

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

Coloured covers/
Couverture de couleur

Coloured pages/
Pages de couleur

Covers damaged/
Couverture endommagée

Pages damaged/
Pages endommagées

Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée

Pages restored and/or laminated/
Pages restaurées et/ou pelliculées

Cover title missing/
Le titre de couverture manque

Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées

Coloured maps/
Cartes géographiques en couleur

Pages detached/
Pages détachées

Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)

Showthrough/
Transparence

Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur

Quality of print varies/
Qualité inégale de l'impression

Bound with other material/
Relié avec d'autres documents

Continuous pagination/
Pagination continue

Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure

Includes index(es)/
Comprend un (des) index

Title on header taken from:
Le titre de l'en-tête provient:

Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

Title page of issue/
Page de titre de la livraison

Caption of issue/
Titre de départ de la livraison

Masthead/
Générique (périodiques) de la livraison

Additional comments: / **Wrinkled pages may film slightly out of focus.**
Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

The Canadian Entomologist.

VOL. XXII.

LONDON, MARCH, 1890.

No. 3.

POPULAR AND ECONOMIC ENTOMOLOGY.

THE MEDITERRANEAN FLOUR MOTH (*Ephestia kühniella*, ZELLER).

BY JAMES FLETCHER, OTTAWA.

During the summer of 1888 considerable anxiety was caused amongst North American millers by the alarming intelligence that the small Pyralid moth, bearing the name given above, had made its appearance in one of our large Canadian milling centres. There are two or three well-known insects which attack manufactured cereal products; but none of these, have ever occurred in injurious numbers in Canada. When, therefore, it was learned that a large warehouse, twenty-five feet wide, seventy-five feet deep and four stories high, had been completely over-run by the caterpillars of a new insect, which had infested all the flour and other manufactured foods therein contained, and had rendered much valuable machinery temporarily useless, it naturally caused much excitement lest the pest should spread to other mills; nor did this excitement abate when it was announced that the new comer was the same species as had been causing so much loss and trouble in English and European mills during the last ten years. The attack was so severe that it became necessary to close the mill where the outbreak occurred, and also to destroy a large quantity of goods. The insects in all stages were to be found in every part of the building. The cocoons were found adhering to the walls, joists, shelves and ceiling. Every crack or nail hole in the wood-work, machinery and furniture throughout the whole building was found to contain caterpillars or cocoons, and the moths were flying about in thousands. The attention of the Ontario Government was called to

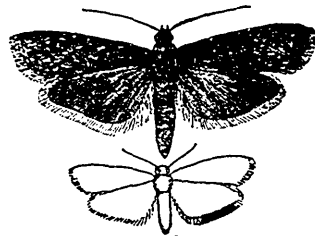


FIG. 2.

the matter in August last, and, under instructions from the Hon. Charles Drury, the Minister of Agriculture, prompt and vigorous steps were taken by Dr. P. H. Bryce, Secretary of the Provincial Board of Health, to ensure the extermination of so dangerous a visitor, which has been described as "the scourge of the Mediterranean ports." Dr. Bryce's investigations and the methods he adopted have been published in Bulletin I. of the Provincial Board of Health. This pamphlet, which is written in a clear, intelligible manner, and is illustrated with figures* of the insect in its various stages, will certainly be of great use to millers in showing them how to recognize and wage war against the insect should they meet with it upon their premises. Other valuable sources of information on this subject are Miss E. A. Ormerod's article in her Twelfth Report (pp. 66-72), and Prof. Riley's article in "Insect Life" (Vol. II., pp. 166-171). The object of the present note is to draw the attention of our readers to the subject, so that the gravity of the case may be recognized and prompt advice sent either to our Society or to the Ontario Government in case of further outbreak occurring in other parts of the Province. The perfect moth is a slender species about half an inch in length, with the wings folded close to the body when at rest. The upper wings are of a leaden grey colour, more or less sprinkled with black scales and crossed by three waved dark lines, two near together at the tip and the other a little nearer the shoulder than the middle of the wing. Just beyond the middle and in the centre of the wing is a black dot (sometimes two). The under wings are greyish-white, edged by a dark line, and all the wings are conspicuously fringed. The eggs, which are about $\frac{1}{40}$ of an inch in length, are oblong, bluntly rounded at the ends, or sometimes rather kidney-shaped. Under the microscope they are pretty objects, being covered with rather large but indistinct star-shaped prominences, the rays (or wrinkles) of which are waved. As a rule the eggs are laid singly, but sometimes in strings of from three to fourteen, connected at their ends. In nature they are probably laid on the outside of sacks, or are possibly pushed in between the meshes by means of the long ovipositors of the females. One female confined in a glass bottle closed with a plug of cotton batting had forced her eggs into the cotton plug to a depth of over $\frac{1}{4}$ of an inch. When first laid the eggs are greenish-

*Fig. 2, showing *E. kuhniella* enlarged, and of the natural size in outline, is kindly lent by Dr. Bryce.

white, after about twelve days they turn purplish, and in nineteen days (in September and October) the young caterpillars eat their way out of the eggs.

When first hatched they are reddish-brown, with dark heads, slender, hairy, and very active. They at once begin to spin a silken thread wherever they go. When full grown the caterpillar is three-quarters of an inch in length, slender and cylindrical; of a greenish-white, but pink where the skin overlaps. The head is reddish-brown. Upon the segment next to the head, and on the last segment, are two chitinous plates of a honey-yellow colour, known, respectively, as the thoracic and anal shields. Along the sides of the body are four rows of dark piliferous tubercles, the most distinct of which are those upon segments 2, 3 and 13. These tubercles are arranged in four series, as follows:—Subdorsal (two on each segment, from 5 to 12), lateral, substigmatal, and supra-ventral. The substigmatal series is double throughout, each tubercle bearing two bristles, separated a little at the base. On segments 3, 4 and 13 the subdorsal and lateral series are represented by a single double tubercle instead of two separate tubercles, as on the other segments.

These tubercles are small but distinct, the dark colouring is in the form of a cloud round the bases of the bristles. On the anterior section of segment 13, the two subdorsal rows of tubercles are joined by a dark cloud, and there is a large double conspicuous tubercle in the lateral area. When full-grown the caterpillars crawl to some crevice or corner and enclose themselves in close cocoons, into which they spin particles of flour dust, or any other material at hand. The chrysalis is honey-yellow at first, but turns darker as the moth matures within it. In about three weeks the moths appear, pairing takes place and eggs are laid within 24 hours.

Remedies.—As to remedies, these will have to be applied according to circumstances. In the attack above referred to, all machinery was brushed and subjected to a blast of super-heated steam. Fumigation, with sulphur and chlorine, was also resorted to. The experience of all who have had the misfortune of being visited by this pest is, that the only safeguard is scrupulous cleanliness. In Canada, where we have several months consecutively of severe winter weather, there should be no very great difficulty in keeping this pest down if millers will only recognize the danger of being indifferent. It is hardly probable that cold will kill

the insects if they are left undisturbed in their silken tunnels ; but, if these are broken by constant sweeping, and the caterpillars are left exposed, cold will certainly injure them. Moths and caterpillars placed in a glass bottle, and exposed to a temperature of five degrees above zero (Fah.), were all severely crippled, and did not recover. The above facts suggest the advisability of occasionally opening mills, which are supposed to be infested, so that the cold of winter may penetrate. If the moths are seen about in spring, fumigating with sulphur at short interval must be practised. Old sacks received from outside sources should be carefully examined, as these would probable be the most frequent means of carrying the pest from one mill to another. It is probable that this insect passes the winter in the caterpillar state, in which it is more or less active, according to the temperature.

SOME NEW COLORADO MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Cossus Brucei, nov. spec.

Expanse, male 2.50, female 3.00 inches.

Ground color, very pale gray, almost white, no dusky shading over the wing. Fore wings crossed by a great number of fine black lines. In the male none of these form reticulations except a few along the basal half of the internal vein and near the outer margin. The female has a few more of the reticulations in the outer third of the wing. On the male one line more prominent than the rest crosses the wing through the middle from the costa to the posterior margin at the origin of the fourth median vein, forming a straight line. On the female this line follows the fourth median vein about a tenth of an inch, and then goes in a straight line obliquely to the margin, and is not so heavy as in the male. Both sexes have a sub-terminal line not quite so prominent as the median, from near the apex to the posterior angle, bifid on costa, nearly straight in the male, slightly curved outwardly in the female, reaching the angle in a fine line. Veins dark only as denuded. Hind wings, with a space at the base and along

the inner margin, covered with long hairs as usual, the rest reticulated ; of the same color as the fore wings.

Head gray, darker in the male ; color slightly more buff tinted than the ground color of the wings, making a light drab, without marks ; thorax gray, a mixture of the ground color of the wings and black, a black line round the posterior margin preceded by a space devoid of black ; abdomen of a lighter gray than the thorax. Beneath the thorax and abdomen concolorous with the same parts above, the legs ringed with light.

This species is nearest to *Cossus Angrezi* Bailey, but differs from that in several particulars. It lacks the dark shading on the fore wings, in the shape and distinctness of the transverse median line on fore wings, and in the shape and position of the subterminal line. The fore wings are a little less rounded at the apices, otherwise they are shaped alike. The hind wings in this species are reticulated over the terminal two-thirds, while in *Angrezi* the reticulations do not cover quite half. In *Angrezi* the thorax is black, with the edge of the tegulae shaded with yellowish gray ; in this the thorax and tegulae are both gray. The antennae are pectinated in both sexes, most heavily so in the male. The under side of the wings repeat the markings of the upper side, but a little blurred. The space between the two transverse lines is a little shaded with brownish. The female has the ovipositor exerted about .30 of an inch.

Described from two examples, one of each sex, taken by David Bruce, in Colorado, in 1887, and in the name dedicated to him.

Tolyte distincta, nov. spec.

Expanse, male 1.12½, the female 1.50 inches.

Male.—In color and markings between *Velleda* and *Laricis*, rather a dark leaden gray ; the fore wings crossed by two geminate lines and a subterminal line, similar to those of *Velleda*, but the subterminal line is also inclined to be geminate. These lines are lighter than the ground colour, but not white as in *Velleda*. The geminate lines bordered each side by a shade line that is slightly brownish ; fringes concolorous, a whitish gray line at the base. Hind wings nearly the color of fore wings, a pale shade through the middle and at the outer border ; fringe like that on fore wings.

Head and thorax gray, the front a little mixed with brown, the middle of thorax with the usual glossy brown scales in the form of a longitudinal crest; abdomen gray, brown tinted, the sides at the base white, beneath a little paler than above; antennæ strongly pectinate.

Female.—Color and markings as in the male, the bands and veins a little more decided in contrast of color with the wings. Thorax dark leaden gray, patagiae rather lighter gray than the wings; the entire absence of white anywhere.

This species is between *Velleda* and *Laricis* in size, as well as markings and colour. The antennæ are strongly pectinate, more so than *Laricis*, but not so much as *Velleda*. There is no decided white on either sex, except on the sides of the abdomen of the male, the cross bands and veins of the fore wings being whitish gray. The fringe of the fore wing show a tendency to be paler at the ends of the veins, but they are not pale externally, as are those of *Velleda*.

Captured by Mr. David Bruce, in Colorado, and described from two males in my cabinet, and one female in that of Mr. Bruce.

Halisidota occidentalis, nov. spec.

Expanse, 1.30 inches.

Fore wings hyaline, except the anterior part to subcostal vein, the base, and the posterior part along the submedian vein and a little above that at the base. The costal space alternately four patches of yellow, between a buff and a chrome yellow, and yellowish brown; the posterior margin alternately two spots each of the yellow and brown, the basal yellow and the terminal brown spots the longest. From the costal brown spots three irregular sub-hyaline brown bands extend across the wing, the two outer connecting with the two brown spots on the posterior margin, the third from the outer margin not reaching the margin but blended posteriorly with the second; the sub-basal brown spot on the costa is in line with a red-brown spot on the median vein at base; the subhyaline brown, is darker than that on the costa. The hyaline spaces left between these brown bands corresponds to the light bands in such species as *Agassizii*, etc. Veins brownish yellow, as also the extreme outer portion of the wing. Hind wings hyaline, immaculate; fringes of both wings pale.

Head pale yellowish brown, a yellow transverse stripe in front, antennæ

pectinate, pale yellow-brown. Thorax yellow buff; collar, a dorsal line and a line on outer edge of patagiae brown, the edge of collar next to head yellow; abdomen yellow; beneath pale yellow, with the front of anterior legs brownish.

Described from one male taken by Mr. Bruce, in Colorado.

Halisidota subalpina, nov. spec.

Expanse, 1.55 inches.

Fore wings yellow-buff, so sprinkled with brown scales as to appear quite brown, crossed by six rows of spots that are part yellow and part white, all except the costal surrounded by a brown annulus. The first row is of two spots, the first on costa and the second on median vein, all yellow; the second row is of three, the first large and at right angles to the other two very small white ones; the third row is of five spots, the costal yellow, the next three white, the second very small, the third and fourth equal, the fifth yellow and lacking the basal part of annulus; the fourth row is of five spots, the costal yellow, the second large and in the cell white, the third a brown spot, the other two small, white; the fifth row of six spots all white except the costal, the first and second only separated by the vein, the sixth very small; the sixth row is of nine spots, all white but the costal, the first, second and ninth very small, the seventh and eighth tending to fuse, the ninth removed inward out of line with the others. The last spot in four of these rows is below the submedian vein. Fringes brown, with buff at the ends of the veins. Hind wings pale buff, a pale stain spot at the end of cell and at the apex.

Head yellow in front, brown between the antennæ, antennæ pale yellow brown; collar buff, a central line and a spot each side brown; thorax buff, a brown line each side of the centre; centre of patagiae pale buff, with a brown line each side, the two uniting in front; abdomen buff. Beneath similar to the upper but paler, the abdomen with a central and lateral brownish stripe, the costa of hind wings with three brown stains.

Collected in Colorado by Mr. David Bruce. Described from one male. This species is near *H. Scapularis* Stretch, but differs in size, colour and markings. In *Scapularis* all the spots are white, and the ground color is brown, with the thorax brown instead of buff. These are a few of the differences between the two species.

NOTES ON *EREBIA EPIPSODEA*, BUTLER.*

Epipsodea was first known to me by examples taken by Mr. T. L. Mead, in Colorado, 1871. He says, in Report of the Wheeler Expedition: "This species inhabits the mountains of Colorado below timber line. Specimens were brought from Fairplay by the Expedition. It begins to appear about the first week in June, is common by the middle of that month, and remains until the last of July."

Several examples were received in 1883, by Mr. William M. Courtis, from Judith Mountains, Montana, at about 4,000 feet elevation, in July. From Mr. Ernest Stevenson, at Walla-Walla, southeast Washington, came some unusually large specimens, late in June, 1885; others from Spokane Falls, in east Washington, by Dr. W. J. Holland. I have also received this species from St. Michaels and Nushagak, Alaska; and have received eggs from Mr. Thomas E. Bean, at Laggan, Alberta. On the other hand, I have not seen *Epipsodea* from south Colorado, or New Mexico, or Arizona, or Utah, nor from the Sierra Nevada range anywhere. So far as appears, it is confined to the Rocky Mountains from middle Colorado northward to the Arctic sea, but flies over the lowlands in its northernmost range, and may there have a wide distribution. Many examples from Colorado are small, the wings expanding less than any seen from Alaska; and the largest have come from Washington. Throughout its territory the two principal varieties seem to be found, the banded and not banded.

Mr. Butler described the species from two individuals "from Rocky Mountains," but the locality was not stated.

Mr. Bruce writes: "I first met with *Epipsodea* in Platte Canon, Colorado, at about 9,000 feet elevation. It frequents damp and boggy places where the grass grows rank and coarse. In such situations, up to nearly 12,500 feet, I found it rather common. In one place, at the highest altitude named, a small stream of muddy water from a mine had been conveyed in wooden troughs which emptied into a basin-like depression; in this place, being always moist, the grass and flowers grew luxuriantly, and many species of butterflies were in profusion. *Epipsodea* was plenty, and in almost all the examples I captured here, the ocelli on

*From Edwards's Butt. N. A., Vol. 3, Part IX., issued Feb. 1, 1890. As comparatively few of our readers are likely to see this work, we have thought it worth while to reprint these interesting notes.—ED. C. E.

upper wings were absent. Many had none on lower wings, others showed black points more or less minute.

"This variety, which Mr. Elwes has called *E. Brucei* I see, is probably peculiar to these high stations, where I have found it during three seasons, for, in the valley below, there was a narrow, boggy tract, more than a mile long, where *Epipsodea* was plentiful; but I found none of the variety spoken of. The only variation there was marked by the absence of the band on under side hind wings, and this was confined to few individuals.

"*Epipsodea* has a rather quick, jerky flight. It is not very readily captured, for, although it never appears to be in a great hurry, it flies close to the ground, and is always just ahead, dodging under every bush, and around every grassy hummock, as if in earnest search for something. It takes long flights without going far away, and seldom alights on flowers. Directly the sun is obscured, it dives in the grass, like almost all the mountain diurnals. All the *Erebias*, as well as the alpine species of *Chionobas*, 'play possum,' and pretend to be lifeless when captured, and will lie in or under the net, or on one's hand, some moments in that condition. I have found *Epipsodea* from June 9th to the end of August, in the front Range, in Colorado; at the latter date it was badly worn."

Mr. Elwes says, *Tr. Ent. Soc., Lond., 1889, Part II, p. 334*: "I have a single specimen, and Mr. Godman has a similar one, collected by Bruce in Cashier Valley, Summit County, Colorado, at 12,000 feet, which are considered by Bruce and W. H. Edwards to be a variety of *Epipsodea*, though it is so different from it that, had I more specimens, I should be inclined to consider it a different species, more especially as *Epipsodea* does not appear to extend to such great elevations, or to vary much; though its range of altitude is very great. I have taken it in Idaho at about 2,000 feet elevation, and in the Yellowstone Park at 5,000 to 6,000 feet, and have it from Colorado, taken by Bruce, as high as 9,500 feet. The specimens above mentioned are somewhat smaller, and with rounder wings, than the average of *Epipsodea*, but are best marked by the entire absence of ocelli on either wing or on either surface, and the partial disappearance of the red band." In the Synopsis of same paper, page 326, Mr. Elwes puts this under the species name as "? Var. *Brucei*."

Mr. Bean writes: "At Laggan, *Epipsodea* is moderately common in June and early July, frequenting open, grassy flats of the Bow River valley,

at an altitude of about 5,000 feet. It is, in my experience, rarely found on the mountains, but I took a single male, the past season on a mountain ridge, at 7,800 feet, or about 500 feet above the tree line. This specimen does not differ from those of the valley, 3,000 feet below. The form you mention (*Brucei*), which partly lacks the eye spots, I do not find.

"*Epipsodea* occurred at McLean, altitude 1,900 feet, in 1884, though not so common as it is at Laggan, and the localities were open grassy flats."

The eggs sent me by Mr. Bruce, in 1888, were laid by a female of this var. *Brucei*, not wholly destitute of spots, there being two or three black points on fore wings. The outcome was a single male, true type *Epipsodea*, scarcely banded beneath, out of chrysalis 12th May, 1888. The eggs were laid 8th July and hatched 20th. On 25th, there were seven young larvæ. The first one passed first moult 27th July, the second moult 4th August, the third moult 28th August. The others lingered in their stages, but by 15th September, five had passed third moult. They were at all times kept out of doors, and cool weather now coming on they ceased feeding gradually. On 29th October, I found but three larvæ, all in lethargy, two of the five having disappeared. In November, I took them to Clifton Springs, as before stated. On 5th April, 1888, I received them again, two alive and wide awake as I opened the box. These were at once placed on grass, and in five minutes thereafter were feeding. On 15th April, one passed its fourth moult, the other on 17th. On 30th April, I noticed that one was bringing together leaves of the grass and forming a sort of loose cylinder. It was in the middle of a pretty dense tuft, the leaves of which were three to four inches long. On one of these the larva rested, holding by its prolegs, and was spinning a few threads and drawing the leaves down and about it. Before night the inclosure was complete. Nearly a score of leaves were held, mainly by threads at top and bottom, that is, above and below the larva, making a pretty close covering, but open by spaces so that most of the side, and the head, were exposed to view. The larva rested head up, back arched. Mr. Scudder, in *But. N. E.*, has well characterized this structure as "an imperfect cocoon." Pupation took place on the night of 1st-2d May. Some hours after, when the chrysalis had hardened, I cut away the leaves one by one. There were fifteen of them, and the pupa rested upright, its lower end one and a-half

nch above ground, in an angle formed by three leaves. As I cut one of these, it turned over and fell, showing itself to be unattached. In fact the cremaster was found to be furnished with but straight bristles, very short, and there were no hooks by which attachment could be had. As before stated, a male of the typical form came from this chrysalis on 12th May.

I had received young larvæ of this species from Mr. Bean, at Laggan, 25th July, 1886, they having hatched *en route*. I lost all but one of these. It passed first moult 2d August, the second moult 10th August, and soon after became lethargic. I kept it at Coalburgh, and brought it into the house middle of January, 1887, apparently healthy. But a month later it unaccountably disappeared.

Mr. Bruce had also sent eggs from Colorado which reached me 28th July, 1886. From these, five larvæ reached second moult, and went into hibernation, and died during the winter. From the behavior of the different lots of larvæ, it appears that hibernation may take place at either second or third moult.

This, therefore, is the complete history of an *Erebia* from egg to imago, and, so far as I know, the first such that has ever been published of one of the genus. To get drawings of the several stages, it was necessary to send them to Mrs. Peart, at Philadelphia, through the mails, some five hundred miles, with risk of loss or damage. Indeed, the second larva was in Philadelphia in its last stage, and being returned to me, imperfectly pupated on the way, and died.

The genus *Erebia* comprises many species, nearly all of which are European and Asiatic. Dr. Staudinger, in 1871, enumerated forty-eight, many of them boreal, others alpine, the latter found as far to the south as the Pyrenees, Alps, Caucasus, and Himalayas. Great Britain is credited with three species, and, in Buckler's *Larvæ of British Butterflies*, Vol. I, on Plate VI, are figured the mature larva and pupa of one of these, *E. Blandina*, and the young larva of another, *E. Cassiope*. In the text, Mr. Buckler relates that he raised the larva of *Blandina* from the egg, obtaining pupa and imago; and a brief description of the several stages is given, that of the larval being imperfect, as nothing is said of the several moults. Nor is it told how the larva pupated. Nevertheless, the plate represents the pupa resting nearly upright on a tuft of grass, but not at all inclosed. It looks very much like the pupa of *Epipsodea*. So an incomplete des-

cription is given of the stages of *Cassiopæ*, but how pupation took place is not told, nor is there a figure shown. The young larva as figured has forked tails, and therefore, I apprehend, it must have been drawn after the first moult.

In North America, are eight or nine species, three at least of which are said to be old world, namely, *Tyndarus*, *Discoidalis*, and *Disa*. One species heretofore erroneously credited to North America, on the authority of Doubleday, *E. Vesagus*, belongs to the Andes, in South America.

The group is a very interesting one, and together with *Chionobas*, and some others, embraces those members of the Rhopalocera, or Diurnals, which are nearest the Heterocera, or Moths, allied to them in important characters in each of the four stages. The resemblances of the larvæ and pupæ are particularly striking. The latter are destitute of cremastral hooks in *Erebia*, in *Chionobas*, even of bristles, and pupation takes place, sometimes on the bare ground, sometimes in or on the sod, in one case, as we have seen, in an imperfect cocoon; sometimes in a real cocoon beneath the surface of the ground; or the larva goes into the ground and pupates naked, in a cavity made by the movements of its body, after the manner of nearly all the Sphingidæ.*

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 36, Volume xxii.)

A. placentia A. & S.

1797—A. & S.,* *Ins. Ga.*, II., 129 pl., 65, *Phalaena*.

1816—Hübner, *Verzeichniss*, 180, *Heraclia*.

1856—Wlk., *C. B. Mus.*, *Lep. Het.*, III., 610, *Arctia*.

1860—Clem., *Proc. Ac. Nat. Sci.*, *Phil.*, XII., 529, *Arctia*.

1862—Clem., *App. to Morris*, *Syn.* 337, *Arctia*.

1863—Saund., *Syn. Can. Arct.* 5, *Arctia*.

*NOTE.—Since the foregoing paper was printed, I have seen the *CAN. ENT.* for December, 1889, and learn therefrom (Vol. XXI., p. 238,) that Dr. H. Skinner has received examples of *Epipsodea*, caught in Assiniboia, about 325 miles west of Winnipeg, and with them one of the var. *Brucei*, mentioned as var. *Sine-ocellata*.

- 1873—Stretch, Zyg. and Bomb., 74, *Arctia*.
 1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, = *nais*.
 1883—Neum., Papilio, III., 150, *an sp. dist.*
 Habitat—Georgia, Canada.

A. quadrinotata Strk.

- 1878—Strk., Proc. Dav. Ac. N. Sci., II., 271, pl. IX., f. 6.
 Habitat—Texas.

A. quenselii Geyer.

- 1830—Geyer, Zutr. No. 424, ff. 847-848, *Arctia*.
 1849—Moeschl, Stett. Ent. Zeit. IX., 173, 174, *Euprepia*.
 1856—Wlk., C. B. Mus., Lep. Het., III., 611, *Arctia*.
 1858—Wlk., C. B. Mus., Lep. Het., VII., 1780, *Arctia*.
 1860—Clem., Proc. Ac. N. Sci. Phil., XII., 527, *Arctia*.
 1862—Morris, Synopsis, 223, *Arctia*.
 1864—Gn., Ann. Soc. Ent. Fr. 1864, 4e trim., *Nemcophila*.
 1866—Pack., Proc. Bost. Soc. N. H., XI., 34, *Arctia*.
 1873—Stretch, Zyg. and Bomb., 74 et 222, pl. IX., f. 8 (♀).
 1874—Pack., *Rept. Geol. Surv., 1874, 558, f. 14 (larva).
 1887—Smith, Ent. Amer., III., 109, *Arctia*.

gelida Moeschl.

- 1849—Moeschl, Stett. Ent. Zeit., IX., 174, *Euprepia*.
 1856—Wlk., C. B. Mus., Lep. Het., III., 611, *Arctia*.
 1860—Clem., Proc., Ac. N. Sci. Phil., XII., 528, *Arctia*.
 1862—Clem., App. to Morris Syn., 341, *Arctia*.
 1873—Stretch, Zyg. and Bomb., 74, *Arctia*.
 1873—Streckl., Lep. Rhop. et Het., 23, pr. syn.
 1883—Moeschl, Stett. Ent. Zeit., XLIV., 116, pr. syn.
 1883—Neum., Papilio III., 150, pr. syn.
 Habitat—Labrador, White Mts., Col.

A. rectilinea French.

- 1879—French, CAN. ENT., XI., 45, *Arctia*.
 1887—Smith, Ent. Amer., III., 110, *Arctia*.
 Habitat—Illinois, New York.

A. remissa Edw.

- 1888—Edw., Ent. Amer., III., 184, *Arctia*.
 Habitat—H. B. Terr.

A. rhoda Butl.1881—Butler, Ent. Mo. Mag., XVIII., 135, *Arctia*.

Habitat—United States.

This species bears the same relation to *ochreatea* Butl. that *decorata* Saund. does to *nais* Dru., and Mr. Butler suggests that it may be the female of either *phalerata* Harr., or *ochreatea* Butl.

A. saundersii Grt.1864—Grt., Proc. Ent. Soc., Phil., III., 75 et 324, pl. 4, f. 3, ♂, *Arctia*.1868—Saund., CAN. ENT., I, 27, *Arctia*.1873—Stretch, Zyg. and Bomb., 74, *Arctia*.1881—Butler, Papilio, I., 131, *Arctia*.1883—Hulst., Bull. Bkln. Ent. Soc., VI., 71, *parthenice*.1883—Neum., Papilio, III, 149, an sp. dist. *parthenice*.1887—Grt., Ent. Amer., III, 147, *Arctia*.1887—Grt., CAN. ENT., XIX., 32, an sp. dist. *parthenice*.
virguncula † Saund.1863—Saund., Syn. Can. Arct., 9, *Arctia*.1864—Grt., Proc. Ent. Soc., Phil., III., 75, pr. syn.
intermedia Stretch.1873—Stretch, Zyg. and Bomb., 216, pl. IX., f. 3, *Arctia*.

1875—Grt., CAN. ENT., VII., 197, pr. syn.

1883—Neum., Papilio, III., 150, an sp. dist.

1887—Smith, Ent. Amer., III., 110, an sp. dist.

Habitat—Can., N. Y., Mass., N. J., Ills.

Mr. Stretch's species *intermedia* is certainly not referable to *saundersii*, but to *stretchii* Grt. and *oithona* Strk.

A. simplicior Butler.1881—Butl., Ann. and Mag., N. H., ser. 5, VIII., 311, *Arctia*.

"Possibly a well marked variety of *A. achaia*; but apparently intermediate between that species and *A. saundersii*." So says Mr. Butler.

Habitat—Oregon.

A. snowi Grt.1875—Grt., CAN. ENT., VII., 197, *Arctia*.1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, = *nais*.

Habitat—Kansas.

A. shastaensis Behrens.1889—French, CAN. ENT., XXI., 35, *Arctia*.1889—French, CAN. ENT., XXI., 162, fig. ♀, *Arctia*.

Habitat—Mt. Shasta District, Cal.

A. speciosa Moeschl.1865—Moeschl., Wien. Ent. Monatschr, VIII., 195, pl. V., ff. 13-14
Arctia.1866—Pack., Proc. Bost. Soc. N. H., XI., 34, =*quenselii*.1873—Strk., Lep. Rhop. et Het., I., 23, *Arctia*.1874—Pack., Rept. Geol. Surv., 1874, 558, *quenselii* var.1883—Neum., Papilio, III., 150, =*quenselii*.

Habitat—Okak, Labr., White Mts.

(To be continued.)

NOTES ON THE INSECT FAUNA OF HIGH ALTITUDES IN
CUSTER COUNTY, COLORADO.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

(Continued from page 39, Volume xxvii.)

(2) Near Micawber Mine, Aug. 6—

Lysiphlebus salicaphidis Ashm.*Lipolexis chenopodiaphis* Ashm.*Limneria montana* Cr.*Periclistus* sp.*Apanteles* sp.*Diaeretus atricornis* Ashm.*Megachile* sp.*Andrena* sp.*Halictus* sp.*Sapyga aculeata* Cr.*Camponotus vicinus* Mayr.

" sp.

Perilampus platygaster Say.*Habrocytus rosæ* Ashm.*Passalæcus mandibularis* Cr.*Lysitermus coloradensis* Ashm.*Aspilota obscuripes* Ashm.

Aphidius montanus Ashm.

“ *atropetiolatus* Ashm.

Sphecodes dichroa Smith.

Prosapis affinis Smith.

Formica integra Nyl.

Dolichopselphus n. g., n. sp., Ashm.

- (3) Near Micawber Mine—

Pteromalus vanessæ Harris. Bred from a pupa of *Vanessa*. The larva of *P. vanessa* is about 2½ mill. long, and is tinged with purplish. The pupa is pale yellow, with the eyes red and very conspicuous.

- (4) Timber line and above, above Smith's Park Gulch, Aug. 5—

Bombus ternarius Say.

Habrocytus rosæ Ashm.

Nomia nortoni Cr.

Atractodes sp.

Mr. Ashmead remarks, concerning *H. rosæ*: “I first received this species from Messrs. James Fletcher and Harrington, who reared it from a rose-gall collected in British Columbia.” I have reared it from galls of *Rhodites ignota* O. S., and *R. fusiformans* Ckll., n. sp., collected at West Cliff.

- (5) Near Micawber Mine, Aug. 4—

Tapinoma sessile Say.

Lipolexis atriventris Ashm.

Habrocytus rosæ Ashm.

Leptacis tetraplasta Ashm.

Psilophrys occidentalis Ashm.

- (6) Smith's Park Gulch, Aug. 5—

Calliopsis sp.

Tenthredo occidentalis Cr.

“ *ferrugineipes* Cr.

Cremastus sp.

Tapinoma sessile Say.

Bracon sulcifrons Ashm.

Aphidius atropetiolatus Ashm

- (7) Micawber Mine, Aug. 7—

Lampronota coloradensis Cr.

Camponotus sp.

Formica sp.

Cremastus sp.

Passalwecus mandibularis Cr.

Figites coloradensis Ashm. ♀.

Apanteles sp.

Aspilota pallidipes Ashm.

Pimpla annulipes Brullé.

(8) Horeshoe Bend, 1887—

Urocerus flavicornis Fl.

Dolichoselphus Ashm., is allied to *Atractodes*, with abnormally lengthened maxillary and labial palpi.

LEPIDOPTERA.

Mr. W. H. Edwards has kindly examined many of the butterflies. The two species of *Cidaria* were identified by the Rev. G. D. Hulst.

(1) Lakes of the Clouds, 1887—

Colias meadii Edw.

(2) Near Micawber Mine, 1888—

Nathalis iole Bdv.

(3) Near Brush Creek, June 27, 1889—

Phyciodes camillus Edw.

Nisoniades icelus Lintn.?

Argynnis hesperis Edw.

Lycæna sæpiolus Bdv., ♂, ♀.

“ *oro* Scudd.

(4) Near Micawber Mine, June 27—

Pyrameis cardui L.

“ “ form *minor* Ckll., nov.

Anthocharis ausonides Bdv.

Vanessa milbertii var. *subpallida* Ckll.

Pieris oleracca Bdv.

Gnophaela vermiculata Grote.

Agrotis auxiliaris Grote.

Papilio rutulus Bdv.

Colias scudderii Reak.

Lycæna acmon D. and H.

P. cardui f. *minor* differs from the type only in being much smaller.

A *P. rutulus* was caught at the flowers of *Erysimum asperum* var. *alpestre* v. nov.

- (5) Timber line above Smith's Park Gulch, June 27—

Limenitis weidemeyerii Edw.
Chionobas chryxus West. and Hew.
Colias eurytheme Bdv.

C. chryxus was abundant, but difficult to capture because it flew over exceedingly precipitous and rocky ground.

- (6) Horseshoe Bend Gulch, June 27—

Argynnis Edwardsii Reak.
Grapta sp.
Vanessa antiopa L.

- (7) Timber line above Smith's Park Gulch, Aug.—

Brenthis sp.
Parnassius smintheus Dbl. and Hew.

- (8) Smith's Park Gulch, August—

Brenthis sp.
Colias alexandra Edw. ♂.
Chrysophanus helloides Bdv.
Gnophaela vermiculata Grote ♂, ♀.
Limenitis weidemeyerii Edw.

- (9) Near Micawber Mine, Aug.—

Gnophaela vermiculata Grote.
Cidara montanata Moesch. (Aug. 15).
 " *nubilata* Pack. (Aug. 4).

Pyrameis cardui L.
Vanessa antiopa L.
Parnassius smintheus D. and H.
Limenitis weidemeyerii Edw.
Alucita hexadactyla L.

Grapta sp.
Pieris protodice B. and L., ♂ (Aug. 6).
Chrysophanus helloides Bdv. (abundant).
Nomophila sp.

Botys sp.
Metrocampa margaritata var. *perlata* Guèn. (Aug. 6).

Plusia sp.
Clisiocampa sp.

Colias alexandra Edw., ♂, ♀

Pieris occidentalis Reak. (Aug. 6).

Satyrus charon Edw.

Colias eurytheme var. *pallida* Ckll.

“ “ var. *keewaydin* Edw. (Aug. 6).

“ “ var. *eriphyle* Edw. (Aug. 6).

(10) Horshoe Bend Gulch, Aug. 15—

Colias eurytheme Bdv.

ORTHOPTERA.

Ceuthophilus sp., near Micawber Mine.

HEMIPTERA.

The Hemiptera have been identified by Mr. Ashmead.

(1) Smith's Park Gulch, 1889—

Cicada sp.

(2) Timber line above Smith's Park Gulch, Aug. 5—

Nysius californicus Stal.

(3) Smith's Park Gulch, Aug. 5—

Lygus diffusus Uhler.

“ *pratensis* L., var.

(4) Near Micawber Mine, Aug. 6—

Podisus bracteatus Fitch.

Nysius angustatus Uhler.

Anthocoris melanocerus Reuter.

Corizus hyalinus Say.

Hadronema militaris Uhler.

“ *robusta* Uhler.

(5) Timber line above Smith's Park Gulch, July 27—

Lioderma viridicatum Uhler?

(6) Micawber Mine, Aug. 7—

Lygus pratensis L., var.

Idiocerus alternatus Fitch.

Pycnoderes insignis Reuter.

(7) Near Micawber Mine, Aug. 15—

Alydus eurinus Say.

(8) Near Brush Creek, June 27—

Dacota hesperia Uhler.

Lygus pratensis L., var.

DIPTERA.

Tipula sp., Micawber Mine, Aug. 7.

Musca domestica L., near Micawber Mine, Aug. 6.

Culex sp., Lakes of the Clouds, 1887.

Various other species of Diptera, etc., as well as some *Trichoptera*, and species of *Thrips* and *Tomocerus* (probably *plumbeus* L.), and many Aphides, are as yet undetermined. The Arachnida are represented by *Epeira* and *Misumena* (probably *vatica*), and *Phalangodes robusta* Pack. was found near the Micawber Mine, this being the highest altitude known for this species. The Myriapoda are represented by species of *Lithobius* *Geophilus* and *Julus*, and most interesting of all, *Polydesmus* was found near the Micawber Mine.

BIBLIOGRAPHY.—The only species hitherto recorded from 10,000 feet, or above, on the Sangre de Cristo Range, seem to be *Parnassius*, *Gnophaela*, *Brenthis* and *Bombus*. But some not very distinct ranges have been explored. Many species are recorded from Veta Paes, and Mr. Scudder has written (Appalachia, 1878) on the insects of Sierra Blanca, and Mr. W. S. Foster has collected Lepidoptera on Marshall Pass.

CORRESPONDENCE.

RARE CAPTURES.

Dear Sir:—When in London last winter, I assisted in naming the private collection of Mr. Rowland Hill, our present young curator. As I was going over his material, my attention was arrested by the unfamiliar look of a few specimens he had secured the season before; they had a resemblance to a familiar enough form—*Lachnosterna*—but much smaller, and I concluded that I had seen it before. After several ineffectual efforts to secure its name, I sent a specimen to Dr. Hamilton, Allegheny, and he has identified it as *Cyclocephala immaculata* Burm., and remarks that “this species is widely distributed from Ohio to West Mexico but I never heard of its being taken in the Northern States, east of North-western Ohio.” I have also been in communication with Prof. Fernald, and I copy the following from his reply:—“No. 2 is *Pædisca nisella* Cl., a European species never before reported in the United States.”

J. ALSTON MOFFAT, Hamilton, Ont.

Mailed March 1st.