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The Canadian Entomologist.

VOL. XI. LONDON, ONT., MARCH, 1879. No. 3

INSECT POWDER.

BY THE EDITOR.

The Insect Powders of commerce are the powdered flowers of different species of *Pyrethrum*. Those of *Pyrethrum carneum* and *roseum* were introduced some thirty years ago under the name of Persian Insect Powder, and subsequently those of *Pyrethrum cinerariæ folium*, a native of Dalmatia, Austria, as Dalmatian Insect Powder. Both the Persian and Dalmatian powders are good insecticides, but the latter is much the more energetic in its action and hence commands a higher price; indeed, it is so much preferred that it is gradually driving the so-called Persian powder out of the market. The fact of the flowers of *P. roseum* being less active than those of *P. cinerariæ folium*, has been accounted for on the ground that the single flowers are much more powerful than the double ones, and that the double flowers occur in *P. roseum* in much larger proportion than in the other species. The flowers, either whole or powdered, preserve their activity for a long period. A recent European experimenter states that he could not perceive any particular loss of activity in samples which had been kept for six years. The fresh (undried) flowers act very slowly as compared with the same dried and powdered, and the plant itself powdered is quite inactive. It is singular that while there are many other composite plants closely related to the genus *Pyrethrum*, as yet this peculiar property has been found only in plants belonging to this genus, and even within this limit there are several species whose value as insecticides is very slight. A large number of *Compositæ* indigenous to Austria have been tested and found to be of no value in this respect. The flowers of Tansy (*Tanacetum vulgare*) are said to have a slight stupefying effect.

The *Pyrethrums* are hardy plants which bloom abundantly the second year from seed. The powder is prepared from the half-opened flowers gathered during dry weather and dried in the shade under cover, but the process of gathering, drying and preparing involves so much time that their culture can only be made profitable where labor is cheap.

Insect powders have not attracted general attention as insecticides until within the last three or four years, during which time they have been introduced in various forms in packages and boxes, accompanied by suitable blowers or insect guns for the purpose of properly distributing the powder, and recommended for the destruction of flies, cockroaches, fleas, bugs, &c. Sometimes these prepared articles have been artificially colored so as to disguise their source, but all have owed their activity solely to the presence of the powdered flowers of one or other of these *Pyrethrums*.

House flies are very sensitive to the effects of these powders. A few puffs of the dust from an insect gun, blown into the air of a room with the doors closed, the discharges directed towards those parts where flies are congregated, will stupefy and kill them within a very short time. The powder is somewhat pungent, and to breathe an atmosphere charged with it will frequently cause a slight sneezing, but beyond this the operator need not anticipate any annoyance. Frequently during the past summer, when flies have been troublesome, we have pretty thoroughly charged the air in our dining-room and kitchen at night, closing the doors, and in the morning found all, or nearly all, the flies lying dead on the floors. A few minutes after its use they begin to drop on their backs, and after a very short time die; if a room be closed for half an hour after using the powder, few, if any, will escape. By some this energetic action has been attributed to the presence of a volatile oil in the flowers, by other and later investigators to a peculiar crystalline principle believed to be an alkaloid; but this point does not as yet seem to be fully settled.

More recently we have been experimenting with this powder on the green Aphis which troubles our green-house plants. The usual plan of smoking with tobacco is an unpleasant remedy, and is also very injurious to many plants of delicate constitution, whereas the insect powder used to any extent is perfectly harmless to plant-life. After freely charging the air of a green-house with the powder, blowing it in fine clouds of dust among the plants, the tiny tormentors who are busily engaged in sucking the life out of the leaves and tender shoots, soon manifest symptoms of

uneasiness and begin to drop from the plants to the ground, and in the course of an hour or two the larger portion of the enemy's forces will be found lying sprawling on the earth in the pots or on the shelves and floor of the house, where, probably partly from the stupefying effects of the powder and partly from their natural inability to find their way to any given point, they fail to reach the plants again and hence perish. By applying the powder freely in the evening and giving the plants a thorough syringing in the morning, they may in the worst cases be almost freed from Aphides by a single application ; it is better, however, to repeat its use the next evening, so as to make sure work. The powder does not appear to kill this Aphis as it does the flies. For the purpose of testing this point we placed a number of them in an open glass cell of a microscope slide and powdered them thoroughly, and found some of them alive after two days of such severe exposure to its influence. Having recently found a plant literally swarming with the green Aphis, so that the sight of it was almost disgusting, we submitted it to the action of this powder one afternoon, having previously spread a large piece of white paper under the plant so that the effect of the powder on the insects might be distinctly seen. Almost immediately they began to fall on the paper, and in less than ten minutes a hundred or more of them were lying on their backs or crawling sluggishly about. In the course of half an hour some four or five hundred had fallen on the paper, and when the plant was examined again the following morning, there remained but very few on it, and most of these were removed by a slight syringing. We have had the powder used in green-houses by some of our friends, who also report its success. This matter is well worthy the attention of all those who indulge in window gardening or who grow plants in small conservatories attached to dwellings, since if this proves an efficient and economical substitute for tobacco smoke, it will save much annoyance and some loss. Success will necessarily depend on the quality of the material used, but after the experiments we have tried, we feel confident that with good Dalmatian powder there need be no failure. It will be interesting to learn as opportunity offers how moths and other insects will be affected by the use of insect powders. If the beautiful specimens which sometimes fly into our rooms at night can be drugged in this way and captured without a struggle, we may add many a perfect specimen to our collections which would otherwise be more or less defaced. There is quite a field for experiment here.

THE CLOVER-SEED FLY—A NEW INSECT PEST.

BY J. A. LINTNER, N. Y. STATE MUSEUM NAT. HIST., ALBANY.

In the summer of 1877, my attention was called to some "worms" which had been discovered in the heads of red clover *(Trifolium pratense)*, and were said to be preying upon the seeds. They were found to be minute maggot-like creatures, hidden within the seed-pods and entirely destroying the seeds which they attacked. Numbers of them were subsequently detected in the examination of heads of clover taken from several localities in the vicinity of Albany, and in Warren County, N. Y. I was unable at the time to refer the insect to any described species, or to find any record of a similar depredation on clover seeds in this country or in Europe.

The following season, additional examples of infested clover heads were submitted to me, which had been sent from Mr. George W. Hoffman, President of the N. Y. State Agricultural Society, from Elmira, N. Y. A number of the larvæ were obtained from these heads, and their careful examination enabled me to refer them to the Cecidomyidæ—of a species probably closely related to the well-known wheat-midge, *Cecidomyia destructor*. Several of the larvæ were preserved in alcohol, and the larger number placed in a pot of damp sand, in which they speedily buried themselves for their transformation. The perfect fly has not yet made its appearance, but it is hoped that the final change will soon take place and the specimens be secured.

At the recent Annual Meeting of the N. Y. State Agricultural Society, in this city, in January last, in a paper presented to the Society, on some Injurious Insects observed during the past year, I gave an account of this new depredator upon an important crop, and described its larva, as follows:

Cecidomyia trifolii, n. sp.—Head subacute, subtriangular, slightly rounded laterally on its posterior half, giving that portion a subquadrangular form; a short cylindrical horny? process at its tip, and two longer antennal processes, cylindrical, tapering apically. Body elliptical, moderately constricted at the joints, flattened on the sides, rather rounded behind, delicately shagreened, laterally at about the middle of each segment, a short fleshy papilliform process, with two short bristles of unequal

length near the posterior of the segment; posterior segment bilobed, each lobe armed with two short fleshy? processes, of which the outer is the longer; "breast-bone" of pale yellowish color, its projecting end divided into two rather blunt, laterally rounded, points. A dorsal row of processes similar to the lateral ones is suspected, but was not definitely made out. Color of the living larvæ, pinkish, approaching orange; length, 0.08 of an inch.

The reading of the paper elicited the information that the insect had committed serious depredation upon clover-seed in Tompkins, Seneca and other counties in Western New York, during the past year. In Seneca County, fields of clover which had been kept for seed, proved to be not worth the cutting. It was also stated that a worm similar to those in the heads had been discovered preying upon the roots, but these are probably the same larvæ, which having matured, had left the heads for their pupation in the ground, where the Cecidomyidæ larvæ frequently remain unaltered for a considerable length of time.

The extent of the ravages throughout our country of this newly discovered insect, which promises to be of considerable economic importance, will be an interesting subject of inquiry for the ensuing summer; and the interesting question also arises, now that its hidden covert has been detected, will the species also be discovered in Europe, whence the red clover was introduced in this country.

A NEW SPECIES OF ARCTIA.

BY G. H. FRENCH, CARBONDALE, ILL.

Arctia rectilinea, n. sp.

Average length, ♂, .50; ♀, .55 of an inch. Expanse of wings, ♂, 1.30; ♀, 1.50 inches. Head reddish flesh color, or in some lighter; eyes and palpi black; antennæ dark brown or brown black. Prothorax and thorax the same color as the head, the first with two, the second with three longitudinal black lines, those on the thorax with the following arrangement: one dorsal and the other two on the tegulæ. Abdomen bright scarlet, the dorsum either a broad black stripe dentate on the

sides, or broken up into a series of oval black spots, one to each segment; a row of black spots at the sides.

Under side of body: Thorax blackish, a little dark flesh color in the middle; abdomen yellowish flesh color, a row of black spots each side of the middle.

Upper surface: Primaries black, marked as follows: with the same shade of flesh color as on the head and thorax; all the veins, the costa and hind or inner margin, a line running from the base of the wing to the end of the third median veinule, that may be called the sub-discal line, and three transverse lines that extend from the costa to this sub-discal line. The first or inner of these transverse lines is nearly in the middle of the wing, the second crossing the wing obliquely at the end of the discal cell; these two straight; the third pursues a zigzag course, starting on the costa between the second and apex, extends to near the base of fringe between the second and third disco-cellular veinules, makes an acute angle and joins the second transverse at the juncture of the first and second median veinules with the median vein; from this it extends to the end of the sub-discal line. Secondaries bright scarlet with a narrow outer and costal border of black, and a discal spot and three large spots of the same near the outer border. Of these the middle of the three spots is free, but the discal and the first and third of the outer are usually blended with the border.

Under side: Both primaries and secondaries marked as above, but the light on the primaries is more tinged with scarlet, while the scarlet of the secondaries is not so bright.

Described from two males and two females. These were taken in connection with *Arctia Nais* Dru., and like that, seems to be double brooded. The first, a female, was taken May 27th of the past season; the rest, one male Sept. 15th, and one male and one female Sept. 25th. I have also seen one specimen captured by another person.

NOTES FROM WOLLASTON, MASS.

BY F. H. SPRAGUE.

During the season of 1878 I have found at this place, situated within two miles of the limits of Boston, some species of butterflies which are seldom found in this vicinity. On the 8th of October I obtained a nice

specimen of *C. eurytheme*, which had probably left the chrysalis but a short time before. It was flying in a meadow, in company with great numbers of *C. philodice*. The orange-colored tinge of the wings is lighter than on specimens taken farther south. If I am rightly informed, this is the first instance of the capture of this species in this vicinity.

On the 29th of June a specimen of *L. arthemis* was taken, and another July 3rd; both specimens had just emerged from the chrysalis. The larvæ evidently fed on the *Quercus alba*, which was very abundant in that locality.

A number of specimens of *J. coenia* have been taken here within the last three years, in the month of August or early in September. *Coenia* seems to be rather widely distributed through Massachusetts, and though quite rare, I have found it more common in this vicinity than elsewhere. This species seems to prefer meadows and lowlands to higher ground, and is quite fond of the flowers of the Golden-rod.

THE TAILS OF CALLIMORPHA INTERRUPTO-MARGINATA ♂.

BY C. G. SIEWERS, NEWPORT, KY.

In a former article in the CANADIAN ENTOMOLOGIST I mentioned a large capture of the above moth in July, 1876 and '77. At the first taking I ran out of pins, and so had recourse to the time-honored practice of squeezing—when, lo! out of the hind segments there issued two plumes over an inch long and less than one-sixteenth in diameter, so light that the least breath of air fluttered them from side to side. They were cut in numerous vertical segments and sparsely covered with short hairs, were semi-transparent and evidently air-inflated; fig. 12 will give some idea of their appearance. I noticed also that only those that had the anal segment tufted with hair possessed these appendages, they being males, the females having a clean terminal segment, and without these organs.

Fig. 12.

I mentioned this discovery in letters to several scientists at the time, but as it elicited no response, I concluded it was nothing new. On

reading the interesting articles on the organs of *pseudargiolus* by Mr. W. H. Edwards, I mentioned this matter to him, and he at once proposed to test it this season. But the disease that, as I mentioned, had attacked the larvæ, evidently a species of Muscardine, left few survivors, and but five males could be found. These, with some pressed organs, I forwarded to Mr. Edwards, who sent them to Dr. Hagen, at Cambridge.

In a letter from the Doctor, October 15th, he mentions that he was sure he had seen an account somewhere of similar organs, but from lack of time had no opportunity to look it up till then. He found that in *Psyche*, Cambridge, No. 6, October, 1874, Mr. H. K. Morrison has described just the same organs in *Leucarctia acræa*, and similar ones in *Agrotis plecta*, *Euplexia lucipara* and *Danais erippus*. In *Psyche*, No. 35, March, 1877, Mr. B. P. Mann read extracts from a letter of Fritz Mueller to Charles Darwin, published in *Nature*, vol. x., page 102, respecting the presence and character of abdominal appendages in several glaucoped moths, similar to those described by Mr. Morrison. Dr. Hagen adds: "The fact is indeed very interesting and new for *Callimorpha*."

In capturing the *Callimorphas*, which fly with a heavy darting motion but a few yards at a time, it often occured that on coming to the place where one had settled, no trace of the moth was to be found, it having continued its flight ten or fifteen yards further under the high weeds on which the larvæ feed, *Eupatorium ageratoides*. These seemed to be double flights, but in the summer of 1877, when sugaring at dusk, I was accompanied a long distance by a male *Callimorpha* in a steady flight among the weeds, either following the light or the odor of sugar, and it finally lit on the trunk of a tree, where I captured it, very much to my surprise when I found what it was.

It is plain that by the aid of these appendages they are able to make a sustained flight in search of females or in escaping pursuit. The tails issue from the sides of the segment next the anal, somewhat underneath, slowly on pressure, but collapse instantly when freed, and come out of the detached body even on pressing the next segment to them, and on the dried males two side tufts of hair can be plainly perceived. They seem to furnish the same assistance to flight as the tails of *Luna*, the *Papilios* and others do. That *Agrotis* and other darting moths have similar organs is very plausible; where there is a want, there is a way, in nature; where a superfluity, it is dispensed with, like the blind eyes of cave fishes.

DESCRIPTIONS OF NEW SPECIES OF BUTTERFLIES COLLECTED BY MR. H. K. MORRISON, IN NEVADA, 1878; ALSO, REMARKS ON SOME ERRORS OF SYNONYMY AND ARRANGEMENT.

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

Argynnis Laura.

Male.—Expands 2.2 inch.

Upper side deep red-fulvous, obscured at base of primaries and still more at base of secondaries, the ground there being black with a slight dusting of fulvous; the black markings as in the allied species, rather heavy, while the nervules of primaries, especially the discoidal, and the branches of median,—and on secondaries the branches of sub-costal, are widely bordered with black; the mesial band of secondaries confluent; fringes yellow-buff, black at the ends of the nervules. Under side of primaries red-orange at base and along the median nervules; also within the P-shaped spots of cell; remainder of wing, which includes the outer half of cell, and area to apex and hind margin, yellow-buff; the upper marginal lunules more or less silvered, as well as the sub-apical spots; secondaries pale yellow; the belt between the outer rows of spots broad, clear colored, the spots large and well-silvered; the basal and discal areas mottled with delicate ferruginous; in one example, brown, in some lights a little greenish; the marginal spots broad, rounded, edged with a few black scales; the spots of second row broad ovals, except fourth from costa, which is minute, and the seventh on margin, irregularly lunate; all bordered with black anteriorly; the third row consists of either four or five spots, the third and fifth sometimes one or both obsolete; the first on costa rounded, the second large, sub-triangular, and fourth sub-lunate; all edged above with black; in cell a rounded spot, a long oval in sub-median interspace, both edged with black; patches of silver at the top of the interspaces at base; shoulder and abdominal margin well silvered.

Female.—Expands 2.35 inches.

Upper side paler over discal area; the margins edged broadly with black; under side very nearly as in male.

From 4 ♂, 1 ♀ taken by Mr. Morrison, and 1 ♂, 1 ♀ formerly sent me by Mr. Henry Edwards. This species may be distinguished by the clear yellow belt between the two outer rows of silver spots, which is

relatively as broad as in *Cybele*. It is of a deeper fulvous than any except *Liliana*, which it resembles in this respect as well as in size and shape of wings. *Liliana* shows a very narrow belt, so encroached on by the unusually large silver spots as to be reduced more than one-half in width.

Satyrus Paulus.

Male.—Expands nearly 2 inches.

Upper side blackish-brown, color of *Nephele;* both wings have a faint submarginal black line; on primaries two small black ocelli, the upper one with white central dot; fringes brown, on secondaries darker at the ends of the nervules. Under side of primaries brown, yellow-tinted, of secondaries more decidedly colored by yellow; both wings have the hind margins edged with black, just within which is a parallel black line; a little beyond, a second line or fine stripe, not quite parallel to the margin on primaries, and irregularly crenated on secondaries; across disk of primaries a sinuous dark stripe; the basal half of the wing, above median, finely streaked with dark brown; the costal margin sprinkled with same, grayish at apex; the ocelli repeated, but greatly enlarged, with ochraceous rings and small white pupils; in one example these ocelli are of nearly equal size, but in the other the lower one is obsolescent, represented by a brown dot in a small pale brown spot; across the disk of secondaries an irregularly sinuous and partly angular black stripe, and another less distinct near base, the two forming the outlines of a broad band; the whole wing streaked and sprinkled with dark brown, but the streaks are extremely fine and almost obsolete; color from base to outer edge of the band yellow-brown, but beyond the band clouded with gray; the ocelli are from three to six in the two examples examined, in pairs of three in the one case, a tolerably large one forming the middle of each, the others minute, one or two obsolescent; in the other example the ocellus on second median interspace is distinct and pupilled, but the other two are obsolescent.

Female.—Expands 2 inches.

Paler, with the extra-discal area a shade lighter; on this are the two ocelli, the upper one large, with white pupil, the other medium, without pupil, each in pale yellow ring. Under side brown, with a yellow tint and suffused with whitish-gray, largely over the extra-discal area of each wing; all the markings distinct; primaries more heavily streaked than in male,

secondaries very finely streaked; the discal stripe on primaries pretty regularly curved, a little convex outwardly, and projecting a spur along submedian nervure; on secondaries this stripe is wavy and crenated, but not angular, projecting considerably opposite the cell; the inner line is nearly straight across cell and bends at a right angle towards base in the subcostal interspace; the ocelli of primaries scarcely larger than on upper side, and pupilled; secondaries have the ocelli disposed as in male.

From 2 ♂, 1 ♀. The species belongs to the *Nephele* group, and may be distinguished, especially in the female, by the hoary under surface, with distinct markings.

Pholisora oricus.

Male.—Expands 1 inch.

Upper side brown, primaries somewhat dusted with gray scales, and marked with black; across the disk a series of long black serrated spots, the points reaching nearly to hind margin; on the upper three of these are three minute white spots, forming a curved demi-band; a small dull gray spot on the serration which occupies the upper median interspace, and a similar one near inner margin; across the wing near base a black band, also serrated, the upper part only being clearly distinguishable; fringes of primaries brown, with a few white hairs; of secondaries brown. Under side glossy dark brown, a little dusted with gray; the white spots of primaries repeated.

From a single example. This is near *Alpheus*, Edw., a New Mexican species, but is smaller, and is without the whitish spots on under side of secondaries, which are found in that species. *Alpheus* also is without the gray spots on upper side of primaries.

Argynnis Nevadensis, Edw., But. N. A., vol. 1, pl. 33.

This species has long puzzled me, inasmuch as there seemed too much discrepancy in size between the sexes as figured, and difference in the coloration of the under sides. Except in a few species of Argynnis where the coloration throughout differs in the sexes, as *Diana*, *Leto*, &c., there is a very close resemblance, so that if two sexes of one supposed species constantly vary in the coloring of under side, and in the form and size of the silver spots, it becomes highly probable that there are two species involved. And I am now satisfied that this is the case with what has been known as *Nevadensis*, since examining the very rich series of examples

sent me by Mr. Morrison. Here are a score of males corresponding in size and coloring of under side with the male of my Plate. Some of them are as pale fulvous above, but most are deeper red. With them are twelve females, agreeing in size, and of same coloration beneath; that is, both are yellow on secondaries, mottled with green. The males expand from 2 in. to 2.3 in., and females from 2.25 to 2.5 inches. On the other hand, here is another series corresponding to the female of the Plate, the under side brown, with olive tint, on yellow ground. The males expand 2.5, the females 2.7 and 2.8 inches. I have now no doubt that the female figured and described is *Coronis* Behr, a Californian species, abundant in some districts, but sparingly represented in Nevada. In this Mr. Henry Edwards agrees. I shall give a Plate of *Coronis* and of the true female of *Nevadensis* in due time.

A. MONTIVAGA, Behr, and allies; and A. Zerene and allies.

1. MONTIVAGA. Mr. Mead also made large collections in Nevada, in 1878, all which I have had the opportunity of examining. Among them were scores of examples of the smaller species of Argynnis, Group I. Mr. Morrison has also sent me upwards of sixty of these, comprising every variation observed by him. I have Dr. Boisduval's type specimens of *Egleis* and *Mormonia*, labelled by himself, the word "type" written on each label. I have also well executed and colored figures of Dr. Behr's Argynnids. Nos. 4 and 5, described in Proc. Cal. Acad., 21st April, 1862, sent me at that time by Dr. Behr himself. In same Proceedings, 1863, Dr. Behr proposed for his No. 4 the name *Montivaga*, but No. 5 received no name from him then or afterward. No. 4 *(Montivaga)* was characterized by the light hue of upper surface as compared with most of the related species; under side of hind wings reddish-brown, with a few diluted spots, those of the intermediate fascia quadrangular rather than oval, and not edged on the marginal side by black. On the other hand, No. 5 is stated to be easily recognised by the black bordering of the intermediate fascia, their oval not quadrangular shape. In 1864, I published a paper entitled "Notes on the Argynnides of California," Proc. Ent. Soc. Phil., in which Dr. Behr's papers were recited and an abstract of them given. In this I said that the author seemed to me to have re-named an old species, viz., *Astarte* Doubl., which appeared to be identical with the No. 4, and I transferred the name *Montivaga* to No. 5. It was afterwards discovered that *Astarte* was not an American species,

and Dr. Behr's name was therefore not a synonym, but became the rightful species name of No. 4, as he originally imposed it. Mr. Strecker, Catalogue, page 114, has recently re-named this species *Argc*, which of course becomes a synonym. For several years, and until Mr. Mead's specimens came to view, I had lost sight of Behr's No. 4, and any examples of it in my collection must have long since disappeared. To this unsuspected loss may be attributed the errors upon this sub-group of species contained in my Catalogue of 1877. I therein gave

123. EURYNOME, Edw., syn. *Astarte*, Edw., not Doubl.

124. MONTIVAGA, Behr, syn. *Egleis* Bois.

125. MORMONIA, Bois.

126. IRENE, Bois. I believe *Irene* to be a good species, but it belongs to a distinct sub-group from *Montivaga* and *Egleis*, near to *Calippe* Bois., through *Liliana* H. Edw., it appears to me. I have Dr. Boisduval's type specimen of it. It is size of *Egleis*, deep red above; below the spots of hind wings are one-half larger than of *Egleis*, those of second row subquadrangular and buff colored, on red-brown ground; and the belt between the two outer rows of spots is narrower than in *Egleis*. Neither Mr. Mead nor Mr. Morrison found it in Nevada. The series of species should therefore run thus:

IRENE, Bois.

Egleis, var. *Irene*, Bois., 1869.

Sub-group.

123. EURYNOME, Edw.

124. MONTIVAGA, Behr, 1863; "No. 4," id., 1862.
Astarte, Edw., not Doubl., 1864.
Argc, Strecker, 1878.

125. EGLEIS, Bois., 1869.
♀ *Mormonia*, Bois., 1869.
Montivaga, Edw, not Behr, 1864.

The No. 5 of Behr is *Egleis* Bois., of which *Mormonia* is the female, as the type specimens show. *Egleis* is larger than *Montivaga*, which last is the smallest of this sub-group found in Nevada and California. It is deeper fulvous above and on the under side very variable, both in the coloration of the ground of secondaries, which varies from buff to yellow, more or less mottled over basal and discal areas with dull ferruginous-brown, lighter or darker. The spots are well silvered, or very slightly, or

not at all, in this last case being of a clear yellow-buff. Sometimes the marginal spots are silvered, the others not. Some examples have the ground with a reddish tint. But whatever the variation in other respects, the spots of second and third rows are heavily edged with black on the basal side. The females agree closely with the males in coloration and variability. In *Montivaga*, the ground of secondaries is red-tinted, the basal and discal areas are pretty uniform reddish-brown, light and not deep; the spots are moderately silvered. In a larger series than I have examined probably some examples would be well silvered, some with no silver at all. The black edging of the spots is at most very slight indeed, often nil, or represented by a few scales only. The females are of same expanse of wing and resemble the males in coloration below, the spots being well silvered; but they are paler on upper side, with the spots corresponding to second silvered row, light colored a little like *Calippe*, as Dr. Behr notices in his first paper spoken of. I have three females lately received from Plumas Co., Cal., and probably this species has a wide range among the mountains.

2. ZERENE, Bois. In Mr. Strecker's Catalogue all the above-named species, and *Rupestris* Behr, with a query, are set down under the title *Zerene*, Bois., as varieties thereof (*Montivaga* everywhere being called *Montivago*, which is not Behr's name). Now *Zerene*, Bois., and *Monticola*, Behr, are either forms of one species, or two species so closely related that Boisduval's diagnosis of *Zerene*, in 1852, covered both of them. *Zerene* has no particular affiliation with *Egleis* or its allies. It belongs to a distinct sub-group. Yet Mr. Strecker places what he allows to be two good species between *Monticola* and *Zerene*, namely, *Hesperis* and *Inornata* (which belong naturally to other sub-groups), besides two species which are just as certainly good and neither especially related to *Zerene* or to each other, namely, *Rhodope* and *Behrensii*, but are given as merely varieties of *Monticola*. His series runs thus: 205, MONTICOLA, var. a. *Rhodope*, var. b. *Behrensii*, var. c. *purpurascens*, H. Edw.; 206, HESPERIS; 207, INORNATA; 208, ZERENE, var. a. *Irene*, var. b. *Mormonia*, var. c. *Montivaga* ?, var. d. *Rupestris*; 209, EURYNOME; 210, ARGE. Besides that, *Zerene* and *Monticola* are either one species or stand together in a natural series; *purpurascens* is *Zerene* of Behr (Hydaspe Bois.).

Dr. Behr, in the paper of 1862, described a species as No. 8, and in that of 1863, applied to it the name *Monticola*. In a note under his

No. 3, *Leto*, he says "the diagnosis that Dr. Boisduval gives of *Zerene* certainly comprises two species." Giving to one of these the name *Monticola*, he leaves *Zerene* Bois. to the other. The former he characterizes by the under side of its hind wings being deep brown, approaching violet, the latter being cinnamon-colored. All this I set forth in my paper of 1864. before referred to. In 1869, Dr. Boisduval, without apparent knowledge of what had been done in the matter in this country, in his Lep. de la Cal., applied the name *Hydaspe* to what Behr had specified as *Zerene*, using these explanatory words: "This Argynnis, of which we have seen very few individuals, perhaps may be a local variety of that which we have before described under the name of *Zerene*. It is a little smaller, its wings are more rounded at summit; the under side of the hind wings is less vinous, with the yellow spots more clear colored and distinct. Besides this, the female has the marginal spots always yellow, like the others, and never silvered as in the female of *Zerene*." I have the type specimen of the male of *Hydaspe*, sent me by Dr. Boisduval, labelled and marked "type." It is cinnamon-colored and Behr's *Zerene*. The *Zerene* figured in But. N. A. has the under side of hind wings ferruginous, but in all other respects agrees with Behr's description and type, and was sent me by Dr. Behr as *Zerene*. The cinnamon-colored form I was unacquainted with till several years after my Plate was published, when I received it under the name of *purpurascens*, H. Edw., var. Edw. But. N. A., VI. pl. 32. In this series of examples from Nevada, embracing more than 100, taken by Messrs. Mead and Morrison, the ground color of hind wings varies from bright to dull cinnamon, ferruginous and brown. Some are buff overlaid with diluted ferruginous, including the belt between the two outer rows of spots, here and there the sub-color appearing; some have this belt clear buff and the rest of the wing mottled with a vinous gray. In some the cinnamon or ferruginous largely covers the disk, in others very slightly. Some have the under side of hind wings largely melanized. So with the silvering; some show the spots as clear buff, some buff with a few scales of silver. Of *Zerene*, I have found no male with all spots silvered beyond these few scales, though sometimes the marginal row is moderately silvered. The female varies in same manner, but some examples show more silvering, while others have not a trace of it. The typical *Monticola* of Behr is figured in my Vol. 1, pl. 27, and appears in these Nevada examples, the ground being vinous-brown, mottled with clear brown; the male without silver. But while the females of

precisely same coloration are sometimes quite unsilvered, in other cases they are thoroughly silvered on every spot. Variations of the ground color show a range from diluted ferruginous to brown, and in many instances both sexes are equally and well silvered throughout. In both *Zerene* and *Monticola* every phase of color of under side of hind wings in one sex can be matched in the other sex, and I count seven varieties which are readily distinguishable ; and where *Zerene* ends and *Monticola* begins I cannot decide. I am disposed to think, considering that all these variations occur in one locality, that the two forms represent one species, as Dr. Boisduval surmised. If *Zerene* type was peculiar to one district and *Monticola* type to another, I should hold them to be two distinct species, *always bearing in mind that a species is but a permanent variety.* Continuing the series of my catalogue, these species would then read thus :

127. HESPERIS, Edw.

Sub-group.

128. ZERENE, Bois., 1852.

VAR. HYDASPE, Bois., 1869.

Zerene, Behr, 1862.

purpurascens, H. Edw., 1876.

VAR. MONTICOLA, Behr, 1862.

DESCRIPTIONS OF TWO SPECIES OF AGROTIS, AND TWO OF APATELA.

BY A. R. GROTE, A. M.,

Director of the Museum, Buffalo Society Natural Sciences.

Agrotis vocalis, n. s.

♂ ♀. This species seems allied to *albalis* and *lagena*. The hind wings are whitish ; the fore wings are mixed gray, black and white. The lines are black, thick, single, dentate, the subterminal obsolete. A slight black basal submedian streak. Orbicular whitish gray, pear-shaped, lying parallel on the cell, tapering outwardly, cell shaded with black, the spot edged with black, not quite attaining the inner edge of the reniform,

which latter is obsolete, its inner curved edge alone visible. Median lines propinquitous, recalling in aspect some species of *Homohadena*. The t. p. line is much exserted medially, retiring inwardly to internal margin, approaching t. a. line as nearly as at costa. The line is dentate, forming points on the veins, followed by pale dots. T. a. line perpendicular, with a more prominent subcostal tooth. Median shade visible. Fringes concolorous. Collar gray, tipped with brownish; thorax darker gray. Abdomen whitish. Beneath whitish with incomplete line and dots. All the tibiæ armed. Male antennæ brush-like; the hind wings white with soiled veins and a faint terminal line.

Expanse 34 mil. *Habitat* Colorado. Dr. Bailey.

Agrotis vernilis, n. s.

♂. Antennæ sub-serrate, ciliate. This species belongs in appearance to the Western species, *Hollemani*, *silens*, *lagena*, *albalis** and *choris*, but the fore tibiæ appear unarmed. In color it is a darker gray than any of its allies, the hind wings evenly grayish fuscous and more obscure. In ornamentation it resembles *lagena*. The lines are obsolete. There is a submedian basal black dash. The median lines are indicated by black costal shades. The outer (t. p.) line is seen to be rounded over the nervules below costa, running well outwardly; in *lagena* there is an apparent angulation and the line is less outwardly produced. The veins are finely marked in black as in *choris*. The color is uniformly dark mixed gray; the ordinary spots paler. These latter are complete and distinct. The reniform is moderate, kidney-shaped, shorter, broader, less incised than in *lagena*, with a faint internal ring, finely edged with black more noticeably inwardly. The orbicular is similar in color, elongate, oblique, pear-shaped, tapering outwardly to the reniform which it attains; in *lagena* it lies parallel with the cell and fuses with the reniform, while differently shaped. T. p. line indicated by pale venular points. Fringes concolorous gray-fuscous. Thorax concolorous with primaries; a fine black line crosses the collar. Beneath fore wings dark, hind wings pale fuscous; a common, transverse, dark, discontinued shade line; discal spot small, open on hind wings, luniform on primaries. Hind wings darkly irrorate on a whitish ground.

Expanse 40 mil. *Habitat* Colorado. Dr. Bailey.

* Mr. Hill has recently taken in Lewis Co., N. Y., a specimen indicating an Eastern species allied to *albalis*.

Apatela distans, n. s.

♂. Allied to *A. brumosa (= verrillii)*, but distinguishable at sight by the narrower wings and in that on primaries the exterior line is much further removed towards the base of the wing, while the hind wings are whitish. These characters will separate this form, of which two or three specimens have come under my notice, from any of the varieties of *brumosa* with certainty. The primaries are more pointed than in its ally; the subterminal space is wider. It is not so bright or varied a gray as *brumosa;* the markings are very similar, the reniform touches the t. p. line on the vein. There is a blackish stain below the basal streak over the claviform, else the wing is evenly mixed fuscous gray, without the black discal and subterminal shadings of *brumosa*. Hind wings smaller than in *brumosa*, smoky pellucid whitish without marks. Beneath whitish with obsolete line. On the primaries above the black streaks inaugurating the transverse lines are more equidistant than in *brumosa;* this is especially noticeable in that the outer of the two component lines of the t. a. line is nearer to the in eption of the median shade above the orbicular. The median space is thus seen to be narrower than in its ally and the orbicular appears less isolated.

Expanse 34 mil. Montreal, Mr. Caulfield.

Apatela parallela, n. s.

♂. This species belongs to the *tritona* group which is represented in my collection by *grisea (= pudorata), tritona* and *falcula*. It differs from any of these by the greater evenness of the t. p. line and the row of black dots at the base of the fringes of primaries. The hind wings are white, allying the moth to *grisea*. Head and collar blackish gray, darker than the gray thorax. Sides of the tegulæ edged with brown. Edge of the thorax behind tipped with black scales; basal abdominal tuft mixed with black. Fore wings smooth dark gray. A fine basal dash to the double inner median line, which has a subcostal tooth and is inwardly bent below median vein, but else is even. Lines and median shade marked by black costal dots. Stigmata concolorous, separate, with faint interior shades, ringed with black; orbicular spherical, reniform of the usual shape. T. p. line even, double, outer line black and thick, very slightly irregular opposite the disc, followed by a faint brown shading, with a black submedian dash crossing subterminal space, but apparently not reaching the margin. Fringes finely interlined at base, gray, whitish at tips with a

distinct series of black dots at base. Hind wings pure white, with a faint and narrow terminal line; fringes white. Beneath grayish white; ornamentation obsolete. Abdomen above whitish gray, below paler. Palpi black at the sides, white beneath.

Expanse 32 mil. *Habitat* Colorado.

SPHINX EREMITUS.

BY THOS. W. FYLES, COWANSVILLE, P. Q.

This species first came under my notice four years ago. I have met with it every year since, have raised it from the larva, and have taken the perfect insect at Honeysuckle. I find a drawing of *S. eremitus* in No. 13 of Strecker's Work on the Lepidoptera, and an account of the larva written by Prof. Snow, of Kansas. The account is as follows:

"Length 3½ inches, greatest thickness .56 in. Head greenish brown with distinct white stripe on each side; general color of body pale green, with seven oblique lateral white bands; caudal horn black and in length .37 in. It becomes full grown from 21st of September to 15th of October; imago appears from May 20th to June 10th. Food plants, *Salvia Pitcheri* Torrey, and *Salvia trichostemmoides* Pursh. The larvæ were first observed by me in October, 1873, in great abundance, and several imagines were obtained from them in the following May and June. The species is double-brooded."

My own account of the larva is this:

Discovered in September, 1874, feeding on *Salvia officinalis.* Sepia-colored—slightly granulated like "shagreen"—having a varnished appearance. Anal horn black, rather small. The first segments (i. e., those to which the pro-legs are attached) horn-colored and semi-transparent, having *two black shield-shaped blotches upon them, of which the hinder is much larger than the former.* Pro-legs black. Transverse side-lines whitish, the hindmost of them broader than any of the others. Spiracles black. Head with two longitudinal whitish lines.

I have seen, I suppose, thirty of the caterpillars, and this description would answer for any one of them. The difference in the body-color of the insects described by Prof. Snow and that of those described by myself, is no greater, perhaps, than I have met with in the case of individuals of *S. quinquemaculata.* But I do wonder that I have never come across any "pale green" specimens, and also that nothing resembling the

shield-like patches, which have been so conspicuous in all the larvæ I have met with, seems to have been noticed by the Professor in the larvæ he describes. The specimens of the perfect insect I have in my cabinet are rather smaller, and much darker, than the representation in Strecker's work.

NOTES ON THREE SPECIES OF XYLOCOPA.

BY W. H. PATTON, WATERBURY, CONN.

XYLOCOPA MICANS Lepel.

X. micans Lepel., Hym. ii., 208, ♂; Smith, Tr. Ent. Soc. Lond. 1874, 297, ♂ ♀.

X. vidua Lepel., Hym. ii., 210, ♀.

X. purpurea Cress., Tr. Am. Ent. Soc., iv., 284, ♀; Smith, Tr. Ent. Soc. Lond., 1874, 299, ♀.

From Mr. L. Heiligbrodt I have received a specimen of *X. purpurea*, and it agrees in all respects with the female of *micans*. Accompanying this was a male, evidently of the same species. It agrees perfectly with Smith's description of *micans* ♂, presenting only a few slight characters not mentioned by him. The length is eleven lines, the sides of the venter are blue, the tibiæ and the basal joint of the tarsi are more or less testaceous beneath, and the intermediate and posterior tibiæ and a part of the basal joint of the posterior tarsi are clothed with fulvous pubescence.

XYLOCOPA VARIPUNCTA, n. sp.

♀. Length 13 lines. Black, with black pubescence; wings dark brown, with brassy and coppery reflections; flagellum beneath, except basal joints, piceous. Clypeus with large sparse punctures, the clypeus limited above by a smooth slightly elevated ridge; a tubercle between the antennæ, a small pit behind each posterior ocellus; base of the mandibles with few punctures and not excavated, labrum with three uneven ridges or tubercles. Disk of mesothorax and scutellum above without punctures, scutellum truncate. Abdomen punctured, the apical margins of the segments and the median line on segments three to five without punctures; the punctures on segments one and two finer and more numerous than those on the following segments.

Arizona. Two specimens (C. V. Riley). Related to the West Indian *X. mordax* Smith.

XYLOCOPA FIMBRIATA Fabr. A female specimen collected in the Yosemite Valley, Cal., by Mr. F. V. McDonald, adds this species to the fauna of the United States.