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The Canadian Entomologist.

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DESCRIPTION OF PREPARATORY STAGES OF PHYCIODES NYCTEIS.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG— Ovoidal, narrowing above, the base rounded, summit depressed; the lower third smooth; nearly a second third marked by irregularly hexagonal, very shallow cells; and the remainder by vertical ribs, slightly raised, terminating at the rim of summit; color whitish-green. Duration of this stage 9 to 13 days.

YOUNG LARVA—Length .06 inch; cylindrical, each segment well rounded; color green, translucent; over the surface many hairs; head ob-ovoid, bilobed, the vertices rounded; color dark brown. Duration of this stage in June 10 days, in July 8.

AFTER FIRST MOULT—Length .18 to .20 inch; color smoky-brown, semi-translucent, the under side greenish; armed with seven rows, one dorsal and three lateral on either side, of stout, fleshy, tapering black spines, each surrounded by many short black bristling hairs; over feet a row of minute similar spines, and on segment 2 a dorsal collar of small spines; head black, ob-ovoid, high, the vertices rounded, covered more or less with black hairs. To next moult, in June 3 days, in case of the larvæ which proceeded to maturity; in July, 3 to 4 days.

AFTER SECOND MOULT—Length .24 inch; color black-brown, the spines longer in proportion, with broad bases, all shining black; under side greenish-brown; head as at last stage. To next moult, in June 4 to 5 days; in July 4.

AFTER THIRD MOULT—Length .34 inch; color black-brown; under side smoky-brown; at base there sometimes appears a broken yellow stripe or narrow band, dotted with whitish, but most often the yellow is wanting and the color of the ground is dull green; behind the dorsal row of spines are a few blue dots, arranged in two cross lines; spines long,

stout at base, their tubercles shining black and meeting; head rather cordate, flattened in front, the vertices rounded; black, shining; the surface much covered with black hairs. To next and last moult, in June and July, 3 days.

AFTER FOURTH MOULT—Length .50 inch, color and spines as before, but the band more definite. The larva grows rapidly and in three days reaches maturity.

MATURE LARVA—Length 1 inch; cylindrical, slender; color black-brown, the under side greenish-brown; along the base a broad band, usually of dull green, with a yellow stripe in the line of lower lateral spines, and a macular yellow line running with the spiracles; in some cases this band is wholly of ochre-yellow, or reddish-yellow; the dorsum and sides much dotted with white, coarsely and irregularly on the side, but finely and mostly in regular transverse lines on dorsum; the basal band much dotted and spotted with yellowish, and these marks are found also upon the under side; spiracles black, round, in yellow rings, around each a circle of yellow dots, and between each pair irregular clusters of yellow dots and small spots; body furnished with seven rows of long, tapering black spines, one dorsal, three lateral on each side, each arising from shining black tubercles, except those of the lower lateral row, which have greenish or yellow tubercles, and each bristling with short, black hairs; those of third segment somewhat porrected; on second a dorsal collar of similar but smaller, bristling spines; legs black, pro-legs yellow-brown; head cordate, vertices high and rounded, the front flattened, color shining black; much covered with black papillæ, from which spring black hairs. Duration of this stage 3 to 5 days.

This is the history of such of the larvæ as proceed to chrysalis and imago the same season in which the eggs are laid, whatever may be the brood of the year. But a portion of every brood, and of the larvæ from every laying of eggs, so far as experiment shows, behave quite differently, and become lethargic and so pass the winter. The proportion of hybernators in the June brood in this district (i. e., the first brood of the year from egg) is about as 1 to 2, those which do not hybernate passing four moults and reaching the imago in July. But after the first moult of the brood is passed, a change takes place in the hybernators, and their development and growth is retarded, so that when the regulars are passing their third moult, these have but reached their second. And instead of being 24

inch long, black and with black spines and bristles, as the regulars were at their second moult, these are smaller, .22 inch in length, and russet in color, body, spines and bristles. After the moult, either not having fed at all, or but little, they gather in a cluster on a leaf or on the cover of the glass in which they are kept, and within twenty-four hours shrink to the length of .16 inch, and are broader in proportion than at first after the moult. This shrinking brings the bristles together so that the appearance is that of a brush, none of the skin being visible except under a magnifyer. In the second brood of the season from egg, the hybernators are about as 2 to 1, and in the last brood of the year all hybernate.

Immediately after arousing from lethargy in the spring the larvæ prepare for a moult, and this takes place either before any food has been eaten, or very little. On moving, the larva resumes its normal shape, becoming narrower and longer than when asleep, but still only .20 inch long. After the moult it is .22 inch, very nearly or quite what it was when the second moult took place in the fall. Color now black-brown, and the resemblance is close to the summer larvæ at second moult. Following a single larva in its changes, the second moult after hybernation took place 14 days after the first; length now .40 inch, and color and markings as in third summer moult. The next and last moult, or third after hybernation, took place four days after the preceding one, the weather having suddenly turned warm; length .60 inch. Eight days after the larva was in chrysalis. The mature larva measured one inch and resembled in all respects the summer larva at same stage. Other larvæ varied much in all their stages, as I shall presently show.

CHRYSALIS—Length .6, greatest breadth .18 inch. Similar in shape to *Phaeton;* cylindrical; abdomen stout, mesonotum rounded, moderately prominent, the intervening depression slight; head-case short, narrow, nearly square at top; on abdomen five rows of conical tubercles, two of them extending to mesonotum; the coloration varies extremely; some examples are wholly greenish-yellow, others pink-brown, others gray-brown; and usually in these there are but few dark markings, some patches of brown about head-case and mesonotum, and on wing-cases; the latter showing two parallel rows of brown dots along hind margins; the tubercles orange, each having a brown spot on its anterior side; others are brown streaked and spotted with black, and perhaps with more or less sordid white; and many, especially of the summer broods, are very

melanic, black over dorsal area and wing-cases, and black varied with brown on ventral side. Duration of this stage 7 to 10 days.

I have raised many broods of *Nycteis* the past five years, but only this season (1878) have I been able to assure myself fully of its peculiarities. Upwards of 50 larvæ were carried through last winter, and by separating them into small lots and regularly noting the changes in each, it was made certain that three moults occur after hybernation, instead of two as in *Tharos*. And treating the larvæ of the June brood with the same care, the complete winter and summer history is manifest. Of 92 larvæ from one lot of eggs laid 28th May, and all which passed their first moult about 18th June, 56 proceeded to second moult about 21st June, and third moult about 26th, and so on to chrysalis. But 36 lingered after the first moult, and 32 of them assumed the russet hybernating coat, before described, at second moult, while the remaining 4 came up then in black coats like the larger part of the brood, and slowly proceeded to chrysalis, which they reached many days after the others. These 4 seemed to have had a tendency to join the hybernators which was somehow counteracted, but they proceeded with a hesitancy at every stage till they reached chrysalis. The shrinking of the hybernators I have spoken of. These are now resting, some of them in the folds of a dried leaf, others on the tin cover of the glass they fed in, gathered in a close cluster, and if kept through the summer in a moderately cool place, and in the winter in a cool and dry one, will be apt to survive till next spring.*

Of the larvæ which I had alive last winter, most awoke 15th and 16th February, on being brought into a warm room, and moved about. Some fed a little and then rested for their first spring moult, which took place shortly after. Others passed this moult without feeding, for no food was given them. Others remained motionless, or if aroused, went to sleep again, and though subject to the same temperature and treatment as the active ones, did not pass their first moult till early in April, that is, fully six weeks after some of the others. Four larvæ of this drowsy lot passed their first moult 7th April, fed for a day or two very sparingly and dropped to sleep again. On 8th of May one of these began to feed once

* As the printing of this paper has been delayed nearly a year, I am able to add (June 1, 1879) that such of these larvæ as rested on the tin survived the winter with no loss, but those in the leaves all died. I have several times noticed that a cool metal surface protects the larvæ better than leaves, which are apt to become damp with changes in the weather, and mould.

more, and passed its second spring moult 10th May. On 16th inst. two more waked up and passed their second moult 22nd inst., and then went on through the remaining stages without farther delay and reached chrysalis 1st and 3rd June, and butterfly 13th and 14th, or two months after the first chrysalids of the brood had given butterflies. The first examples of *Nycteis* seen in the fields this year were on 20th May.

Several of this lot of chrysalids I put in the ice box, temp. 33° Far., time of exposure 12 to 18 days. Most were killed by the process, but three gave butterflies. They were not altered in color, and I had no especial reason for supposing they would be, as the species is not seasonally dimorphic, but I thought it probable the colors might be made to run, as in case of *Tharos* chrysalids exposed to similar degree of cold, in 1877.

Nycteis here feeds on Actinomeris squarrosa, but will eat Aster, though it prefers the other plant decidedly. I tied 4 ♀ in a bag upon Actinomeris, and as many on Aster the same day. The former gave at once three batches of eggs, but the others had laid none in 24 hours. I then transferred these to Actinomeris, and before night two of them laid. But I have nevertheless obtained eggs on Aster and raised the larvæ exclusively on this plant. The change in the food produced no difference on the larval coloring. In New York this species feeds on wild sunflower. There are three annual broods in this district—the first being in May and June, of which about one-third the larvæ hybernated; the second in midsummer, of which about two-thirds the larvæ hybernated, and the third in autumn, all the larvæ hybernating.

August 1, 1878.

CAPTURES OF NOCTUIDÆ AT CLYDE, WAYNE CO., N. Y.

BY W. L. DEVEREAUX, RESIDENT.

It is hoped the following list of Noctuæ, taken principally at bait, will prove of some interest to readers of the CAN. ENT, although it is not a complete *exposé* of the fauna of this locality, having been compiled from but two years' catches—'75 and '76. During the season of '75 the weather was very favorable for sugaring, as there were always two or three

nights out of a week in which the baits were swarming with moths, from May to October, but baiting was not followed very steadily or thoroughly. Collecting was pursued steadily during '77 from May to August; five or six nights out of each week the baits were regularly attended, but after August 20th sugaring was nearly discontinued. Not a single night happened after this when moths were on the wing or found at bait, caused by the cold and dry weather. Thus the richest part of the season produced but very little during '77. Many species that were quite common in '75 were not seen at all in '76. The average number of baits each night was twenty-five, on trees in an apple orchard and vineyard.

Only the date of the first or earliest observation of each moth's appearance is affixed to each species, as most remain about a month; where they are known to occur longer the length of time is stated.

Lacinia cymatophoroides. June 20; not plenty at sugar.
" expultrix. June 14; unfrequent at sugar.
Acronycta acericola. June 14; common at sugar.
" superans. June 8; not uncommon at sugar.
" noctivaga. June 10; not plenty at sugar.
" brumosa. June 6; common at sugar.
" occidentalis. June 6; common at sugar.
" lobeliae. June 11; common at sugar.
" connecta. July 15; one taken at sugar.
" hamamelis. June 13; rare at sugar.
" vinnula. June 20; not common at sugar.
Bryophila corticosa. June 16; scarce at sugar.
Microcoelia diphteroides. June 15; common at light and sugar.
" fragilis. July 29; one taken at sugar.
Moma fallax. June 8; rare at sugar.
Agrotis clandestina. June 15; very plenty at light and sugar.
" amputator. July 17; common at sugar.
" augur. June 26; common at sugar.
" alternata. August 20; not common at sugar.
" subgothica. July 21; common at sugar.
" c-nigrum. June 16 to September; common at sugar.
" bicarnea. September 1; one taken at sugar.
" suffusa. June 16 to October; common at sugar.
" sigmoides. June 20; common at sugar.

Agrotis plecta. July 29; rare at sugar.
" baja. July 25; rare at sugar.
" herbida. June 24; scarce at sugar.
Mamestra subjuncta. June 17; not uncommon at sugar.
" legitima. July 22; rare at sugar.
" herbimaculata. July 28; rare at sugar.
" atlantica. July; not uncommon at sugar.
Hadena rurea. June 14; common at sugar.
" vulgaris. June 10; common at sugar.
" finitima. June 7; common at sugar.
" lignicolora. June 17; common at sugar.
" devastator. June 20; very plenty at sugar.
" arctica. June 15 to October; common at light and sugar.
" sputator. June 19: common at sugar.
" lateritea. July 21; rare at sugar.
" impulsa. June 15; rare at sugar.
" delicata. June 17; rare at sugar.
" verbascoides. June 12; not common at sugar.
" modica. July 13; rare at sugar.
" xylinoides. June 12; common; second brood in August.
Dipterygia pinastri. June 17; not common at sugar.
Perigea luxa. July 22; scarce at sugar.
Callopistria mollissima. June 10; scarce at sugar.
Euplexia lucipara. June 7; frequent at sugar and at blooms of Petunias.
Brotolomia iris. June 21; scarce at rest and sugar.
Nephelodes minians. September 1; scarce at sugar.
Helotropha reniformis. July 24; scarce at sugar.
Hydroecia nictitans (with white spot). July 23; at sugar.
" var. lucens (without white spot). July 17; common at sugar and in daytime on blooms of Milkweed *(Asclepias cornuti)*.
" lorea. June 12; common at sugar.
" sera. June 18; plenty at sugar.
Leucania pallens. June 14; not plenty at sugar.
" phragmitidicola. June 17; not common at sugar.
" pseudargyria. June 9; uncommon at sugar.
" commoides. June 28; one taken in grass.
" adonea. June 30; one specimen at sugar.
" unipuncta. June 28; plenty at sugar.

Amphipyra pyramidoides. July 21; common at light and sugar.
" tragopoginis. July 18; scarce at sugar.
Ceramica picta. Bred from larvæ found on Spearmint in autumn.
Tæniocampa incerta. June 10; scarce at sugar.
Orthodes infirma. June 24; uncommon at sugar.
Orthosia helva. July 31; scarce at sugar.
" ferruginoides. August 20; scarce at sugar.
Cirrhoedia pampina. August 26; one specimen at sugar.
Scoliopteryx libatrix. June 28; scarce at sugar.
Lithophane cinerea. September 10 and in warm spells in winter up to April 15, at sugar, plenty.
" pexata. September 20; rare at sugar.
" Bethunei. October 6; rare at sugar.
" signosa. September 24; not common at sugar.
" disposita. September 21; rare at sugar.
Calocampa curvimaculata. April 30; at rest: hybernated.
Cucullia asteroides. May 20; at rest, and in August and September at Petunias.
" convexipennis. Same.
" Speyeri. May 28; at rest.
Telesilla cinereola. July 20.
Plusia simplex. June 1; at Lilac blooms in day time, and in Sep. at rest.
" precationis. Same.
" contexta. September 7; one specimen at rest.
" balluca. August 9; one taken at Petunias.
Brachytaenia metana. June 30; uncommon at sugar.
Erastria carneola. June 1 to November; very plenty at sugar.
" muscosula. June 8; very plenty at sugar.
" nigritula. *July 12; scarce at sugar.*
Drasteria erichtea. May 15 to October; very plenty at rest and sugar.
" erichto. June 4 to August; common at sugar.
Ophiusa bistriaria. June 13; plenty at sugar.
Ingura occulatrix. June 28; one specimen at sugar.
Parthenos nubilis. June 14 to August; plenty at sugar.
Catocala parta. August 6 to October; common at sugar.
" unijuga. July 16; one at sugar.
" Briseis. July 12; uncommon at sugar.
" ultronia. July 8; common at sugar.

Catocala amatrix. July 18 to October; uncommon at sugar.
" ilia. July 3; scarce at sugar.
" cara. September 20; scarce at sugar.
" concumbens. July 31 to October; not common at sugar.
" coccinata. July 18; one at sugar.
" neogama. July 19 to October; common at sugar.
" paleogama. July 27; not common at sugar.
" subnata. July 20 to October; not plenty at sugar.
" piatrix. August 8 to October; common at sugar.
" serena. August 12; one specimen at sugar.
" antinympha. July 22; one specimen at sugar.
" habilis. July 30 to October; common at sugar.
" Clintoni. July 5; scarce at sugar.
" polygama. June 28; very common at sugar.
" cerogama. July 21 to October; very plenty at sugar.
" androphila. July 24; one at sugar.
" epione. August 3; one specimen at sugar.
" obscura. August 6 to October; common at sugar.
" desperata. August 5; very common at sugar.

Homoptera Saundersii. June 13 until cold nights in October, at sugar; common; one taken in grass May 20 in very worn condition; hybernated (?)
" edusa. September 7; one taken at sugar.
" lunata. September 8; rare at sugar.
" nigricans (Ypsia undularis). May 28 to August; at rest and at sugar.

Zale horrida. June 7; not uncommon at sugar.
Homopyralis tactus. July 25; scarce at sugar.
Pseudotnodes vecors. July 14; one taken at sugar.
Zanclognathe cruralis. July 10; scarce at sugar.
" laevigata. July 3; rare at sugar.
Platyhypena scabra. July 28; unfrequent at sugar, and very plenty in meadows in daytime, in autumn.

A few moths belonging to succeeding families of Heterocera, and some insects from nearly every Order are found on bait at night, and also butterflies belonging to the genera Vanessa and Grapta, in daytime. The large Tree Toad *(Hyla versicolor)* was observed a few times clinging to trees beside the bait, enjoying a midnight feast, no doubt, as well as the

common Toad *(Bufo Americanus)*, which in several instances was seen stationed half concealed in the mulching at the foot of the tree just under the bait.

Coleoptera is next to Lepidoptera in abundance at bait, and I therefore venture to append a list of species seen at sugar.

Calosoma calidum.
Dromius piceus.
Calathus gregarius.
Platynus molestus.
Pterostichus Sayi.
Harpalus caliginosus.
" pensylvanicus.
" fallax.
Peltis surinamensis.
Megalodacne fasciata.
Pityophagus 4-guttatus.
Adelocera marmorata.
Agriotes mancus.
Melanotus communis.
" parumpunctatus.
Corymbites sulcicollis.
Asaphes memnonius
Cyphon pallipes.
Photinus ardens.
Podabrus diadema.
Elaphidion parallelum.
Monohammus confusor.
Saperda tridentata.
Merinus lævis.
Centronopus calcaratus.
Xylopinus saperdioides.
Tenebrio molitor.
" tenebrioides.
Hymenorus obscurus.
Pyrochroa femoralis.
" flabellata.

OBNOXIOUS PESTS—SUGGESTIONS RELATIVE TO THEIR DESTRUCTION.

BY DR. H. HAGEN, CAMBRIDGE, MASS.

The question how to check the ravages of obnoxious insects is a very important one, and I am very often asked for advice in special cases. While occupied with a close examination of the proposed remedies and looking through a large number of scientific tracts, some of them fell into my hands and induced me to study them again. The present communication is the result of those studies.

Somewhat more than twenty years ago the lower forms of some fungi attracted the attention of many students, and especially of Dr. Bail, of Prussia. The reports of his observations are scattered in different peri-

odicals, and the final result of my study of those reports was the conviction that a remedy for insect pests, offering several prominent advantages, could be found in the easy application of the yeast fungus. Further, that this remedy could be used probably against the famous Colorado grass-hopper, for the destruction of which the Government has appointed a commission appropriated with $75,000; also, that the remedy could be tried in an easy way against the obnoxious hairy caterpillars, against the potato bugs, and last, but not least, in every greenhouse against leaf lice and similar pests.

Dr. Bail asserts that he has proved by many skillful experiments that four species of microscopical fungi are merely different developments of the same species. One of them, the fungus of the common house-fly, is the vexation of every housekeeper. The dead flies stick in the fall firmly to the windows, or anywhere else, and are covered by a white mould not easy to be removed. The second is the common mould, known to everybody and easily to be produced on vegetable matter in a damp place. The third is the yeast fungus, a microscopical species and the basis of the work done by yeast of fermentation. The fourth is a small water plant, known only to professional botanists. Dr. Bail contends that the spores of the fungus of the house-fly develop in water in this last species, out of water in mould, and that the seeds of mould are transformed in the mash tub into yeast fungus.

The experiments made by Dr. Bail cover a period of more than a dozen years, since the numerous objections which were made against his results induced him to repeat again and again his experiments in different ways. I am obliged to state that even now prominent botanists do not accept Dr. Bail's views, which he maintains to be true and to be corroborated by new and sure experiments. This question, important as it may be for botanists, is without any influence regarding my proposition; as Dr. Bail has proved that mould sowed on mash produces fermentation and the formation of a yeast-fungus, which kills insects as well as the fungus of the house-fly. I was present at the lectures of Dr. Bail before the association of naturalists, in 1861, which were illustrated by the exhibition of mould grown on mash, on which the fungus of the house-fly had been sown, and by a keg of beer brewed from such mash, and by a cake baked with this yeast. Both productions were declared perfect by all who tasted them—an experiment in which I did not feel obliged myself to join, as both are to be had prepared without the fungus of the house-fly.

In a later communication Dr. Bail states that the use of mould has been the secret in brewing formerly certain kinds of a strong and well-reputed beer.

For the so-called jopenbier in Danzig the mash was not used before the forests of mould grown on its surface had sunk to the bottom—or, in other words, till the spores of the mould were sown by themselves on the mash.

Dr. Bail has proved by numerous experiments that healthy insects brought in contact with mash and fed with it are directly infested by the spores of the fungus with fatal consequence. These facts, not belonging strictly to the main part of his experiments, were observed first by chance and later on purpose. The most different insects, flies, mosquitoes, caterpillars, showed all the same results. The experiments were made in such a delicate manner that a small drop of blood taken with an oculist's needle from the abdomen of a house-fly left the animal so far intact that the same operation could be repeated in two days again. Both drops examined with the microscope proved to be filled with spores of fungus.

More to the point are epizootics produced by this fungus and observed on insects in the open air.

A really pestilential epizootic of the common dung-fly was observed in 1867. Not only those, but many other insects, died in the same locality and in the same manner; also other species of flies and gnats, the caterpillars of moths and of Phalænids, and the common hairy caterpillars of a moth which is very nearly related to the famous hairy caterpillar of the Boston Common. Of some species the destruction was so complete that the next year they were very rare. During those years the caterpillars of two species of moths had destroyed pine forests belonging to the State and valued at several millions, and a larger calamity was imminent, when suddenly all caterpillars died from the same fungus.

Similar observations have been made in other places in Europe and here. Mr. Trouvelot formerly began in Medford, Mass., the raising of the Polyphemus moth for silk, and was successful enough to get a prize in the Paris Exhibition of 1867. Unfortunately he brought home from Paris eggs of another species from China, and purported to be superior for silk-raising in the open air. Those eggs proved to be infested by fungus, and the caterpillars hatched from them died, but not those alone. All caterpillars of the Polyphemus moth became infested, and even most of the other indigenous species living on the twelve acres of shrub land

which Mr. Trouvelot utilized for this purpose, died rapidly. After two years of a similar calamity, Mr. Trouvelot was obliged to stop his experiments, which might have developed, perhaps, a new source of wealth for this country. A similar pest of an indigenous species of moth stopped only last year the interesting observatians of Mr. Siewers in Newport, Ky.

The common silkworm in Europe has been in recent times extensively affected by a sickness called muscardine, which is also the consequence of a fungus. Similar fatal epizootics have been observed on the honey bee, and in Brazil several years ago nearly all the bees died from this cause. In Entomological journals are reported fatal epizootics of leaf lice, of grasshoppers, of the cabbage butterfly and of the currant worm, both imported here only a few years ago, and both very obnoxious.

Considering those facts, which are doubtless true, and considering the easy way in which the poisonous fungus can always and everywhere be procured and adhibited, I believe that I should be justified in proposing to make a trial of it against insect calamities. Nature uses always to attain its purposes the most simple and the most effectual ways; therefore it is always the safest way to follow nature.

Beer mash or diluted yeast should be applied either with a syringe or with a sprinkler; and the fact that infested insects poison others with which they come in contact will be a great help. Of course it will be impossible to destroy all insects, but a certain limit to calamities could be attained, and I think that is all that could reasonably be expected. In greenhouses the result would probably justify very well a trial, and on currant worms and potato bugs the experiment would not be a difficult one, as the larvæ of both insects live upon the leaves, which can easily be sprinkled. But it seems to me more important to make the trial with the Colorado grasshopper. I should recommend to infest the newly-hatched brood, which live always together in great numbers, and I should recommend also to bring the poison, if possible, in contact with the eggs in the egg-holes, to arrive at the same results, which were so fatal to Mr. Trouvelot's silk-raising. After all, the remedy proposed is very cheap, is everywhere to be had or easily to be prepared, has the great advantage of not being obnoxious to man or domestic animals, and if successful would be really a benefit to mankind. Nevertheless, I should not be astonished at all if the first trial with this remedy would not be very successful, even a failure. The quantity to be applied and the manner of the application can only be known by experiment, but I am sure that it will not be diffi-

cult to find out the right method. I myself have more confidence in the proposed remedy, since it is neither an hypothesis nor a guess-work, but simply the application of true and well-observed facts. I hear the question—When all this has been known for so long a time, why was it not used long ago? But is that not true for many, not to say for all, discoveries? Most of them are like the famous Columbus egg.

OBSERVATIONS ON NEPHOPTERIX ZIMMERMANI.

BY D. S. KELLICOTT, BUFFALO, N. Y.

This pine-boring Pyralid was described by Prof. A. R. Grote in a paper read at the Nashville Meeting, 1877, of the American Assoc. for the Adv. of Science, and published in CANADIAN ENTOMOLOGIST, vol. ix., 161. During the summer and autumn of 1878, and again this year, I have made some observations upon the occurrence, larval habits and parasitic enemies of this moth, and am able to state concerning them some additional facts of interest.

The moth, it appears, is pretty widely spread, and it seems rather odd that it should not have been discovered until 1877, having been overlooked by our excellent economic Entomologists. I have met with it in some one of its stages in the following localities: It occurs not uncommonly in both foreign and native pines in and about Buffalo; many of the trees of this species in the Niagara St. Parks have been bored by it. I found it quite abundant in small white pines of the forest at Chehtowaga, Erie Co., N. Y. At this place I found many plants had been dwarfed and ruined by their ravages. It also occurs, to what extent I am unable to say, at Hamburg and Clarence Center, in the same Co. I recently visited a portion of this State, Oswego Co., formerly clad to some considerable extent with white pine, and there are yet standing some virgin forests of this splendid tree. In divers places in that county I found our borer; it is so abundant in one locality, at least, that it proves a grave enemy to the young pines of second growth where the primitive trees have been removed by the lumberman. There is near Hastings Center an "old slash" in which at least one-half of the many such small pines have been

injured; indeed, in one neglected corner, among scores, scarcely one tree had escaped. In this instance, also, many pines were stunted, while some thus weakened had been broken off by the wind. In other localities where the pine is indigenous I have been unable to find it, or else it was only occasional; for example, at Portage, where young pines are plentiful, and although the trunks bore masses of pitch closely like those from the wounds by *Zimmermani*, yet a diligent search discovered but one pupa skin, and of the identity of it I am not quite certain, as it was badly broken in removing from the pitch.

April 12th last, at Hastings, I took many larvæ of various sizes from .25 to .7 of an inch in length when crawling, so there is no longer a doubt as to the winter stage. None of those taken were "livid or blackish green," but dull white; nor do the hairs arise from a "series of black dots," but from light brown ones. I take it to be a case where a naked hybernating larva is lighter than during the warm summer. Otherwise the caterpillars were as described by Mr. Grote.

In a clump of pines whose trunks were from 6 in. to 1 ft. in diameter many of the larger ones had been "boxed," i. e., inclined incisions had been cut by the axe through the sap-wood in order to catch the pitch exuding from the wound. Around the borders of these "boxes" the galleries with both pupa skins and living larvæ were plentiful. It appears that the larva cannot penetrate the outer bark of other than quite tender trees; nor could I find evidence of their attacking the branches of larger trees, although I had opportunity to examine such that had been felled during the winter just past. Since this larva so readily takes advantage of a wound, may it not stand related as a *messmate* to other borers? At both Chehtowaga and Hastings I found on trunks in the same neighborhood masses of exuding pitch in which were larvæ of an orange color, attaining a length of .45 of an inch, remaining through the winter, and going into pupa towards spring, as I found them in both conditions April 12th and early in May. These larvæ are those of one of the *pine weevils*. It appears to me that *Zimmermani* may and does take advantage of these wounds by the weevil, as it does of those made by the axe.

I have found the moth's galleries in both trunk and branch, both above and below the whorls (usually below), sometimes completely girdling the stem, thus killing the portion above; in one instance I found a gallery passing from one whorl to the one above.

Now, when the moth borer and the weevil work together and pretty much in the same way, i. e., by cutting the inner bark and the cambium layer, thus scoring and girdling the stem, to which culprit belongs the greatest amount of credit for mischief? Both are guilty of enough to justify everlasting execration.

It remains to add a word about its insect enemies. The hymenopterous parasite which Mr. Grote found to fill certain of the chrysalids, I have found in every location where the moth is at all abundant; there is another which I have found quite as abundant. Early in April I obtained from the galleries of last year a number of brown cocoons, about .4 of an inch long, nearly cylindrical, ends rounded, texture thin papery, pupa visible through the cocoon. The skin and head of the victim was found at one end of this cocoon, showing that the caterpillar was the host.

In a few days there appeared from each cocoon a lively fly. Expanse of male .6 in., of female .7 in. Color above black, legs yellow, underside of abdomen white with a row of black dashes on side, front of male white, of female black. A white line on shoulder of each extends on to the costa. Ovipositor as long as the abdomen.

I shall presently refer the species for identification.

ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Annual Meeting of this Club will be held at Saratoga, N. Y., on Tuesday, August 26th, at 2 p. m. All Entomologists are invited to meet with the Club. A series of interesting meetings is expected to be held during the week. B. PICKMAN MANN, Secretary.

[The place of meeting this year being so central and easy of access, it is expected that an unusually large number of Entomologists will be present. It is hoped that all will come with copious notes and with memories well stored with personal recollections of insects and their habits, so that a large mass of useful information may be submitted. The discussions at these yearly meetings are always of very great interest, while the social charms attending such a reunion of kindred spirits add greatly to the pleasures of the occasion.—ED. CAN. ENT.]

DESCRIPTION OF A NEW SPECIES OF MELITAEA FROM TEXAS.

BY W. H. EDWARDS, COALBURGH, W. VA.

Melitaea Fulvia.

Male.—Expands 1.5 inch.

Upper side brown-black over basal area of each wing, somewhat dusted with fulvous; or the ground color is partly replaced by fulvous, especially in the cells; the costal margin and apex of primaries black, and both hind margins are narrowly edged by black; all the nervures and branches black; remainder of wings fulvous; both have a submarginal series of fulvous spots, preceded by a black line, those of primaries at apex replaced by yellow, or obsolete; beyond the black line a complete common series of small yellow spots; a second on the disk, larger, and on secondaries elongated, sometimes very much so, and more or less confluent with the spots of the outer row; on primaries a large yellow spot, edged with fulvous, next inside arc of cell, and two or three small yellow spots below this; in cell of secondaries a small similar spot, but sometimes wanting; fringes alternately and equally black and white.

Under side of primaries pale orange fulvous, the light spots of upper side on disk and towards base showing not very distinctly; so also the spots of extra discal row below median, but above and to costa these are distinct and clear yellow-buff; next apex the marginal row offers four yellow-buff spots, and there is another at inner angle, the remainder being fulvous, and confluent with the ground color of disk; secondaries wholly yellow-buff, the nervules broadly edged with black, and the hind margin as well as costal and inner margins edged with a narrow black border; across the extra discal area a black band, within which are six or seven small yellow-buff spots; and the spots next margin, cut off by this black band, are large and sub-rectangular; in the cell a V-shaped black stripe, pointing toward base, one limb of which is in line with the second branch of median; there is also an additional stripe running through the submedian interspace. Body black above, the rings of abdomen yellow at junction; beneath, the thorax yellow-buff, the abdomen yellow with more or less fulvous; legs fulvous; palpi yellow, nearly white at sides, black in front and at tip; antennæ black on upper side, ringed with yellow, ferruginous below; club black.

Female.—Same size. The fulvous shade predominates, only the apex and costal margin of primaries and both hind margins being black; the yellow markings as in male, but indistinct. On the under side the markings of disk and at base are almost obliterated, but the outer rows of yellow spots are plain; secondaries as in the male.

From several examples taken by Mr. Jacob Boll in Western Texas, in March, 1879. I formerly received a female taken by Mr. Morrison in So. Colorado. The species is allied to *Leanira* Bois.

MICRO-LEPIDOPTERA.

BY V. T. CHAMBERS, COVINGTON, KY.

GRACILARIA.

G. fasciella Cham.

G. 5-notella Cham.

With ten specimens of *fasciella* and two of *5-notella* before me, with scarcely a trace of variation in the ten, but with the two differing from each other somewhat and both differing very decidedly from the ten, I had no doubt as to the distinctness of the two species. A larger series, however, induces the belief that they belong to the same species. The difference between them may be thus stated: In *fasciella* the base and apex of the fore wings are brownish-gray, and between these portions are three brownish-gray and four white fasciæ, all very distinct and well defined. In *5-notella* the whole dorsal half of the wing is white; there is a small brown spot on the base of the costal margin, another further back, and still further back another which in the middle of the wing is produced backwards to the gray-brown apical part of the wing, which encloses two small white costal streaks. A larger series, however, shows that the two forms vary into each other, and induce the suspicion that Dr. Clemens described his *G. fulgidella* from a form like *5-notella*. The tuft on the second joint of the palpi is minute, and in all of my specimens but two it has been removed in pinning.

G. Packardella Cham.

In this species there is great range in the intensity of the purplish tinge. Some specimens might be described as having it so strongly developed as to ally them to *purpuriella*, *stigmatella*, etc., while in others it is very faint and delicate, the ground color of lemon yellow not being at all obscured by it. It is, however, allied to *superbifrontella* and *Sweederella*, etc., more closely than to any other known species.

G. inornatella Cham.

This must be dropped from the list, as I am satisfied that it was described from worn specimens of *G. Packardella* and *superbifrontella*.

G. purpuriella Cham.

Since the last notice of this species was written I have bred it from larvæ feeding on the Silver-leaf Poplar; but I have never met with it on the Weeping Willow, though it is common enough on many of our native Willows. It may prove to be the European *G. stigmatella*, which feeds on Sallows. It is certainly very near that species.

CORRESPONDENCE.

The present season has so far been as unfavorable for the collection of Lepidoptera as was the same period last year, and very few butterflies have been taken or observed, although diligently sought for. The recent "hot wave" will have the effect of bringing them forth, and as other insects are abundant, there has been no excuse for idleness. I have added numerous specimens to my collection of Coleoptera, paying particular attention to the Buprestidæ and two or three other families. The Buprestidæ are well represented here, over twenty species having been taken by me last year, and more than half of the same this season, with the addition of one or two new ones, such as *A. striata* and *Brachys ovata*. Since the middle of May *C. virginiensis* and *C. liberta* have been more or less plentiful on the pines, but not in such numbers as in the autumn; those at present found are chiefly pairs copulating. One chief object of my attention has been the beautiful little green *C. Harrisii*, of which I have taken several specimens on the Quebec side of the river since the 3rd inst. After repeated search I have also found it on this side, as has Mr. Fletcher since. Has it been hitherto noted as captured in Ontario? At present different species of *Monohammus*, as *confusor*,

scutellatus and *dentator*, are to be found on the pines also, and are noticed gnawing the bark on twigs and semi-girdling them, while the trees are disfigured by many old scars caused by similar operations in former years. In the evenings numbers of them come flying heavily, but strongly, across the river, and lodge often upon the Parliament Buildings, causing some excitement to nervous promenaders on the Hill. The popular name for *confusor* is "Ottawa cow." Colorado beetles are reported to be doing less damage, and have been thinned out by Paris green, but their co-workers the blister beetles *(E. cinerea)* are unusually abundant in the woods, and a new foe is reported by one of our market-gardeners, who brought four insects to a friend of mine, stating that they were, in immense numbers, destroying his plants and flowers, having been first noticed on wild Convolvulus. I found them to be *Chelymorpha cribraria*, but was not aware that this beetle occurred in any number or was known to be very injurious. At the joint excursion held by the Natural History Society of Montreal and our Field Naturalists' Club, on the 12th inst., at Calumet (half way between here and Montreal), I was somewhat disappointed to see comparatively little interest taken in Entomology, Botany seeming to almost monopolize the workers. I had looked forward to meeting some fellow-laborers among the Montrealers. My "take" during the day was but an average one, containing neither very many nor very rare specimens, about the only novelty being *Cicindela longilabris*, which I have not seen around here yet. I have been using a beating net made according to description by Dr. Bailey in last year's ENTOMOLOGIST, and find it an admirable instrument.

Ottawa, 30th June, 1879. W. HAGUE HARRINGTON.

On the 11th May last, while on the Island at Toronto, a fine specimen of *Papilio thoas* flew past at a distance of not more than eight feet from me, but as I was in a marsh I had no opportunity to capture it. Being quite familiar with *turnus* alive, and with both species mounted, there is no doubt at all in my mind about the identity of the specimen in question. The butterfly was flying north when first observed, and continued in the same direction as long as it could be seen. The appearance of this butterfly at so early a date would seem to indicate that the species is double-brooded here, unless it can be shown that the escape of the imago from some of the chrysalids of the same brood is much earlier than from others.

W. E. SAUNDERS.