly received the common name Stone Root, for the roots are almost "as hard as a stone," being quite comparable to a piece of well-seasoned hardwood. That the larvæ forsake the fairly commodious stem and endeavour to make an impression on the root, was what drew particular interest to it. By maturity these endeavours have borne some result, and a little cell large enough to crowd in has been formed. In looking for something easier the epidermis is pierced repeatedly, so that the cell is often incomplete by reason of these broken tissues. But there is some flavour in Stone Root particularly enticing, for the larvæ of two other species are found to work in it in a very similar manner. One of these has a larva so close it is not at first recognized as different, and the other, the ubiquitous *cataphracta*, is always intruding itself into better company. Indeed, it is a "sly" borer, as it would make *nitela* and *cataphracta* its scapegoats, maturing early, forsaking the plant for pupation, and leaving these two later-appearing species that pupate in their burrows to take the brunt for the damage which is ultimately blazoned in the dying stem. Lucky were we to secure one inflated specimen and to carry through one other to imago. Even with the limited material and but one year's data, there is sufficient to warrant the following description:

*Papaipema astuta*, n. sp.—Form and habitus fully congeneric; ground colour chrome yellow, a little brighter than *Merriccata*, and the powdering of brown scales not so heavy. Head and collar purplish-brown, no white scales at the base of the antennæ nor at the base of the

primaries. The prominent thoracic tuft and vesiture heavily scaled in purple-brown and yellow. Abdomen the same silken shade of pale fawn as the secondaries. Basal area of primaries small and of the ground colour, the outlying area to the t. a. line dull purple; median space entirely of the yellow ground colour, and contrasting at the t. p. line, as the remainder of the wing is quite dark. The median shade is a fine brown line extending from the middle of the inner margin to the lower end of reniform, whence it angles and crosses the cell to the costa in an unusually irregular course. The t. p. line is nearly straight, geminate, the inner a fine brown thread, the outer blended and lost in the deep purple of the subterminal space. This area is glistening, violet-purple, and adds greatly to the attractiveness of the insect. The very irregular s. t. line borders a rather wide terminal space of the dull purple that holds inside the median field. The ordinary spots are small; the orbicular and claviform are three, almost equal, superimposed spots, the former a pure white round dot, the latter double, the upper yellowish and the lower a pure white oval dot. Reniform broken, the commingling spots yellow, except the lower inner one, which is white. There exists the customary dash of the ground colour at the apex. Fringes deep purple and glistening. The secondaries scarcely show any terminal clouding, and have concolorous fringes. Expanse, 31 mm.; 1.25 in. The type is a female. Superficially it approaches *cataphracta* somewhat, though the straighter t. p. line, the small white-marked spots and the lighter secondaries easily separate it. Numerous *cataphracta* examples bred in *Collinsonia* show no change from the typical form, and appear nearly a month later.

*Astuta* larvæ were first observed July 10th, being then about half grown, and having emerged from the hibernated ova presumably about the first of June. The stems are entered three or four inches above, and the burrow is made downward to the root, which has been reached by this date. An inflate made July 20th shows a larva in the penultimate stage. Head, 2.2 mm. wide; normal, shining-yellow, without side line or shade; ocelli and mandibles blackened. Thoracic shield as large as head, black at sides. The longitudinal lines are barely seen, none of which cross the darkened area shown on the first four abdominal joints. The tubercles, though small, are black and easily definable. On joint ten, IV is low down, with no accessory, and is bare of setæ. On joints eleven and twelve the plates are normal. Length, 39 mm.

Pupation occurs in the ground, and the date of the single emergence is Sept. 12th. The pupa is light brown and active, and offers no feature of individuality.

The perusal of life-histories in this genus naturally brings out some features of distribution, which might not otherwise be obtained, one being that certain localities are favoured haunts of particular species, due of course to the prevalence of the natural food-plant, that may in an adjoining territory meet with restriction. So we have come to consider *necopina* and *duovata* as special Rye forms, never happening to observe them elsewhere. But the food-plant of *necopina*, Grote, is *Helianthus giganteus*, and is not confined to the seaboard, while closely-allied species of the plant occur commonly at all points. Being plants entirely suitable for *Papaipema* boring, all varieties have been examined repeatedly to discover if *necopina* ever changed its diet to any other, and this has been going on since the discovery of its larva in 1895. Never once in all this period have we been able to offer the slightest reflection upon its epicurean taste, so, when in 1906 *Helianthus divaricatus* was found bored at its base, with the familiar gall-like swelling there, it was presumed that the Grote species had at last been driven to the wall. These larvæ are still small, and have a continuous dorsal stripe which they should not possess, yet we are very willing to stretch a point, being eager, in fact, to encounter larval variation. We knew that the moment a pupa appeared we could settle the question, for *necopina* has a little frontal projection that is all its own. So when a very small chrysalis appeared undistinguished by any frontal development, it was known beyond question that we were not dealing with this species. The final emergence, however, produced a moth so like the Grote species that it was evident the common progenitor had not been very remotely removed down the line of evolution. What may have caused the new larva to have gained a dorsal stripe or to lose a frontal development in the pupa, should this be considered the branching species (in which the author hardly concurs), opens a field far too wide for discussion here. A description of the form, however, becomes absolutely necessary.

*Papaipema imperturbata*, n. sp.—Form fully congeneric. Ground colour very dark, almost black, with a brown or olivaceous reflection. The vestiture of head and thorax is of the one tone of ground colour, though grayer than the median field of primaries. The anterior tuft is of the usual prominence, though less adze-shaped than in many. The ally has an elongate, conical tuft, quite individual. Primaries almost uniform in colour, copiously powdered with blue-gray scales, the lines and markings obsolete. The subterminal space is obscurely evident, its blue tone

thoroughly tempered by the sprinkling of gray scales. Secondaries whitish, though clouded with dark gray at the margin. Beneath, this same light tone, overlaid by heavy powderings. No median shade observable in the series. Expanse, 28-32 mm.; 1.15-1.28 in. Six specimens, embracing both sexes, are at hand. Co-types will be placed in the U. S. National and the British Museums.

The species may be superficially separated from *necopina* in the moth state by its smaller size, lighter secondaries and bluer reflection of primaries. The male structures offer little of comparative value, being typical merely. The main characters will be found in the earlier stages, as already noted.

Larvæ were found to be in the fifth stage at the middle of July. They belong to the most prevalent, the *nitela-rutila* series, having the conspicuous dorsal stripe continuous. Its ally has this line broken in all stages. In the penultimate, which is the most important for comparisons, we find, for this section of the genus, a very representative larva. The colour is pale sienna, more livid than *Merriccata*. Longitudinal lines wide, straw colour. Head, 2.3 mm. in width; shining russet, no side line, mouth-parts and ocelli black. Thoracic plate as wide as head, shining, lighter in colour, edged with black laterally. True legs and spiracles black. Tubercles I and II show as the merest dots on all joints but eleven and twelve, where they are normal. Lateral tubercles small, though all are definable; IV on joint ten is low down, and has no accessory. Anal plate is small, rougher than thoracic. The dorsal line is very plainly shown for the stage, unbroken in its entirety. The other lines break from joints three to seven. Length, 40 mm; date, July 20.

Pupation occurs Aug. 10-15; emergence, Sept. 9-20. The pupal change takes place in the gallery, which extends down to all parts of the root that are available, for the species is a gourmand, and it is hard to make one plant furnish enough substance. The amount of food consumed by different species is very striking. Some eat very little, others, most notably *cataphracta*, can be identified without ever being seen. *Imper-turbata* enters but slightly above the root, and the plant, which is growing very fast at that time, makes an effort to counterbalance the boring by an elongate enlargement, that in the end furnishes considerable additional substance. The gallery goes upward also until the stem is eaten off and falls. An irregular opening is made for the moth's escape, which the epidermis is left to cover. This larva is not, however, so neat an artisan as *necopina* in making a doorway. The pupa differs upon comparison

from any of the four closely-allied species. It is normal, front smooth, the shape is most like *nelita*, though the latter is darker and less shining. The difference between *eupatorii*, *necopina* and *nitela* is obvious. Colour light chestnut, shiny. The two divergent, hooked anal spurs are relatively larger than its allies. Length, 17-18 mm. A very nice little *Sesia* is a co-labourer in the *Helianthus* root, and emerges just a few days ahead of its companion. An accident befell the one example carried through, so it is not known what species was represented.

(To be continued.)

### THE *EUPITHECIAE* OF EASTERN NORTH AMERICA.

BY GEO. W. TAYLOR, WELLINGTON, B. C.

(Continued from page 168.)

We have now to consider nine names proposed by Dr. Packard between 1867 and 1876, the date of his admirable Monograph.

The first in order of time is:

*Eup. luteata*, Packard, Proc. Boston Soc. Nat. Hist., XI, 46, 1867.

Described from Labrador in the first place, but redescribed as *Eup. palpata* six years later from specimens collected in Maine and New York.

When Dr. Packard wrote the Monograph he placed *palpata* as a synonym of *luteata*, and I suppose the better plan is to follow him in this course. The description of *luteata*, however, seems to point to at least a distinct variety. The description given under the name *luteata* in the Monograph, it should be noted, is almost word for word a copy of the original description of *palpata*, and not that of *luteata*, as one might have expected. Dr. Hulst many years later described *Eupithecia ornata* from Colorado. This species is superficially somewhat like *palpata*, and Dr. Hulst named for various collections specimens of *palpata* as *ornata*. I have several specimens so misnamed by him in my own collection, and misled by these specimens I am afraid I have given this name (*ornata*) to many of my correspondents. Recently Mr. Swett has compared specimens for me with Packard's types, and he assures me that there can be no doubt that I have now *palpata*, that is, *luteata*, correctly identified.

The species seems to be common all through the eastern States from the middle of April to the end of May.

*Eup. geminata*, Packard, 5th Report Beabody Acad. Sci., 58, 1873.

Packard described the species from two specimens apparently not conspecific. The one, a male (figured in the Monograph at Plate viii, fig.

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2), was probably a specimen of what in this paper I have called *coagulata*, Guenée, and the other, a female (Plate viii, fig. 3), would, therefore, become the type and take the name of *geminata*, but that the name is preoccupied by the *Eupithecia geminata* of Grote and Robinson. Under these circumstances, I propose the new name *Packardata* for *geminata*, Packard, part, and as Packard's description will not apply in its entirety, I have redescribed the form below.

*Eup. Packardata*, new name.

= *E. geminata*, Pack, not Grote and Robinson.

= *absynthiata*, Pack., Monograph, not Clerck.

Expanse, 27-30 mm. Males rather smaller.

Palpi rather large and coarse, very dark gray. Head paler than thorax, which is gray, with a brown shade, darker in front. Abdomen with a very distinct black transverse band on second segment.

Fore wings colour of thorax, costal spots not as heavy as in *coagulata*, the most distinct being the basal, intra-discal and extra-discal. This last is the largest, and is preceded by two smaller ones. Each of these spots marks the commencement of a fine line appearing only as dots on the veins, but in very perfect specimens the lines can be traced right across the wings.

The basal line is much curved, and reaches almost to the base on the inner margin. The intra-discal is almost straight, meeting the inner margin at right angles. Sometimes two other lines are visible between the basal and intra-discal lines. The three extra-discal lines are parallel, curving out from the costa to pass the large elongated discal spot.

The submarginal space is a little darker than the rest of the wing, and is sometimes bounded inwardly by a fine line parallel to the extra-discal. The submarginal white line is not so evident, and the twin spots are not so large and conspicuous as in *coagulata*. A dusky marginal line, scarcely interrupted at the ends of the veins; fringe long, obscurely spotted.

Hind wings well rounded, a little lighter in colour than fore wings, discal spots very small. The wings are crossed by numerous dark wavy lines, about nine of these lines being sometimes visible; submarginal white line very faint, marginal line and fringe as on fore wings.

Under side of fore wing quite clear from base to extra-discal line, except for a single dark extra-basal spot on the costa, which does not correspond with either the basal or intra-discal costal spots of the upper side, but has a position between them. The discal spots, the extra-discal, submarginal and marginal markings are as above, but fainter. Hind wings,



discal spots more evident than above; and there are about eight cross lines traceable from margin to margin.

The dates of my specimens run from 10th June to 12th September. The species is very closely allied to *E. casloata*, Dyar, from British Columbia, and to *Eup. fumata* and *E. indistincta*, which will be described in the present paper. It is also near to *E. fumosa*, Hulst, as I understand that species.

I have little doubt that my specimens are conspecific with the type of *geminata*, Packard, figured in Plate viii, fig. 3 in the Monograph, but to guard against mistakes I have placed a type label on a very perfect specimen of *Packardata* taken at Ottawa (7, viii, '06) by Mr. C. H. Young.

*Eup. palpata*, Packard, 5th Rept. Peabody Acad. Sci., 58, 1873.

This species, as stated above, was abandoned by Packard himself as being the same as *E. luteata*.

*Eup. interruptofasciata*, Packard, 5th Rept. Peabody Acad. Sci., 59, 1873. Monograph, 52, Pl. viii, fig. 5, 1876.

This species was very fully and carefully described by Packard, and I think there cannot be any doubt as to the form he had before him when drawing up his description. It must be borne in mind, however, that he only distinguished 12 out of our 40 or more eastern species, and that his series under each name would, therefore, almost certainly be mixed. No weight, therefore, can attach to specimens distributed by Packard as *typical*, any more than to so-called authentic specimens of *misurelata*, sent out by Grote.

When writing the Monograph, Packard sunk his *interruptofasciata* as a synonym of *miserulata*, but in my opinion the two are abundantly distinct. I understand that the original types of Packard's species are not now in the collection at Cambridge. *Interruptofasciata*, as I have identified it, is not a very common insect.

My best specimens were bred by Dr. Fletcher from larvæ found on Juniper at Hull (Province of Quebec) in May, 1904 (see description of larvæ by Dr. Fletcher and note by me in CAN. ENT., XXXVII, 262). This species is an autumn flier. Dr. Fletcher bred specimens emerging in September. It is very closely allied to my *Eup. impedita*, to be described in the present paper.

*Eup. Strattonata*, Packard, 5th Rept. Peabody Acad. Sci., 60, 1873. Monograph, 58, Plate viii, fig. 8, 1876.

This species was described from one female taken by Stratton at Natick, Mass., on July 17th.

It is well described in the Peabody Report, but the description is shortened a little in the Monograph, and the figure therein is not very characteristic. The insect is apparently rare, and I have only a single specimen (which I owe to the kindness of Mr. Swett), taken at Winchendon, Mass., June 20th.

*Strattonata* cannot be mistaken for any other of our eastern species, the unusual colour (brownish-ochreous, Packard calls it), the heavily-marked costa, and the small but very distinct discal spots, readily separating it from its allies.

Why this species should ever have been placed on a synonym of *Eucymatoge anticaria* I cannot imagine. It bears very little resemblance to that species, and has the single accessory cell of *Eupithecia*, not the double one of *Eucymatoge*

*Eup. fenestrata*, Milliere, Rev. & Mag. Zool., 1874, p. 243, and Icon., iii, 431, 153, 14, 15, 1874.

= *Larentia cretacea*, Packard, 6th Rept. Peab. Acad. Sci., 40, 1874, and Proc. Bost. Soc. Nat. Hist., xvi, Pl. i, fig. 3, 1874.

= *Eup. cretacea*, Packard, Monograph, 63, Pl. viii, fig. 15, 1876.

= *Glaucopteryx cretacea*, Packard, Monograph, 562, 1876.

There is a difficulty in recognizing this species, which, though described from Sierra Nevada, is equally common on the Pacific Coast and in the Atlantic States. There is no doubt, I think, that the *cretacea* of Packard is at best only a variety of the European *E. fenestrata*, and in Staudinger and Rebel's Catalogue (No. 3589) the two are placed together.

I do not understand why Packard should have printed his description twice over in the Monograph (see pages 63 and 562).

Last autumn, in company with Dr. Dyar, we discovered the larvæ of this species feeding in great numbers on the flowers and seeds, and later on the leaves of *Veratrum viride* (the False Hellebore). The larvæ were about one inch in length, of a yellowish-green colour, with eight interrupted black lines, one dorsal, two lateral and one subspiracular on each side, and one ventral. The head and legs shining black. These larvæ were full fed at the end of August, and the moths are now (4th of June) emerging.

*Eup. albicapitata*, Packard, Monograph 48, Pl. viii, fig. 1, 1876.

This is one of the most distinct species we have in the genus, and the description of Packard is very good, though the figure is hardly so satisfactory. The moth is not very common or well known, and it is quite usual to find some very different species under this name in collections. *Albicapitata* flies in June, and it occurs on both the Atlantic and the

Pacific coasts. I have not, however, received any specimens from the Prairie Provinces. Mr. T. Bryant took a number of specimens near the British Columbian and Alaskan boundary in 1905, and it also occurs at Kaslo, in British Columbia. A specimen from the latter locality was inadvertently recorded by Dr. Dyar (Proc. N. S. Nat. Mus., xxvii, 889) as *laquearia*, Herr-Sch., a species not entitled to a place on our American list. I have not seen many specimens from the eastern States, and Mr. Swett tells me that the species is not common, but is subject to considerable variation.

*Eup. zygadeniata*, Packard, Monograph, 51, Pl. ix, fig. 7, 1876.

This species was admirably described and equally well figured in the Monograph. The types were from Texas, and I have not seen specimens from any other State. Once seen, it cannot afterwards be mistaken for any other species. Nevertheless, it has usually been misnamed in collections. Dr. Hulst does not appear to have recognized it, for I have seen several specimens of other species (none of them really *zygadeniata*) sent out by him with this name on the label. As a result of these misidentifications the name, *zygadeniata*, has appeared on several local lists, but I should mistrust any record from localities other than Texas. My own specimens (all dated May, 1902) are from the type locality, and agree exactly with the original diagnosis. Judging from the description and locality, I should say that the "*Tephroclystis tenebrescens*" of Hulst (CAN. ENT., XXXII, 102) is a synonym of this species.

The spelling of the name seems to be a stumbling-block to the list-makers. It is spelt incorrectly in Hulst's "Classification" and in Dyar's and Smith's latest lists, and in each of these instances we are favoured with a different variation.

*Eup. ravocostaliata*, Packard, Monograph 60, Pl. viii, fig. 9.

Described from the Pacific Coast, and so well known and easily recognized from description and figure that a mistake with regard to it would be almost impossible. The species is not, I think, quite as common in the east as in the west, but it is found in more or less abundance in every locality from which I have seen collections.

Of Packard's nine species noted above, six will continue to bear his names. One (*palpata*) is sunk in deference to Packard's own opinion; one (*geminata*), which had been placed in synonymy by Packard, is restored under a new name (*Packardata*); and one (*cretaceata*) is dropped as being but a slight variety of a previously-described European species.

(To be continued.)

## ENTOMOLOGICAL SOCIETY OF ONTARIO.

A summer meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, July 4 and 5. Through the kindness of President Creelman, the members from a distance were hospitably entertained in the College residence during their visit, the ladies of the party being provided for in the Macdonald Hall. The number in attendance was smaller than was anticipated, many who had been looking forward to taking part in the meeting being prevented from coming by a variety of causes. A very satisfactory audience, however, was made up by the Summer School of Ontario teachers from the Macdonald Institute, and several students and members of the College staff. The sessions began on Thursday afternoon in the lecture-room of the Biological Department, the President of the Society, Dr. Fletcher, of Ottawa, being in the chair. Mr. H. H. Lyman, of Montreal, read a paper on the distinctions between *Thecla calanus* and *Edwardsii*.

Dr. Brodie, of Toronto, described the life-history of a colony of the Tent Caterpillar, and related his experience in breeding a large number during a series of years in order to observe the effects of parasites upon them.

Dr. Fletcher gave an account of a visit he had recently paid to Massachusetts, and described what was being done to control the Brown-tail and Gypsy moths by the importation of parasites from Europe and by practical field operations.

Mr. C. W. Nash, of Toronto, spoke on "Balance in Nature," in which he described in a very interesting manner some of the numerous checks and counter checks which are provided in order to prevent the undue preponderance or the extermination of any particular species, and showed how this balance had been upset by man's disturbing agency, and the difficult problems that had arisen in consequence. A discussion followed, which was participated in by the chairman, Dr. Brodie, Prof. Bethune, Mr. Jarvis, Mr. Caesar, and others.

In the evening the session was held in the Nature-study lecture-room of the Macdonald Institute, and was attended by the Summer School and a number of others from the town and College, as well as by the members of the Society. Dr. Henry Skinner, of Philadelphia, gave a highly interesting lecture on "Insects as Carriers of Disease." Mr. C. W. Nash followed with a lively address on "Instinct vs. Education," and Dr. Fletcher spoke in his usual attractive manner on "Nature Study as a

Means of Education." The evening was thoroughly enjoyed by all present, and no doubt the school teachers carried away with them much information and many impressions that will be of value to them in the future.

The next day, July 5th, was given up to an excursion to Puslinch Lake, a picturesque sheet of water about nine miles from the College. The Summer School joined in the picnic, making up a party of more than sixty in all. The day was spent in collecting botanical and entomological specimens and other objects of interest. At the close short addresses were given by members of the College staff and others on various specimens that had been brought in, including fresh-water shells, insects and plants. The meeting on the whole was so delightful and successful an experiment that it will no doubt be repeated in future years, and become annually more attractive and well attended.

At a meeting of the Council, Mr. L. Caesar, O. A. College, was elected Secretary of the Society for the remainder of the year in place of Mr. E. J. Zavitz, who has found it necessary to resign, as his various duties in the department of Forestry leave him no time to devote to the business of the Society.

#### THE GEOMETRID GENERA ALSOPHILA, HUB., AND PALEACRITA, RILEY.

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

It would be supposed that the last word had been written about the canker-worms, the literature of which has been so confused, as well as the two species. Had attention been given but slightly to their structural characters, there had been no need of this. *Pometaria*, Har., is correctly placed, in my judgment, by Dr. Hulst in *Alsophila*, with *æscularia*, Schiff, as its type. He says (Trans. Am. Ent. Soc., Vol. 23, p. 258), "I cannot agree with Mr. Meyrick in his reference of this genus to the Monocteniinæ. The most characteristic venation is the merging of vein 8 of hind wings with the cell. If this is to be ignored, the lack of the accessory cell would be no more reason why it should be placed with the Monocteniinæ than with the Ennominae." He might have gone further, for besides the merging of vein 8 with cell, vein 5 is present, and this effectually keeps it out of the Ennominae, besides, it has an accessory cell, as has also the type. Hence the reasons disappear why it should not stand just where it does.

With *Paleacrita* the strange part of the present arrangement comes in. Here the type *vernata*, Peck., has the true venation of the Ennominae,

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with accessory cell rarely present in the fore wings, and it has vein 8 of hind wings running parallel with cell for half of cell's length, *not united with it*, while vein 5 is a fold only, sometimes faintly evident at wing margin, but disappearing before it reaches cell, or entirely absent. The antennæ, as Dr. Riley pointed out three years after he described his genus *Paleacrita* (8th Mo. Report, p. 15 and 17), are nearly in agreement with those of *Erranis* (*Hybernia*), but the spinose armature of the abdomen prevents the entrance of the species under that genus and their antennal structure from the genus *Phigalia*. *Paleacrita*, with the species under it, will properly, I think, find its place among this group of the Ennominae, which also includes the genus *Conoides*, Hulst, with its wingless female, the type *plumigeraria*, having in both sexes the spinose armature of abdomen, a feature apparently overlooked by Dr. Hulst. In my opinion, *Paleacrita* should be placed at the beginning of the Ennominae, followed by others of this group, in the same manner that *Alsophila* opens the series of Hydriomeninae, for, it will be observed, the species under this genus show, in individual cases, a tendency toward the recurrence of vein 5. It is interesting to note that a common point is thus established, from which spring the two great divisions of the Geometrinae, thus *pometaria*, purely Hydriomenid in venation of hind wings, sometimes loses the accessory cell in fore wings, while *vernata*, as purely Ennomenid in venation of fore wings and in the separation from cell of vein 8 in hind wings, does, in the latter, as I have stated, show an occasional vestige of vein 5. What Dr. Hulst says, following my quotation above, as to the noctuiform position of vein 5 under *Paleacrita* applies to *pometaria*, an observation even more strongly accentuated in the type species *æscularia*, of which through the kindness of Mr. L. B. Prout, I have an example. Under *Paleacrita* there should be listed *four* species, viz., *vernata*, Peck; *Merricata*, Dyar; *longiciliata*, Hulst, and *speciosa*, Hulst. The ♀♀ are unknown, except in the case of *vernata*, where both sexes have the abdomen spinose, but they are undoubtedly wingless in all. In the ♂♂ the antennæ vary in each, but may be generally defined as follows: Stalk long and slender, nodose on each side, with fascicles of long curved ciliæ from each nodule. In *vernata*, *two* on either side of each joint, *one* in each of the other species, hence the separation of *Merricata* as a variety of *vernata* and its establishment as a distinct species. In recent correspondence with Mr. Meyrick, he stoutly maintains this as his opinion also, and hopes to give its life-history in confirmation of it.

NUMBER OF MOULTS OF THE FEMALE OF *DACTYLOPIUS CITRI*.\*

BY ROBERT MATHESON, ITHACA, N. Y.

The life-history of the male of *Dactylopius citri* has been worked out by Reed in 1890 at Cornell University. His results are embodied in an unpublished thesis. Berlese, '93, in "Le Cocciniglie Italiane Viventi Sugli Agrumi," pp. 23-33, has given a more detailed account of the male's life cycle. It may be well to give here a brief summary of their work before describing the transformations of the female:

The young nymphs moult for the first time in from 10 to 22 days after hatching. During the first stage it is impossible to separate the males from the females by their external characters, and only just previous to this moult can they be distinguished. Berlese has shown that the future mouth-parts of the female which is about to shed its skin, are coiled spirally just beneath the transparent cuticle. In the males no developing mouth-parts can be observed, and those which they possess disappear at the time of the first moult. These facts can be observed just before the moult.

The cast skins usually remain attached to the caudal extremity of the male nymphs. In the second stage the male nymphs are sluggish in their movements. They usually seek out some secluded spot and, in about ten days, begin spinning their cocoons. The spinning of the cocoon occupies about two days, and, shortly after its completion, the second moult occurs. This cast skin is, in a day or two, pushed out at the caudal end of the cocoon. It is during the second stage that the beginning of the wings and halteres may be noted. They appear as small papillæ on the mesothoracic and metathoracic segments.

The third moult occurs five days after the second, and a week later they moult for the last time. The perfect winged insects emerge from the cocoon in from three to four days after the fourth moult.

The life-history of the female is in marked contrast to that of the male. Neither Reed nor Berlese, nor any previous worker, succeeded in determining the number of moults in the female. Reed supposed there were three, whereas Berlese, reasoning from analogy with the male, considered there must be at least four.

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\*Contribution from the Entomological Laboratory of the Cornell University. August, 1907

As is generally known, each female lays from 150 to 200 eggs. These eggs are enclosed in a waxy secretion, produced by hypodermal glands. These glands are situated on the ventral surface of the abdominal segments. The first nymphs appear in from 10 to 18 days after the commencement of the egg-sac. Only a small number of those hatched from a single egg-sac are males. The young nymphs on hatching remain a short time within the egg-sac, and, on leaving it, spread rapidly over the leaf, settling in large numbers along the mid-rib and at the joints of the stems. As previously pointed out, it is impossible to separate the males from the females during this stage.

#### FIRST NYMPHAL STAGE.

At time of hatching, the young nymphs are about .4 mm. long, and from .18 mm. to .21 mm. wide, bright yellow to orange in colour, oval in outline, slightly narrowed at the caudal end and rounded at the cephalic end. The appendages look large and clumsy in comparison with the size of the body.

The abdomen is distinctly divided into eight segments, the transverse sutures being distinct on both dorsal and ventral surfaces. The divisions of the thorax are not so distinct. The transverse sutures cannot be distinguished on the venter, and only with difficulty on the dorsum. The suture separating the head from the thorax can be seen only on the dorsal surface.

The antennæ are about .16 mm. long, situated on the ventral surface of the anterior end of the body. The bases of the antennæ are not contiguous, and small hairs are scattered over their entire surface. They are divided into seven segments. The basal one is triangular in outline and quite short. The seventh segment is the longest, longer than the three preceding segments taken together, oval in shape, and ends in an apical tubercle, upon which is inserted a stiff hair, almost as long as the segment itself.

The cornea of the eyes projects from the sides of the head. The black pigment is well developed, showing prominently on the ventral surface.

The legs are well developed and strong, especially when compared with their condition in the adult.

#### SECOND NYMPHAL STAGE.

The first moult occurs from 10 to 22 days after hatching. It is just before this moult that Berlese could distinguish the males from the females by the absence of developing mouth-parts.



After the first moult the females are about .625 mm. in length, .3 mm. in width; bright orange in colour, somewhat rounded at the anterior and posterior ends.

The antennæ are .19 mm. long, and have seven segments. The basal segment is quadrangular in outline and quite short. The seventh is the longest, being nearly as long as the three preceding taken together.

It is difficult, if not impossible, to separate the first and second nymphal stages, except by rearing them and noting the time of moulting. The characters of length and size of the antennæ are of doubtful value, and not to be depended upon. The antennæ of a nymph, near the latter part of the first stage, measured over .19 mm. This is the length usually found in the nymphs at the beginning of the second stage.

#### THIRD NYMPHAL STAGE.

The second moult occurs, on the average, about 15 days after the first.

The antennæ now consist of eight segments, and are .264 mm. in length. The basal segment is quadrangular in outline, and the eighth is nearly as long as the three preceding taken together. The character and the number of the antennal segments readily distinguish this stage from the preceding ones, but are absolutely of no value in separating it from the mature or last stage. In other characters they do not differ materially from those of the preceding stages.

As all previous workers have considered the antennæ in the first nymphal stage as consisting of only six segments, I would like to draw attention to the fact that in all specimens which I have examined there were seven clearly-defined segments in the first and second nymphal stages and eight in the third, as well as in the adult female.

#### ADULT.—FEMALE.

The third and last moult takes place, on an average, about 13 days after the second. I found it very difficult to secure many observations on the exact time of this moult on account of the roving habits of the nymphs under observation.

After this moult the females do not usually move about, but remain practically motionless. Egg-laying commences in from 15 to 20 days later, and continues for from 10 to 14 days. An interesting observation worth recording is that the females are usually not of uniform size at the time when they commence egg-laying. This has been pointed out by Reed in his thesis, and I had many opportunities of verifying his

observations. Often what I, judging from size only, considered were nymphs in the third stage would prove to be mature females and commence egg-laying.

The formation of the egg-sac, the number of eggs laid, and the external characters of the adult female, have been so well described by previous workers as not to need repetition here.

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### BOOK NOTICE.

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KIRBY'S CATALOGUE OF ORTHOPTERA.—Vol. II.

By A. N. Caudell, U. S. Nat. Museum, Washington, D. C.

Volume two of this most excellent general catalogue of Orthoptera\* comprises a well-bound volume of over five hundred and fifty well-printed pages. In it 154 genera of crickets (Achetidæ) and 689 genera of katydids and allies (Phasgonuridæ) are listed, together with their species. The Achetidæ as here used corresponds with the more commonly used name Gryllidæ, while the name Phasgonuridæ is used instead of the more familiar name Locustidæ. The reason for the change of Gryllidæ to Achetidæ is not clear to me. As in the first volume, the types of all genera containing more than one species are indicated.

As of interest to North American students of this order, the following facts bearing on United States genera and species may be noted :

#### LOCUSTIDÆ (Phasgonuridæ).

*Microcentrum*, Scudd.—This genus is used for the insects hitherto usually placed in the genus *Stilpnochlora*, which is here sunk in synonymy under *Microcentrum*. Kirby specifies his number 2, *thoracicum*, Serv., as the type, but erroneously so, as neither this species nor any of its synonyms are among the originally included species. Personally I should favour taking the first species, *retinervis*, as type, thus preserving the commonly-accepted nomenclature. By elimination the type is *marginellum*, Serv., which Kirby records only from S. and Cent. America and the West Indies. North America should be included, as *Microcentrum thoracicum*, Scudd., one of its synonyms, was described from the United States, and I have two specimens from Florida that agree with ones from Cuba. I also have eggs from Florida, showing the species to be a permanent resident there.

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\*A Synonymic Catalogue of Orthoptera. By W. F. Kirby, Vol. II, Orthoptera Saltatoria, part I (Achetidæ et Phasgonuridæ). London, 1906.  
August, 1907

*Orophus* Sauss.—Under this generic name appears the aggregation of species usually listed under *Microcentrum*. Our common insect usually known as *Microcentrum laurifolium* is now *Orophus rhombifolium*, the true *laurifolium* being a species from Caymans, and belonging to the genus *Microcentrum* as here used. Our well-known *Microcentrum retinervis* now becomes *Orophus retinervis*, a change unnecessary were the first species rule a law.

Amblycorypha, Stal.—*A. Saussurei*, Bruner, I do not find in the Catalogue. It was very poorly described in Bull. Washb. Coll., i, p. 195 (1886), from specimens which the describer has recently written me were taken near Washington, D. C. The name should be entered in the synonymy under *A. oblongifolia*.

Cyrtophyllus, Burm.—This genus is replaced by *Pterophylla*, Kirby, described in Kirby and Spence's *Introductio Entomol.*, ed. v, vol. ii, p. 218 (1828). *Camellifolia*, Fabr., is designated as the type. This species replaces *perspicillatus* of the same author. The *Gryllus perspicillatus* of Linnæus, wrongly quoted by Scudder as the same insect as the *perspicillatus* of Fabricius, is not, so far as I can find, mentioned in the Catalogue.

Conocephalus, Thunberg.—This genus is placed in the synonymy under *Anisoptera*, Latr., and the species so long associated with it are placed in the genus *Conocephaloides* of Perkins. The publication containing the original reference to *Conocephalus* is at present unavailable, and I am thus unable to determine if I agree in the suppression of the name or not. *Hebes*, Scudd., is listed as a distinct species, but is not marked as being present in the collection of the British Museum. As Scudder himself places this species in the synonymy under *nieti*, that is very likely its proper place.

Orchelimum, Serv.—*Vulgare*, Harris, usually listed as a synonym of *agilis*, DeG., is listed as a distinct species, and, I believe, properly so. *O. gracile*, Harr., is removed from the synonymy under *Xiphidion fasciatum*, where it is usually placed, and listed as a distinct species of *Orchelimum*. This I believe an incorrect step. No specimens of the species were before Mr. Kirby, nor is any insect known in the eastern United States that agrees with Harris's figure. The description given by Harris agrees very well with *X. fasciatum*, but does not agree with his figure, which represents the ovipositor as being decidedly falcate. The

figure is evidently inaccurate, and the species is very surely *X. fasciatum* with dorsal infuscation, a common variation. *O. concinnum*, Scudd., is catalogued as a distinct species. In view of the fact that Mr. Kirby seems to have possessed neither this species nor *herbaceum*, of which Scudder considers *concinnum* a synonym, I prefer to leave the former in synonymy under the latter. *Nigripes*, Scudd., is replaced by the earlier name *validum* of Walker. *Bruneri*, Blatchley, is listed as distinct, though the describer has pronounced it a synonym of *volantum*, McNeill, after direct comparison of types of both species.† *Sphagnum*, Walk., described as a *Decticus*, and since omitted from American lists, is recorded. It will very certainly preoccupy some one of our later described species.

Xiphidion, Serv.—This well-known generic name, like *Concephalus*, Thunberg, is in the synonymy under *Anisoptera*, Latr. The species placed here are those usually classed under *Xiphidion*. *Cinereus*, Thunb., is removed from the synonymy under *fasciatum*, though no specimens of it seem to have been before the cataloguer. There may, however, be good reasons for this action. As stated above, *gracile*, Harr., is listed as distinct. *Phaneroptera coloradensis*, Glover, Ill. N. A. Ent., Orth., pl. xi, fig. 12 (1872), is omitted from the Catalogue. It is a synonym of *fasciatum*.

Engoniaspis, Scudd.—This genus, as shown in my revision of the Decticinae‡, p. 320, is a synonym of *Atlanticus*. I accredit it to Scudder, as I maintain that a generic name can not stand without a species being cited under it. The first species mentioned under the generic name *Engoniaspis* is *testacea*, Scudd., which is a synonym of *Atlanticus pachymerus*, Burm.

*Atlanticus*, Scudd.—The *Decticus derogatus* of Walker is quoted as a synonym of *A. dorsalis* instead of *A. pachymerus*, as is usually the case. The description of Walker gives no aid in the matter, but the locality, Massachusetts, would indicate its being *pachymerus*. Kirby had specimens of *dorsalis*, but none of *pachymerus*, and when he has specimens of the latter for examination his views on this point of synonymy may change.

†The Orth. of Ind., p. 390, 391 (1903).

‡Proc. U. S. Nat. Museum, xxxii, pp. 285-410 (1907).

Anabrus, Hald.—*Similis*, Scudd., which is here listed as distinct, is a synonym of *A. simplex*.

Cyphoderris, Uhl.—This genus is wrongly located in the Decticinae. It is a genus in the Stenopelmatinae.

Cacopteris, Scudd.—As shown in my revision of the Decticinae, this is a synonym of *Idiostatus*, Pict.

Tropizaspis, Scudd.—This genus falls, as it is the same as Walker's earlier described *Neduba*, and the type, *steindachneri*, equals *Neduba carinata*.

Chelidoptera, Wesm.—This is preoccupied in birds, as stated on p. 403 of my recent paper on Decticinae.

Idionotus, Scudd.—This genus is wrongly referred to the synonym under *Neduba*, Walk.

Camptonotus, Uhl.—For our United States species of this genus Mr. Kirby uses the specific name *Scudderi*, Uhler, 1864, instead of *carolinensis*, Gerst, 1860. As these names are admittedly synonymous, it is not clear why the one first established is not used.

Stenopelmatius, Burm.—*S. oculatus*, Scudd., and *hydrocephalus*, Brunn., are placed in synonymy under *cephalotes*, Walk., a species hitherto not found in our catalogues. These three species will very likely eventually fall through preoccupation by *fuscus*, Hald., which was described in 1852.

Diestrammena, Brunn.—Mr. Kirby has recorded no species of this genus as occurring in the New World. One species, however, *D. marmorata*, has occurred for several years in injurious numbers in Minnesota greenhouses, and another species, *D. unicolor*, has been recorded from Illinois, where it was introduced, probably, with plants.

Spilacris, Rehn.—This is a synonym of *Scudderia*, the type, *S. maculatus*, being an immature specimen of a species of that genus.

Hadenæcus, Scudg.—I do not find *H. puteanus*, Scudd., in the Catalogue.

Udeopsylla, Scudd.—*Gigantea*, Brunn., belongs to this genus, not to *Daihinia*.

#### ACHETIDÆ (Gryllidæ).

Gryllotalpa, Latr.—This familiar name is in part replaced by *Curtilla*, Oken, and in part by the new name, *Neocurtilla*, the latter covering those species having the posterior tibiæ unarmed on the upper border, typified

by *G. hexadactyla*, Perty, a species very near, if not the same as, our common northern mole-cricket, *G. borealis*. I cannot agree to the replacement of *Gryllotalpa* by *Curtilla*, a genus erected thirteen years later. *Gryllotalpa* was described by Latreille in 1802, the description being full and the *Gryllus gryllotalpa* of Linnæus cited as example. Thus I see no reason for discarding the name. Mr. Kirby lists the macropterous form of *borealis*, the *G. colubia* of Scudder, as a distinct species, with *G. longipennis*, Scudd., a synonym. *G. ponderosa*, Bruner, is also listed as distinct. It is very surely the same as *major*, Sauss. Kirby does not appear to possess specimens of either of these species.

*Scapteriscus*, Scudd.—The catalogue gives no records of any species of this genus from the United States, though they have been known from our fauna for some years. Both *S. didactylus* and *abbreviatus* are not at all rare in our southern States, especially the former.

*Tridactylus*, Oliv.—*Fissipes* and *incertus* have been shown synonymous with *terminalis*, *Illinoiensis*, *tibialis* and *mixtus* with *apicalis*, and *histrion* with *minutus*, but Mr. Kirby has listed them all as distinct species, placing the last two and *minuta*, also the South American *denticulatus*, in the genus *Ellipes*, Scudd.

*Myrmecophila*, Latr.—*Nebrascensis* should be accredited to Lugger, as he was the first one to give the name validity. Bruner gave no description of it, nor did Lugger, but the latter gave figures of it. Scudder was the first to give a description of it, but Lugger's figures established the name.

*Liphoplus*, Sauss.—This is sunk in synonymy under *Ornebius*, Guér, and the name is not found in the index. It occurs on page 57.

*Nemobius*, Serv.—Varieties *amplus* and *brevis* of *canus*, Scudd., which were described with the species, are not mentioned in the Catalogue. *Abortivus*, Caud., is given specific rank. *Affinis*, Beutenm., is not listed so far as I can find. *Exiguus*, Blatch., is replaced by *janus*, new name, on grounds of preoccupation. *Nemobius pictus*, Scudd., belongs to the genus *Miogryllus*, and is a synonym of *M. sicarius*, Scudd.

On page 19 Mr. Kirby has included a species under the name *Nemobius exiguus*, Say, with the reference Proc. Acad. Nat. Sc. Philad., iv, p. 309 (1825). The same reference, except that it is properly called Journal instead of Proceedings, is given on page 86 as the original

reference to the insect now known as *Anaxiphus exiguus*. The latter insect is the one described by Say, and Kirby's reference on page 19 should be quoted in synonymy under it.

*Gryllus*, Linn.—*Nigra*, Harr., is listed as a distinct species, is spelled *niger*, and has *neglectus*, Scudd., and *nigerrimus*, Walk., as synonyms. I should retain the original spelling, and place it as a variety of *Pennsylvanicus*, Burm. *Luctuosus*, Serv., is listed as distinct. I believe it to be a macropterous form of *abbreviatus*, Serv. *Americanus*, Blatch., listed as distinct, is a synonym of *Pennsylvanicus*, var. *nigra*, Harr. § *Lineaticeps*, Stal, here listed as distinct, had probably better have been left in the synonymy under *assimilis*. *Acheta marginata*, Thomas, Trans. Ill. Agric. Soc., v, p. 443 (1865), is not mentioned in the Catalogue so far as I can find. It is not a member of the genus *Gryllus*.

*Cyrtoxipha*, Brunn.—*Gundlachi*, Sauss., occurs in the United States as far north as the District of Columbia. *Variegatus*, Bruner, Publ. Nebr. Acad. Sc., iii, p. 32 (1893), is sufficiently well characterized to warrant recording, but I can find no reference to it in the Catalogue. It is a synonym of *Nemobius carolinus*.

*Orocharis* Uhler.—*Uhleri*, McNeill, is a synonym of *Hapithus agitator*, Uhl.

*Tafalisca*, Walk.—*T. lurida*, Walk., should have the United States included in its habitat, as it has been recorded from our fauna, and specimens from Florida are in the collection of the National Museum.

A few species, such as *Conocephalus Caudellianus*, Davis, apparently described in time for recording, do not appear in the Catalogue. These will doubtless appear in the Supplement promised in the introduction to volume first.

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§Blatchley's name could not stand in any case, being preoccupied by *Gryllus Americanus*, Drury, Ill. Nat. Hist., i, p. 121, pl. 49, fig. 2 (1837). That this first-established name applies at the present time to an insect of a different family, does not prohibit its preoccupying a later name of the same combination and spelling.