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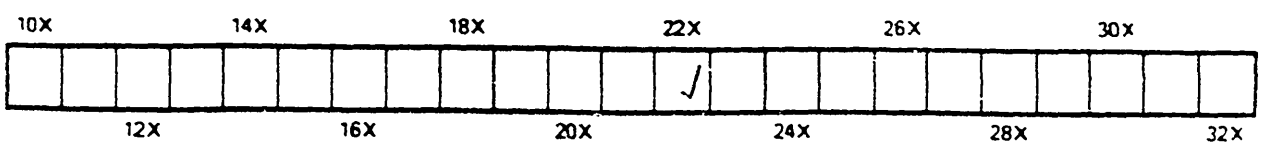

The Canadian Entomologist.

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A NEW ENEMY OF THE BLACK SPRUCE, ABIES NIGRA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

An enemy of Abies nigra sent to me by Mr. C. S. Sargent, from the Arboretum of Harvard University, induced me to compare the literature about the enemies of this tree. To my surprise, all that is published consists of two very excellent papers by Mr. Ch. H. Peck, Albany. One, "The Black Spruce," read before the Albany Institute, May 4, 1875, 8v., pp. 21; the other in the New York State Museum's Report of the Botanist, No. 30. I do not remember to have seen these papers recorded in entomological serials. There are noted two vegetable parasites, *Arceuthobium pusillum* and *Peridermium decolorans*. Of insects are recorded a plant-louse near *Adelges coccineus*, and some Hemipterous gall insect; also, two beetles, *Hylurgus rufipennis* and *Apate rufipennis*.

The twigs sent to me contained numerous pale spots, the consequence of some dead leaves, three or more, one near the other. The examination of those leaves showed on every one at the base, sidewards, a small round hole. The interior of the leaf was hollow, in some cases only the lower half, where the enemy had not yet finished the work. I discovered directly a small caterpillar, belonging to Tineidæ and probably to the Argyresthians, as the destructive enemy. The biological collection contains no enemy of the Black Spruce, and no similar destruction of Pines, except a somewhat related twig of Pinus Canadensis, quoted also as probably done by an Argyresthian larva. In Mr. Chambers' valuable list no Tineid living on Spruce is recorded.

The European literature contains only one fact similar to the American. It is recorded that *Cedestis farinatella* hollows the leaves of Pines. But until now no American species of *Cedestis* is known. Probably the moth will be raised and the mystery solved; at all events, I desire to draw the attention of entomologists to this enemy. Perhaps it may be more common than is supposed, Prof. Peck stating as a fact that the Spruce trees in some parts were said to be dying at an unusual rate, as if affected by some fatal disease. To judge by analogies, the attack made by *Hylurgus* and *Apate* is only a consequence of the previous attacks by other enemies.

DESCRIPTION OF PREPARATORY STAGES OF AGRAULIS VANILLAE, LINNÆUS.

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

EGG—Conoidal, truncated, the top a little arched; the sides more or less convex, varying; the height to the breadth as 9 to 7; marked by 11 straight ribs, which are compressed and elevated, and run from base to top; crossed by about 11 striæ, horizontal, rather prominent; the spaces between the ribs and striæ are quadrangular, the shortest side being with the long axis of the egg; these spaces are depressed and are either flat or slightly convex; the summit is covered with rows of cells, concentric, those of the outer two rows large, hexagonal and irregular, of the third row small, hexagonal; within these are 8 small cells, not depressed, irregularly rhomboidal and forming an eight-rayed star; in the centre a minute star of six rays. Duration of this stage 4 to 5 days.

YOUNG LARVA—Length .14 inch; cylindrical, thickest at 4, tapering slightly to 13, the segments well rounded; color brownish-orange, glossy; on either side the dorsal line on each segment after 2 is a row of short, conical, pale black tubercles, and two similar rows on either side, forming transverse rows of 6 tubercles, from the top of each of which springs a short black hair; on 2 is a black dorsal collar, with fine tubercles; feet brown; head nearly globular, flattened on lower front face; color brown; slightly pilose. Duration of this stage about 2 days.

After First Moult—Length .24 inch; same shape; nearly same color, less brown, more orange; armed with six longitudinal rows of long, tapering, black spines, at top sub-conic, each ending in a fine, short, black bristle; a few similar bristles about the spine from base up (for arrangement of the spines, which is uniform in all the succeeding stages, see description of the mature larva); on 2 a dark chitinous collar, broken at the dorsal line, and bearing minute hairy tubercles; feet black; head obovoid, the sides quite convex, the face flattened, the top depressed, and on each conical vertex a simple black process very similar to the body spines, but less tapering and much shorter, pointed at top and ending with a short fine bristle; others disposed about it just as with the spines; a few hairs, long and short, on front face; color chocolate-brown. To next moult 2 days.

After Second Moult—Length .3 inch; color dark (or red-brown) orange, glossy; between dorsals and first laterals a greenish-brown band, not well defined—rather a discoloration, and about segment 10 fading away; the spines long, all black and shining, from black tubercles; those of dorsal rows on 3 and 4 longest, those of first laterals on 2 and 3 nearly as long; collar on 2 black; head as at second stage, glossy black; the vertices rather high, conical; the processes two thirds as long as the dorsal spines on segment 3, irregularly tapering, slightly bent back, conical at top. Duration of this stage 36 hours.

After Third Moult—Length .8 inch; color now dark orange, glossy; a medio-dorsal stripe of olive-brown; a broad band of same hue fills the space between dorsals and first laterals from 2 to 13; the lower part of body also olive-brown, so that the orange is restricted to the dorsal area and lower part of sides; in some examples the band is macular, orange showing in it; head as before, but the vertices higher, and the processes longer and much recurved, resembling horns; face black on front, behind the head orange, but from base of each horn a black stripe passes down the back of the head; on the front are five minute orange spots, one at base of each horn, and three in a cross row below. Duration of this stage 36 to 40 hours.

After Fourth Moult—Length .95 inch; color red-orange, the medio-dorsal stripe greenish, the lateral band pale black, and broadened, so as to come to the outer sides of the tubercles of the two rows; the base same color as the band; the orange restricted to a narrow band running with the spiracles. Twenty-four hours after this moult the length was 1.2 inch, and one day after this was 1.5 inch.

MATURE LARVA—Length 1.5 inch, greatest breadth .24 inch; cylindrical, thickest at segments 3 to 5, tapering to 13 very gradually; furnished with six rows of long, tapering black spines, bluntly conical at top, from which springs a short and fine black bristle; a few similar bristles irregularly placed about each spine from base to top; two of these rows are subdorsal, and on middle of either side is one, and one below spiracles; the dorsals extend from 3 to 13, the first laterals from 2 to 12; the lower laterals from 6 to 13; over the feet on each side of 2, 3, 4 is a black tubercle with hairs; the spines of dorsal rows on the anterior segments are longest, measuring .16 inch; the first laterals are quite uniformly .11

inch, and the second laterals .9 inch; color red-orange, with a broad medio-dorsal band of greenish-black, and a broad, slate-black band which occupies the space between the dorsals and first laterals, and reaches to the farther sides of and embraces the tubercles of these rows; the base of body slate-black, so that the orange is restricted on dorsum to two narrow stripes lying between the dorsal and the two lateral bands, and to another stripe running with the spiracles (these bands widened much after the moult and as this stage proceeded), the whole upper surface highly glazed; feet and legs black; head obovoid, deeply cleft, with high conical vertices, on each of which stands a stout spinous recurved process, .15 inch long, black, in all respects formed like the body spines, except that it is less tapering, the upper two thirds being of about uniform size; the tip conical and giving out a short fine bristle; a few other like bristles about the sides; sides and back of head rounded, but the front much flattened; sparsely pilose; color of front black, with two vertical orange stripes, one on either side of and very near the suture; color of hind head, between the horns and down the sides greenish-yellow, the lower part of the side black; also a black stripe runs back from base of the horn. There was some variation in color at maturity; some larvæ had a gray line or stripe below spiracles; on one this line was white and extended the whole length, in another it disappeared at 5; the color of the dark band on upper part of side was greenish-black, or slate-black, varying with the point of view. From fourth moult to suspension 59 to 72 hours; from suspension to chrysalis 13 to 15 hours.

CHRYSALIS—Length 1.05 in.; depth from dorsal to ventral side .34 in.; breadth at base of wings .26 in.; breadth across abdomen .2 inch; long, slender, the thorax much compressed laterally, and the wing cases very prominent, forming a narrow carinated hunch, which rounds abruptly on posterior end; head case high, cylindrical, compressed transversely, the top sloping on the ventral side at about 45°; on each vertex a short (.05 in. long) ear-like process, excavated on the dorsal side, and crenated at the top; between these the top of head is twice incurved; at the base of head case, on dorsal side, a depression; the mesonotum large, prominent, compressed, carinated, followed posteriorly by a deep and broad depression; wing cases smooth, a little flaring at base, depressed in middle; abdomen slender and tapering; a row of minute medio-dorsal tubercles, and on either side of these a row of large, rounded ones, those of the

anterior segments largest of all, and compressed laterally; colors very variable; some examples are buff with greenish markings, or on the abdomen greenish-brown; the head and wing cases buff, the former with a slight red tint; on the depression at base of head case is a patch of clear pale pink on either side the dorsal line, and between, as also at the outer edges of these patches, is a little black; top of head case pink and black, the processes dark brown at top and on dorsal side; mesonotum buff mottled green, as is the dorsal side of abdomen; wing cases buff, with a greenish patch on middle and a stripe running with one of the interspaces of the wing next margin; on side of abdomen a reddish-buff stripe and below this a broad greenish-brown band; on ventral side a clear pink patch from end of wings down. Some were very black, the wing cases and anterior parts mottled in light and dark black; some had the wing cases, mesonotum and head case pink tinted, mottled all over with greenish-black; the ventral edges of wing cases clear pink-buff; in all examples the two pink spots at base of head case and the stripe on abdomen appear, and in all there is a black angular inscription like figure 3 or like V, on the ventral side of the wing case about one-third the distance from base to end.

On 24th June, 1879, I received from Mr. Jacob Boll, Dallas, Texas, several larvæ of *Vanillae*, some of which had hatched en route, others in stages up to near third moult, and feeding on Passiflora. These larvæ passed their changes with great rapidity. Eggs laid 19th June hatched 22nd or 23rd; larvæ passed first moult 25th, second moult 27th, third 29th, fourth 1st July, pupated 5th, and the imago appeared 12th July. So that the whole round in one case was 23 days. In another but 21, the time between the moults from first to fourth being 40, 42 and 59 hours. I had Passiflora growing near by, so that food was plenty and the weather was hot, and these changes proceeded as they might have done in the tropics. The only species of butterfly which I have known to pass its stages so rapidly has been D. *Archippus* of the midsummer brood. The larvæ of *Vanillae* have six rows of spines, longer and slenderer than in Argynnis, and the bristles which surround them are much shorter and finer than in Argynnis. And the head spines are of same character as those of the body. When ready to suspend, the larva spins a button of white silk, and hangs at first straight, the anterior segments bent on segment 5 at a right angle. After a few hours the back curves in somewhat, and the head is lowered till at last it is almost in line with the body. The whole

upper side turns dead white, except that here and there a faint bit of red or dusky black is seen. When the skin splits it is on 3, the rent extending to 2 and 4, and it is shifted off just as in Grapta. At first the pupa is unformed, but the wing cases creep up one segment, the dorsum becomes hunched, and the head case and mesonotum swell out as in Limenitis. Every one of these chrysalids finally took a twist to one side, bending on the last segments instead of hanging straight down, as is usual with the species of Nymphalidæ known to me.

The curious differences in color of the chrysalids I have noted in the description. Later in the season by four months, I received about forty chrysalids from Prof. Gibbes, from S. Carolina, which varied in same manner as the Texan examples, but the dark varieties much predominated.

On two occasions single examples of *Vanillae* have been taken here at Coalburgh, but it cannot be a permanent resident. It abounds in the Southern States, where brood after brood must follow from early in the season till late in the fall. Fortunately it seems in the larval state to feed on nothing but Passiflora, or it might become a pest.

Abbot figured this species in Insects of Georgia, with larva and chrysalis. The larval body bears considerable resemblance to nature, but the spines look like feathers; they are red, moreover, instead of black. The shape of the chrysalis is good, but the color is not like any which I have seen, being dark brown instead of black.

FUNGOID DISEASES OF INSECTS:—A RECLAMATION.

BY JOHN L. LECONTE, PHILADELPHIA, PA.

The following extract is from the *American Entomologist*, vol. iii., p. 138 (June, 1880):

". . . . in which article, by the way, may be found the first "suggestion that we are aware of in this country, of the practical utili- "zation of fungus diseases, so that Walsh really anticipated LeConte in "this suggestion."

The article of the late B. D. Walsh referred to (*Practical Entomologist*, ii., p. 116, Aug., 1867) contains this passage in reference to a gigantic

Sphaerian fungus which grows out of the larvæ of *Lachnosterna fusca* and other Scarabæidæ :

" If only a single such specimen as the above had been met with, we " might account for it by supposing that the larva had accidentally died " with the undevoured seed of some plant in its mouth, and that this seed " thereupon vegetated and grew, using the body of the plant as manure to " aid it in its growth. But how can we account for the large numbers of " these specimens found in one place, at one time, and by one man ? I " can only explain these singular circumstances by supposing that some " particular kind of seed is poisonous to this larva, although the instincts " of the larva do not prompt it to reject such seed as food. Hence it is " to be hoped that Mr. Paulding's experiments will be continued until he " clearly ascertains what plant is produced from this vegetative larva. " Possibly we might turn such knowledge to practical account by sowing " this particular kind of seed in places infested by the White Grub, and " especially where, as with young trees in nurseries, we cannot conveni- " ently reach our enemy with the plough, the hoe or the spade."

In August, 1873, at the Portland Meeting of the Am. Assoc. Adv. Science, after giving an example of the destruction of the entire caterpillar population of a 12-acre lot of forest land, by the accidental introduction of pebrine, or muscadine, from a neighboring colony of silk worms, I spoke as follows, recommending at the end of my discourse :

" 7. Careful study of epidemic diseases of insects, especially those of " a fungoid nature ; and experiments on the most effective means of intro- " ducing and communicating such diseases, at pleasure."

The want of logical connection between these extracts is sufficiently obvious. But in order to place this more clearly before the reader, let me in a few words sketch the pictures presented to the mind by the respective conceptions of Mr. Walsh and myself.

Mr. Walsh exhibits an uninstructed, though intelligent farmer, seeking under his advice for the imaginary seed of an impossible plant, to be strewn on the ground in places infested by the White Grub, in the fond hope that the latter (in his roving hours ?) may swallow this seed and die of indigestion.

My picture is of a well trained mycologist, skilled in the recognition of microscopic forms, acquainted with ferments and their methods of growth, familiar with the protean forms of zymosis, so far as they have

been traced to organic germs—in few words, a first-class scientific student, who, after careful investigation of the fungus-killed insects brought to him by the "practical" entomologists, shall inform the latter of the nature of the fungi, whether they are transmutable or fixed in structure,* how they can most advantageously be cultivated, and in what vehicle they can best be distributed when needed.

Is there any resemblance between these two pictures?

A MYSTERY IN REFERENCE TO PRONUBA YUCCASELLA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

June 6, 1880.

Last summer Dr. Geo. Engelmann saw some parts of the biological collection here, and was so kind to promise me his help to obtain some species, which I was very eager to possess, viz., *Pronuba yuccasella* in its different stages, and *Phylloxera*. By his request, I received through the kindness of Mr. Thos. Meehan, in September, two bundles of the stems of *Yucca filamentosa* and *angustifolia*. The latter species, after a careful examination of every stick, was found to be entirely free of insects or larvæ; but the former contained many numerous small green larvæ in silky cocoons (and no other kind of larva), placed through the whole length of the stem and in every direction. I compared the larva with Mr. Riley's figure and description of *Pr. yuccasella*, and as both disagreed —the larva having *no legs at all*—I believed it to be a new Rhynchophorous larva at least unknown to me, and wrote accordingly to Mr. Thos. Meehan. Having placed some larvæ in alcohol, I postponed further investigation until they would be more advanced; but they lived through the whole winter, and did not increase in a marked manner.

How was I surprised when, in May, I found in the jar where I kept the stems two moths of *Pronuba yuccasella!* I believed at first that I had overlooked their larvæ, and that, after Mr. Riley's description, they had

* As this is a subject of which little is known, it offers a most promising field for squabbling, and in fact is being already cultivated for that purpose, with prospects of an abundant crop of prematurely expressed opinions.

gone in the earth and now transformed. But the two chrysalis skins were there, and not in the earth, but in the stick, the abdomen *still in the silky cocoon of the larva* before mentioned. I was more astonished that the pupa skins were perfectly smooth on the dorsum, and showed in no way the dorsal arcuated plates with blunt flattened projections, as described by Mr. Riley. I believed at first—as at any time when my observations disagree with those of other scientists—that I was mistaken or misled by some curious event. I compared the moths again with typical specimens, and there was no doubt that both are *P. yuccasella*, with its long pointed maxillary palpi. I examined the jar carefully, but I failed to find other chrysalis skins than the two mentioned before, and I failed to find any other moth in the jar which could have transformed out of the skins. The Yucca sticks were kept *alone and entirely isolated the whole time*, in a large jar, in which nothing else had been raised before. The case seemed to me so mysterious that I decided to wait until more moths would transform. But to this date (June 6—now July 1) none have appeared, and in splitting some sticks I found the larvæ living as briskly as before, and was not able to find any chrysalis, as I failed to find any in May.

I wish to give at least a notice of this remarkable fact, the more remarkable as *Y. filamentosa* is said not to be fructified by *Pr. yuccasella*.

June 10.

This moment I see Mr. Riley's article on *Prodoxus*. His remark (p. 142, Am. Ent.) that I have not been willing to send a specimen, is true, but he has forgotten to add that I wrote to him: "Because I was studying the insect myself, and was about to publish it."

I had decided to drop my article had I not in the study of the two female imagoes at hand found that the basal joint of the maxillary palpi *is produced* in a spinous tentacle just *as in Pronuba*. Therefore the only distinctive character mentioned by Mr. Riley is not present in my specimens; consequently my specimens can not be *Prodoxus*, if Riley's description is correct. The specimens from Colorado types of *Pr. yuccasella* Chamb. possess pointed maxillary palpi. Three of them have no spots on the wings (the two raised by me have also no spots). The ovipositor of one is exposed as in *Pr. yuccasella*. I don't know which species Mr. Boll has now at hand, but the type of *Teget. alba* Zeller from Dallas, Texas, is *Pronuba yuccasella*.

ENTOMOLOGY FOR BEGINNERS.

MIGRATORY INSECTS.

BY G. J. BOWLES, MONTREAL, P. Q.

The migratory instinct, common to so many species of birds, and even of mammalia, is also exhibited by many species of insects. In the case of birds and animals it has mostly to do with variations of climate, or the necessity of suitably providing for the raising of their young; in the case of insects the causes of migrations are not so evident, and observation is required in order to decide the point, if, indeed, it can be decided at all. The subject is still in obscurity, though the efforts of American Entomologists have thrown a little light upon it with regard to some species. And it is of great interest, not only to Entomologists, but also to tillers of the soil, as some of the insects which exhibit this migratory instinct are among the most injurious to the crops of the farmer and fruit grower.

THE LOCUST.

Chief among the migratory insects stands the locust, considered as a group. On each of the continents, both of the old and new worlds, some species of the locust tribe have from time to time been notorious for this habit, not only on account of the countless numbers in which they have appeared, but also on account of the terrible destruction they have caused. As far back as the time of Moses their ravages are mentioned, for one of the plagues brought upon Egypt just before the departure of the children of Israel was the plague of locusts. In Asia, Africa and Europe their invasions have been recorded in history, both ancient and modern. To show the magnitude of the effects consequent on their migrations, I give a few instances, as taken by Dr. Packard from different historical sources. The first account, after Joel in the Bible, whose descriptions apply to Egypt, Syria, Palestine and Asia Minor, is the statement of Orosius that in the year of the world 3800 certain regions of North Africa were visited by monstrous swarms; the wind blew them into the sea, and the bodies washed ashore "stank more than the corpses of a hundred thousand men." Another locust plague, resulting in a famine and contagious disorders, according to St. Augustine, occurred in the Kingdom of Masinissa, and caused the death of about 800,000 persons. Pliny states that the locusts visited Italy, flying from Africa. In Europe

locust invasions have been recorded since 1333, when they appeared in Germany. Mouffit states that in 1478 the country about Venice was invaded, and 30,000 people died of famine. In France swarms appeared at the close of the Middle Ages. In 1747 there was a great invasion of Southern and Middle Europe. Before and after this date vast swarms were observed in Asia and Africa. In Russia, whose southern plains form the home of the locust, vast numbers have often appeared and done great damage. In China records exist of the appearance of these insects in devastating numbers 173 times during a period of 1,924 years. The three great causes of famine in China are placed as flood, drought and locusts.

The new world has also its migratory locusts, equally destructive with those of the old. The Rocky Mountain Locust, of which we all have heard so much, is not the only species. Central and South America have also their peculiar locust. Their ravages have been noted by the old Spanish chroniclers of Mexico and the adjacent countries from the time of the first conquest. In 1632 parts of Mexico were overrun with them, and in 1738 and '39 there was an invasion by them of the coasts of Oaxaca, after which a famine occurred in Yucatan. In 1855 and '56 Honduras and Guatemala were invaded, and a famine and pestilence of fever followed. And in 1835 Chili and the eastern part of South America were infested with vast swarms of locusts.

The Rocky Mountain Locust *(Caloptenus spretus)* having been a subject of observation by the most eminent Entomologists of the United States, we know more about its habits and economy than about those of any other species. The terrible devastations it has committed in the Western States have led to this result. When an insect destroys the crops in one year to the estimated value of $45,000,000, it is about time to study its history and habits. Mr. Riley has published a most interesting book on the subject, and from this I have culled a few of the most striking items. Its home is on the elevated plateau of the Rocky Mountains, whence it migrates in favorable seasons to the west and south for hundreds of miles, laying waste the crops wherever it alights and doing terrible damage. It breeds in the regions to which it migrates, and the next generations migrate again north and west towards the "metropolis" of the species, and gradually die out on the way, while those that remain in the place of their birth also die out, so that the species becomes extinct in these localities in a few years.

The observations made, so far, give no special reasons for these migrations, unless it be the unusual abundance of the species and the consequent scarcity of food in its native regions. One or two favorable seasons cause the insect to increase to an immense extent, and when they find the supply of food failing them, they mount into the air in countless millions, and, favored by a westerly or north-westerly wind, sail off towards the settlements in search of "fresh fields and pastures new." Such is the principal reason given by Packard, though he says possibly the reproductive instinct may also be concerned. And he does not think that these movements can be the result of a real migratory instinct, because their migrations (as well as those of the locusts of the old world) are periodical, long intervals sometimes existing between them, so that the development of a migratory instinct would be impossible. If once partially implanted, the long succession of non-migratory years would effectually break up the germs of such an instinct.

Another curious fact in connection with these locusts is, that the generation born in the region to which the species has migrated the previous year, shows a tendency to return north and west towards the primal habitat. This has been proved by repeated observation. One reason for this is found to be the prevalence of favorable winds at that particular season in the regions where these locusts are produced; for locusts, and indeed, all migratory insects, are dependent to some extent upon the winds for assistance and direction in their migrations. This is true for locusts all over the world; they are brought by the wind and taken away by the wind. A striking instance of this fact is given in the account of the great Egyptian plague of locusts, in the Book of Exodus.

So with our American migratory locust. The general direction of the winds on the eastern slopes of the Rocky Mountains and on the plains is, during July and August, west or northwest. These are the months during which the locusts come down from their mountain home to invade the cultivated plains of the border States. And when the generation of which these are the parents attain the winged state, in the following June, it has been found that the prevailing winds are from the south and south-east, and thus are favorable to the flight of the locusts in a northerly or westerly direction

As regards their powers of flight, it has been proved by experiment that the locust, when it has a favorable wind (and it rarely flies at any other time), does not fly faster than the wind, but merely uses its wings to

sustain itself in the air, and allows the breeze to waft it along. An observer proved this by ascending to the top of the State University of Nebraska, when a swarm of locusts was passing, and letting loose among the flying grasshoppers small bunches of cotton. He found that the cotton sailed along quite as fast as the grasshoppers did.

Their numbers are inconceivably great. A British officer who saw a swarm in Syria estimated their number at 180,000,000,000,000. The clouds of them seen in the West have often exceeded 50 miles in length by 20 in breadth, with a depth of from a quarter of a mile to a mile; 1,500,000 bushels of their dead bodies were estimated to be lying on the shores of Salt Lake, in Utah, after a visitation of their hordes. And their eggs are found in the ground in numbers of from 100 to 15,000 to the square foot, in localities favorable to their deposition. Such are some of the reliable statistics gathered regarding the Rocky Mountain Locust.

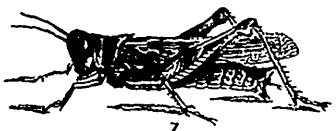

Fig. 19.

This locust is a near relation of our common Canadian locust (*Caloptenus femur-rubrum*), fig. 19. The latter has often been injurious to the crops, particularly of grass and hay, but has little tendency to migrate. It has a vast range, from Labrador to the Pacific coast, including the Western States and Mississippi Valley as far south as 35°.

A curious and fortunate fact with regard to the locust is that it does not become acclimated in the regions to which it migrates. The hordes from the North, fresh from the invigorating air of the mountains, are much stronger and more vigorous than their progeny, born the succeeding year in the plains of Missouri and the other Western States. Prof. Aughey, of the State University of Nebraska, tested their muscular strength by attaching their hind legs to a delicate spring balance and observing the degree of strength they exerted. He invariably found that the locusts from the mountains were stronger than those born in the plains. He also found that the mountain insects could live without food for several days longer than the others. Their eggs are also injured by the moister climate, so that it is estimated that fully one-half become addled and never hatch. These circumstances tend to so reduce their numbers in the new habitat that in a few years the species dies out.

Leaving the locusts, we will pass to the more pleasing duty of noticing

some migratory insects which are comparatively harmless, and are far more beautiful than any of the Orthoptera.

Many of the butterflies are inclined to migrations, particularly the whites and yellows *(Pieris, Colias* and *Callidryas).* These genera, with a few exceptions, are not very plentiful in temperate regions, but have their home in warm climates. So from equatorial and South America, and from the southern parts of Europe, have come reports of vast migrations of these butterflies. Bates, in his "Naturalist on the River Amazon," gives an interesting account of the uninterrupted procession of butterflies belonging to the genus *Callidryas* which he saw passing from

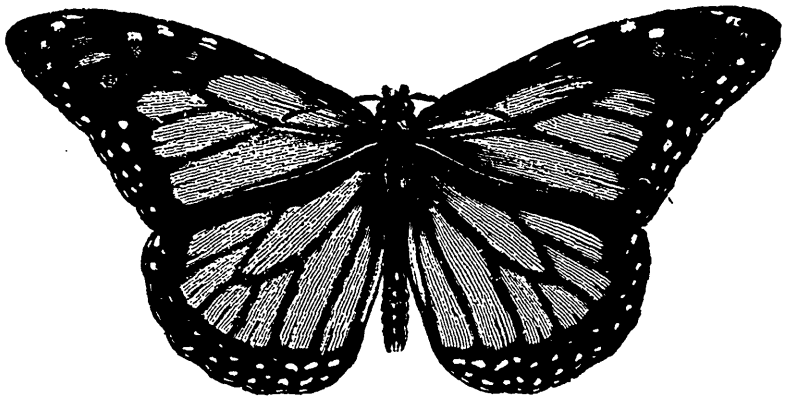

Fig 20.

morning to night in a southerly direction across the Amazon. In these cases migrations may perhaps be connected with the question of food, or of the continuance of the species.

A butterfly which is well known in Canada, and which has a very wide range, is noted for its migratory habits; it is the *Danais archippus*, fig. 20. Hardly a season passes but we read of its migrations. Newspapers in the Southwestern States, and the weather signal officers, were constantly reporting the passage over Iowa, Kansas, Missouri and Texas of swarms of this butterfly during the months of September and October last. Even in Canada they are sometimes seen in great numbers on their way either north or south. I myself have seen the shore of Lake Ontario, near Brighton, strewn with hundreds of their dead bodies, cast up by the waves, and which no doubt had formed part of a swarm which from weakness or some other cause had perished while flying across the lake.

Mr. Riley gives an interesting account of the causes which may lead to the migrations of this butterfly in his 3rd Report. He says: "It would be difficult to give any satisfactory reason for this assembling together of such swarms of butterflies. As I have abundantly proved by examination of specimens, the individuals composing the swarms of our Archippus butterfly comprise both sexes; if anything the females prevail. The flights almost always occur in the autumn, when the Milk-weeds *(Asclepias)*, upon which the larva of this butterfly feeds, have perished. The instinct to propagate is, therefore, at the time in abeyance. The butterflies, unable to supply themselves with sweets from flowers, are either attracted in quantities to trees that are covered with honey-secreting plants, or bark lice; or else they must migrate southward, where flowers are still blooming. The Archippus butterfly hibernates within hollow trees and other sheltered situations. Southerly timber regions offer most favorable conditions for such hibernation. Under the most favorable conditions a large majority perish. A small portion of the females survive the winter. Such hibernating individuals, upon waking from their winter torpor, make at once for the prairie, where the Milk-weeds most abound. Faded, and often tattered, they may be seen flying swiftly over such prairies.

"I have no doubt but that they travel thus for many hundred miles, keeping principally to the north, and ere they perish, supplying the Milk-weeds here and there with eggs. A fresh brood is produced in less than a month, and these extend still farther north, until we find the species late in the growing season as far up as the Saskatchewan country, where it can scarcely successfully hibernate, and from whence the butterflies instinctively migrate southward. We can thus understand how there are two, three or more broods in southerly regions and only one towards British America.

"The exceptional flights noticed in the spring, and which, so far as recorded, take place quite early and in the same southerly direction, find a similar explanation. They may be looked upon as continuations of the autumn flights. Hibernating in the temperate belt, they are awakened and aroused upon the advent of spring, to find the Milk-weeds not yet started, and they instinctively pass to more southern regions. There is a southward migration late in the growing season in congregated masses, and a northward dispersion early in the season through isolated individuals."

It will thus be seen that Mr. Riley looks upon the migration of *D. archippus* as something analogous to the southern movement of the birds

on the approach of winter, the object in both being the preservation of the species; in the case of the insect to obtain a suitable place for hibernation, as well as a continued supply of food until the time of hibernation arrives; in the case of the bird to secure food when it would be difficult or impossible to get it in a northern climate. The instinct of the butterfly might therefore be looked upon as a true migratory instinct, in contradistinction to that of the locust, which is of a lower order.

There is another butterfly which displays this instinct to a large extent. I refer to the well-known *Pyrameis cardui*, or Painted Lady. It is a cosmopolitan butterfly, being found in all parts of the world—a result, no doubt, of its migratory habits, conjoined to a faculty of acclimatization. Though I have never actually seen a migration of this insect, I have had no doubt for years past that one did take place in the vicinity of Quebec, I think in 1865 or '66. I had been looking out for the insect for several years, but never saw a single specimen till one summer, when it suddenly became the most common butterfly in the neighborhood. They could be seen by dozens everywhere. Next year it was not to be found, nor did it return during my stay in Quebec, up to 1872.

I have an idea that others of the genus *Pyrameis*, as well as the species of the allied genera, *Grapta* and *Vanessa*, have these migratory habits to some extent. The same phenomenon, that of scarcity, then extreme abundance for one season, and then disappearance, took place with regard to *Vanessa j-album*. They were so abundant one summer that I even saw them drinking spruce beer from the old applewomens' kegs on the Upper Town Market, Quebec, while next season the only specimen I found was a poor dilapidated individual which I took snugly tucked away under the coping of a fence, where it had evidently passed the winter.

As I said before, the fact of *Pyrameis cardui* being found in all the four quarters of the globe is no doubt due to its migrating propensity. A further proof of this is found in the well-known fact that our *archippus*, originally confined to America (though ranging from Canada to Bolivia), has lately spread over some of the islands of the Pacific to Queensland and New Guinea, and over the Azores to Europe, such extension of habitat necessarily indicating great power of long sustained flight. Since the Milk-weeds are not plants of commercial value, it is highly improbable that the species has been carried in any of its preparatory states in ships. The fact remains, however, that it has been found as a new inhabitant of those countries. Its powers of flight will hardly be doubted by any one

who has attempted to catch it on the wing. But a stronger proof some of you have had in the exhibition of a *D. archippus* some years ago, by Mr. Pearson, of Montreal, which had been captured on board a ship on the Atlantic, hundreds of miles from land.

EARLY APPEARANCE OF CATOCALAS.

BY JAMES S. JOHNSON, FRANKFORD, PENN.

Several of your correspondents have given you articles on the early appearance of Lepidoptera this season, and as the Catocalas are my favorites, I will give my experience with them. According to good authority and report, *C. epione* had the honor of being the first to appear-but I find in this locality a very strong argument against that theory. By referring to my diary I see that *C. ilia* has the precedence. The appear, ance of these two species during five years is as follows:

1876, July 11th; C. ilia, 2 examples.
" " 20th; " epione, 1 "
1877 " 9th; " ilia, 2 "
" " 17th; " epione, 2 "
1878 " 8th; " ilia, 2 "
" " 28th; " epione, 1 "
1879 " 10th; " ilia, 1 "
" " 19th; " epione, 1 "
1880, June 24th; " ilia, 4 "

With this reference we find *ilia* the first, and its appearance this year sixteen days earlier than usual. During the season of 1877 I took 29 species, 461 examples (article in *Field and Forest*, vol. iii., p. 64). This year bids fair to exceed that take, viz.,

1880, June 24; C. ilia, 4 examples.
grynea, 1 "
" 25; ilia, 5 "
insolabilis, 2 "
" 26; ilia, 3 "
insolabilis, 1 "

1880, June	27;	C. ilia,	5 examples.
		grynea,	1 "
		linella,	1 "
"	28;	ilia,	28 "
		insolabilis,	3 "
		serena,	2 "
		grynea,	3 "
		linella,	1 "
		flebilis,	1 "
		minuta,	1 "
"	29;	ilia,	16 "
		grynea,	3 "
		insolabilis,	1 "
"	30;	ilia,	4 "
		grynea,	1 "

Total for the week, 7 species, 87 examples. I have not seen an *epione* yet. About one-third of the captures are cabinet examples. I take this as a fair criterion for the appearance of Catocalæ in this locality, as the captures were all made in the same pieces of woodland.

SOME NOTES ON COLEOPTERA FOR BEGINNERS.

BY C. G. SIEWERS, NEWPORT, KY.

In answer to a query in the March ENTOMOLOGIST as to the rearing of larvæ of wood-boring beetles, I would say that it is very difficult to do after they have been removed from their burrows. Try damp sawdust of the same wood. The better plan where infested timber is found, is to saw it into short lengths, pack in tight box and cover with a wet cloth. Many kinds cannot bore in dry wood. Many Buprestidæ perish from inability to perforate the bark of dead trees which has sprung loose from the wood and become hardened by the sun. They then fall an easy prey to ants, roaches and caribs. Where wild grape vines abound, cut them off at the ground in May or June, and let them hang; in early spring saw them into short lengths and box them, and some rare beetles may be taken. Grubs under stones put away in the same ground in tin or glass, kept moist; found under logs, use the same log debris, and add some sawdust. Finding two very large grubs with black heads under a log late in the fall, I

put them away in a tin can with log refuse and sawdust, and found a male ash beetle and a dead pupa in July. This beetle, *Xyloryctes satyrus* (Fab.), is taken under the roots of ash trees, and falls a victim to its curiosity, for if you begin to dig for them they will come out to see what is going on. I took fifteen from one tree in that way. April and May are generally devoted to searching in logs and dead trees for beetles, when many nymphs can be collected, which can generally be hatched out in a week or two. June and July are the great beating months. I have discarded the beating net for the inverted umbrella, and so will any one who has tried both, as beating the low limbs of trees around the edges of wood will yield tenfold the quantity and variety that bush and weed beating will. Woods protected from cattle and hogs, and full of vines and bushes, are best. Little is got by beating in the interior of woods. Insect life swarms along the edges. Examine the trunks of trees, and where flat stones abound scoop out cavities under them, where Cychrus and various caribs may be trapped; Cychrus are snail-feeders, and some bait traps with snails strung on strings through the shell. The beans of the honey locust yield *Spermophagus Robiniæ;* the fungus puff-ball, *Lycoperdina ferruginea;* all kinds of fungus swarm with beetles, also Staphilinidæ. Pselaphidæ are taken on the under side of stones, but mostly by sifting around decayed stumps on to a white cloth. Beat wild plum trees and haws when in blossom. Where beetles are found, by carefully replacing stones and bark more may be taken, as their scent remains. I was glad to take a single specimen of that rare and handsome longicorn, *Dryobius sexfasciatus*, in one season, but in the summer of 1878 I found five under one piece of bark of beech; so last season, when I found a small colony under bark on a dead maple, I tied the bark on again, and took seventeen more at different visits. Various beetles are also found on fruit and flowers. In closing, I would advise beginners to put small insects on paper slips or wedges, and not pin them with a No. 2 pin, as it cannot be inserted in cork without plyers, and is very liable to buckle. No. 3 enters cork readily, is not too large for paper slips, and about right for larger specimens. Further, do not use Spaulding's glue; it will turn your wedges brown, as it contains a discoloring acid. Make your own liquid glue—better at one-fourth the cost. Dissolve light colored glue or isinglass in the usual way; then while hot stir in alcohol, or a light colored, strained vinegar, till it is thin enough, and decant into a bottle. It can then be thinned with a little water, or by warming.

ANNUAL MEETING OF ENTOMOLOGICAL CLUB, A. A. A. S.

The annual meeting of the Entomological Club of the American Association for the Advancement of Science will be held at the Museum of the Boston Society of Natural History, corner of Berkeley and Boylston Sts., Boston, commencing at 2 p. m., Tuesday, Aug. 24, 1880. It is proposed to send to every member of the American Association, and to all others who may favor the undersigned with their address for that purpose, a circular announcing the special subjects which will be presented at this meeting of the Club; and therefore all entomologists who desire to read communications at that time are requested to notify one of the undersigned before August 1st. This will ensure a fuller discussion of the topics presented, and, it is hoped, a larger attendance.

There will be an informal social gathering of entomologists at the rooms of the Boston Society of Natural History, 24th Aug., 1880, from 10 a. m. to 1 p. m. During the meeting of the American Association a room will be constantly open for the exclusive use of the entomologists.

B. PICKMAN MANN, *Sec'y*, Cambridge, Mass.

SAMUEL H. SCUDDER, *Pres.*, Cambridge, Mass.

CORRESPONDENCE.

DEAR SIR,—

Mr. W. H. Edwards, in his excellent article in the June No. of the CAN. ENT., page 113, inadvertently gives my residence as Bloomington instead of Carbondale. It would be well to correct this, for 50 miles north of Bloomington the form of Satyrus should be *Olympus*, or approaching it, at least, and not as he gives it.

I like Mr. Coquillett's suggestion of having uniform terms for describing the larvæ of many moths, but would suggest a little change in his terms for the spaces. Would it not be better to call the space between the dorsal and subdorsal lines the *dorsal* space, the space between the subdorsal and stigmatal lines the *subdorsal* space, the space below the stigmatal line to the venter proper the *substigmatal* space? As the prefix *sub* means under or below, it is evident that one not having the text of his suggestion would look for the *subdorsal* space below that line, etc.

G. H. FRENCH, Carbondale, Ill.