



LYCÆNA PSEUDARGIOLUS
 VAR. NIGRESCENS ♂
 THECLA STRIGOSA
 VAR. LIPAROPS
 PHYCIODES HANHAMI
 LYCÆNA PSEUDARGIOLUS
 VAR. ARGENTATA ♂
 VAR. ARGENTATA ♂ (UNDERSIDE)

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 VAR. NIGRESCENS ♀
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DESCRIPTIONS OF SOME NEW SPECIES AND VARIETIES OF CANADIAN BUTTERFLIES.*

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I submit herewith descriptions of 3 species and 3 varieties of Canadian diurnal Lepidoptera, specimens of which have been in my collection for many years, and of which a continued study convinces me that it is wise to characterize them for the benefit of other students of Canadian butterflies. It is possible that some of these may be only local races, but they are so constant that I believe them to be well worthy of recognition. In describing these forms, I have endeavoured to compare them with their nearest allies, as a description, even when accompanied by a plate, is more intelligible when a new form can be compared with a well-known standard. My thanks are due to Dr. Henry Skinner, of Philadelphia, who very kindly undertook the arrangement and preparation of the specimens illustrated on the plate given herewith, and also from his own cabinet provided some specimens which were better for illustration than the actual types used in the descriptions. I have also to express my gratitude to the American Museum of Natural History for a beautiful painting of *Thecla Heathii*, which was specially made for the purpose and used for the accompanying illustration, on account of two of the wings in the type specimen being imperfect. It is well here to mention that this painting is, in my opinion, almost as perfect as a drawing can be, and represents exactly the appearance of the type in every mark and spot as well as in colour and shape. Mr. Wm. Beutenmuller very kindly undertook personally the supervision of this painting.

The names used in this paper are those in the recognized check lists of diurnal Lepidoptera now used by American entomologists, viz.: the "List of Lepidoptera of Boreal America," by Dr. J. B. Smith, 1891, and "A Synonymic Catalogue of the North American Rhopalocera," by Dr. Henry Skinner, 1898. Up to the present time the names given by Dr. S.

*Reprinted from the Transactions of the Royal Society of Canada, Section IV., 1903, p. 207.

H. Scudder in his magnificent work, "The Butterflies of the Eastern United States and Canada," have not been adopted by collectors in labelling their collections: These names, however, are, I believe, for the most part well founded, and it is merely a matter of time before they will be generally accepted.

PHYCIODES HANHAMI, n sp. (Hanham's Crescent.)

Sexes similar both in colour and markings. Alar expanse, males 37-38 mm.; females, 40-43.50 mm.

Upper side.—Wings bright orange fulvous, darkened towards base and bordered with a clear black margin, which is widest at apex of primaries. The base and cell marked as in *P. nycteis* and with the same "tangle of black lines" mentioned by Dr. Scudder in his description of that species; the basal area, however, is never so black as in *nycteis*, and in some specimens the

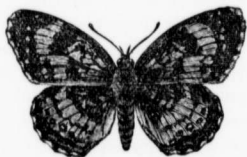


Fig. 4—*P. NYCTEIS*. Db.-Hew.

ground colour is hardly darkened at all. All the veins of both wings are lined with dark brown.

The white marks of the under surfaces of both wings are repeated above as light yellowish contrasting spots, giving the species a much brighter appearance than *nycteis*, in which this feature does not occur, even in the forms of that variable species where the fulvous colour predominates on the upper surface. A striking character in which *Hanhami* differs from both *P. nycteis* and *Melitæa Harrisii*, a species which it also resembles, is the absence on the secondaries, above, of the median black line, which in those species divides the fulvous discal area on almost all specimens. There is a more or less complete series of submarginal ocelli in the interspaces between the submarginal and median veins, but these are smaller and less distinct than in the two species named, and in some specimens are obsolete. Fringes white, interrupted with black at the tips of the nervures. *Under side.*—Fore wings fulvous brown, marked with brown streaks and pale spots, after the pattern of *M. Harrisii*, but much paler and less contrasting, owing to the absence of black marks. Apical area very little darkened. There is a submarginal series of nacreous lunules in all the interspaces, except the lowest, and inside this a sinuous series of pale spots. Margin fulvous, narrow, wider than in *nycteis*, but always narrower and more regular than in *M. Harrisii*. Hind wings with

colour areas distributed as in *nycteis*, but much less contrasting, the basal area being bright fulvous, and the brown field at apical margin less intense in colour. At base are 5 large nacreous spots and a dash inside the internal vein. The triple mesial band is wide, distinct, and nacreous, the spots of the same shape and comparative length as in *nycteis*; but the outer transverse traversing line is somewhat angled where it crosses the nervules, that is, is made up of short, almost straight dashes as in *M. Harrisii*, not of rounded crenations as in *nycteis*. The outer margin of this band is, as in *nycteis*, not clearly defined, a character in which both of these species differ from *M. Harrisii*, where this is distinctly the case. Beyond the mesial band is a row of 5 ocelli, the central one of which is white, ringed with brown, and the two outer ones on each side of this are black, shaded inwardly with fulvous and pupilled with white. The most conspicuous character of this species, and one by which it is easily separated from *nycteis*, is the complete series of large marginal silvery lunules which occur on every interspace, as in *M. Harrisii*. In *Hanhami*, as in *nycteis*, the pattern below is outlined in brown, while in *Harrisii* the margins of the spots are black, thus producing the well-defined and distinct pattern which is characteristic of that species. Body above black, fulvous on sides, silvery beneath. Abdomen banded narrowly with white above. Antennæ black above, banded with white, bright fulvous beneath. Palpi silvery white, fulvous at tips. I must acknowledge that I refer this species with some hesitation to the old genus *Phyciodes*. The general appearance and venation seem to make it congeneric with *nycteis*; but, at the same time, the upper sides of some specimens resemble closely extreme forms of *M. Harrisii*, in which the yellow colour predominates, and in addition, the shape of most of the markings beneath is similar to those of that species. On examining a good series of specimens, the venation comes rather under the genus *Charidryas*, characterized by Scudder, and as figured by Holland in the Butterfly book, than under *Cinclidia*. Although, as stated, the markings resemble more closely those of *Harrisii* in shape, the distribution of the colour areas is more as in *nycteis*. There is also in the mottled appearance of the under side a resemblance to *P. mylitta*, which is congeneric with *nycteis*.

Distribution: Manitoba (Eastern, Central and Southern), Minnesota. The first specimens of this insect seen by me were in the collection of Mr. A. W. Hanham, at Winnipeg, near which place, at Bird's Hill, he had taken them late in June, 1895. Subsequently I took several specimens at the same place and at Brandon in the beginning of July.

Mr. L. E. Marmont finds the species not uncommon at Rounthwaite, Man., and Mr. Norman Criddle takes it also at Aweme, Man. Dr. Win. Barnes writes me that he has specimens from near Minneapolis, Minn.

Described from 12 specimens (6 males and 6 females). The types of both sexes, which are figured, are deposited in the U. S. National Museum at Washington. The species is named after Mr. A. W. Hanham, an enthusiastic and indefatigable collector, who has done so much towards working up the insect fauna of Manitoba and British Columbia.

THECLA STRIGOSA, Harr., var. *LIPAROPS*, n. var. (The Bright-eyed Hair-streak.)

In the *CANADIAN ENTOMOLOGIST* for November, 1895, p. 315, I referred to the Manitoban form of *Thecla strigosa*, and expressed the opinion that this form was worthy of at least varietal recognition. This, as far as I have seen, always shows the large, rich fulvous, well-defined blotches which are represented on the plate herewith. The ordinary form of *T. strigosa* is shown in the accompanying wood-cut. (Fig. 5.)

I have examined during the last fifteen years a great many specimens of this variety from Manitoba, and all without exception showed the two large fulvous eye-like spots on the primaries. Mr. E. F. Heath, who formerly took the insect in numbers at Cartwright, Man., writes: "I have never taken this form without the fulvous patch on the primaries in both sexes, and I have certainly taken and seen over one hundred specimens. Four or five years ago, and for years prior to that, it was very abundant here; now it seems to have disappeared. I do not come across one in a season."

Mr. L. E. Marmont, of Rounthwaite, Man., who has lived and collected in Manitoba for many years, writes: "I have only 9 specimens of your variety *liparops* of *strigosa* just now; but all have the large fulvous blotch on the fore wings. In one female it is fainter than the others, but quite noticeable; in another female the primaries are almost entirely fulvous with only a blackish border."



Fig. 5.—*THECLA STRIGOSA*, Harris, Eastern form.

Occasional specimens of the eastern *T. strigosa* show a more or less poorly-defined fulvous blotch on the upper side of primaries, but such specimens in my experience have proved to be of decidedly rare occurrence. Dr. Scudder thinks that Boisduval and Leconte intended to represent

under the name of *T. liparops*¹ what we now know as *T. strigosa*, Harris. I can hardly think that this is the case; but it seems well to preserve the name; so, I suggest that it should be used for the variety found in Manitoba, which constantly shows on the primaries above a bright clearly-defined blotch, and this was the chief character from which the name *liparops* was derived. On discussing the reference by Dr. Scudder of Harris's *strigosa* to Boisduval and Leconte's plate with Mr. W. H. Edwards some years ago the latter wrote as follows: "Scudder says this is *strigosa* of Harris, but no one would know it from the figures. The description is done from the figure and not from the insect; therefore, *liparops* represents no insect, but merely the said figure, and for that reason I reject the name. The first time the insect was described was by Harris, and his name prevails." In addition to the large and handsome golden fulvous, almost quadrate patch which occupies nearly half the area of the primaries, the secondaries are also frequently ornamented with a fulvous cloud at the anal end, near the tails. The under side of the western form is of a darker brown than in the type, with the white lines much paler, these in some specimens being almost obliterated.

Described from 10 specimens taken at several places in Manitoba: Beulah (Dennis); Cartwright (Heath); Aweme (Criddle); Brandon (Fletcher); Routhwaite (Marmont).

The types described herewith are deposited in the United States National Museum at Washington.

THECLA HEATHII, n. sp. (Heath's Hair-streak.)

Described from one female (not a male, as stated on the plate.)
Alar expanse, 26 mm.

Upper side.—Blackish-brown (when taken), as in *T. calanus*. Costa at base finely edged in front with yellow, as in *calanus* and *acadica*.

Under side.—Fawn-brown, faintly washed with white from the base almost up to a submarginal band of large pearly-gray blotches which occur on all the wings. On the primaries these are four in number and ovate. On the secondaries there are five square blotches and a long whitish spur running up the inner margin. Exterior to these blotches is an incomplete series of marginal lunules, as in several other allied species of the genus; consisting of, at the anal angle, between the internal and submedian veins, a few scarlet scales shaded exteriorly with as many white ones and bordered inside and outside with black; between the submedian

¹Histoire générale et iconographique des Lépidoptères, p. 99; Pl. 31, fig. 1.

and the first median veins is a large, wide and shallow white lunule, without any scarlet scales; between the first and second median veins, a scarlet crescent outlined on both sides with black and shaded externally with white; between the second and third median veins is a small red lunule one-third the size of the last, shaded externally with white.

The specimen here described and figured has no tails to the secondaries, but, from the appearance of the ends of the veins and the marginal pattern, as well as the presence of a few longer scales at the end of the first median vein, I have no doubt that originally tails existed.

On the primaries the ovate blotches are bordered on each side by a broad band about two-thirds their own width, and darker than the ground colour of the wings. On the secondaries the series of square blotches is outlined on both sides by an almost black angulated line. Beyond the cell on all the wings is a large dark, oblong quadrate blotch; the fringe on all wings is dark. Eyes ringed with pearly white; palpi white, tipped beneath with black; antennæ black, ringed with white; club orange below and at the tip.

Locality.—The type was taken by Mr. E. Firmstone Heath, near his home in the picturesque valley of the Long River, a few miles from Cartwright, in Southern Manitoba. This spot is about ten miles north of the boundary of North Dakota and about 25 miles north-east of the Turtle Mountains. This valley, near Mr. Heath's house, is about a mile wide, and is well-wooded with scrub oaks (*Quercus macrocarpa*), ash-leaved maples (*Acer negundo*), aspen and balsam poplars (*Populus tremuloides* and *P. balsamifera*), Saskatoon-berry (*Amelanchier alnifolia*), white thorn (*Crataegus coccinea*), wolf-berry (*Symphoricarpos occidentalis*), prairie roses, wild plum (*Prunus nigra*), a few American elms, chokecherries and various willows. Mr. Heath tells me that it was taken in July about 25 years ago, and, although he has been keenly on the lookout ever since, he has never seen another specimen. It is a remarkable form, and, as will be seen from the accompanying plate, which is an excellent representation, bears very little resemblance to any described species.

The species of *Thecla* occurring at Cartwright at the season *T. Heathii* was taken are *T. acadica*, *T. calanus*, *T. strigosa*, var. *liparops* and *T. titus*. The pattern of the under side of the insect here described in no way resembles that of any of these, and I can hardly think that it is a suffused albinic variety of any of them.

The type which was generously presented to me by Mr. Heath, after whom it was named, is deposited in the United States National Museum at Washington. The painting from which the figure in the plate was made is in my own collection.

LYCENA PSEUDARGIOLUS, Bd.-Lec., var. ARGENTATA, n. var. (The Manitoba Blue.)

The beautiful variety of the common Spring Blue butterfly figured herewith is the prevailing form in Central and Southern Manitoba, where it has usually been named by collectors var. *neglecta*. From this latter, however, it differs in having the black marks of the under side less distinct, in some specimens these are almost entirely obliterated so as to present a clear, nearly unspotted, surface of silvery white. The illustration given herewith does not quite represent the colour of the under side, rather too much of the red pigment having been used, which gives it a warm tint not seen in nature. The shade of blue of the upper surface in both sexes is, as a rule, paler than in other forms (or varieties) of *pseudargiolus*. In the females the discal area of primaries is silvery white, with a blue reflection and a more decided flush of blue at the base.

Described from 18 specimens (12 males and 6 females) collected at Cartwright and other places in Southern Manitoba, as well as in south-eastern Assiniboia. The types of both sexes are deposited in the U. S. National Museum at Washington.

LYCENA PSEUDARGIOLUS, Bd.-Lec., var. NIGRESCENS, n. var. (The Kaslo Blue.)

An interesting variety of *L. pseudargiolus* has been sent to me by Mr. J. W. Cockle, from Kaslo, on Kootenay Lake, British Columbia, where it is in the common spring form. The most conspicuous difference between this and the other described varieties of the stem species, is the large amount of black on the upper surface of the females. This darkening forms a wide black border on the costal and outer margins of primaries, and spreads over the whole surface of the secondaries, which merely show a little blue on the folds between the veins. The blue of the disc of primaries is a dark purplish-blue, as in var. *piasus*, and is frequently irrorated with black scales. The upper side of the male is a deep rich violet-blue, almost of the same shade as in *amytula*. The under side of this variety is remarkable, and specimens of both sexes may be found which, if the under side alone were seen, might be referred to *neglecta*, *violacea*, *lucia* or *marginata*, and some even combine characters

of all of these. One beautiful form which frequently occurs has an irregular discal dark blotch of confluent spots on the secondaries beneath as in *lucia*, and the clear marginal and submarginal spots of *violacea*. This form Mr. Cockle, who has collected this butterfly for several years and has been much interested in it, considers to be most typical of the variety. In all forms of this Kaslo Blue the eye-like spots of the marginal band are distinct, a character in which it differs from *piasus*. Some specimens beneath show the marginal band of *marginata* either with or without the confluent discal patch.

Described from 16 specimens (8 males and 8 females). Types of both sexes deposited in the U. S. National Museum.

PAMPHILA MANITOBOIDES, n. sp. (The Nepigon Skipper.)

In the annual report of the Entomological Society of Ontario for 1888 I described the larva of a *Pamphila* belonging to the *comma* group, which Dr. Scudder and I had taken in small numbers in the first week of July at Nepigon, Ont., north of Lake Superior. In subsequent years I have found the butterfly as early as the last week in June. In low lands the favourite flower visited seems to be *Mertensia paniculata*, but on the higher rocky ridges along the Nepigon river this skipper seems to confine itself almost entirely to the inconspicuous white flowers of *Potentilla tridentata*. It is extremely shy, active and difficult to catch.

This species is rather smaller than *P. Manitoba*, but the markings of both sexes above are very similar to those of that species, although the colours are different. In *Manitoboides* the upper side is a rich tawny-brown with a wide very dark brown margin. None of the spots at apex of the primaries are hyaline, and the bases of both primaries and secondaries show a much less broken field of brown colour than is the case in *Manitoba*. The male and female above are perhaps rather more like the figures of *P. Colorado*, given by Dr. Scudder on plate X., fig. 17 and 18, in his paper "On the Species of the Lepidopterous Genus *Pamphila*," in the Memoirs of the Boston Society of Natural History, Vol. II., Part III., Number IV. (1874), except that the tone of colour is of a more fuscous brown and the border is darker, giving more contrast with the light shades.

Under side.—A bright tawny brown in fresh specimens, primaries much darkened at the base. The whole tone of colour of the under side, including the dark shade at the base of primaries, and the washed-out appearance of all spots, both on primaries and the mesial band of

secondaries, very similar to the under side of the British Columbian *P. agricola*. The mesial band is dull yellow, inconspicuous, angled and irregular, composed of the same squarish spots as in *Manitoba*. These are perhaps normally 8 in number, as in *Manitoba*, when all are present, but this is seldom the case in this species. I have only eight specimens before me at the present time: in one of these there are seven spots and a trace of the eighth; in one specimen there are seven, in five six, and in one five. The spots of the lower portion of the band, when present and of full size, confluent or nearly so, the two spots at the angle of the band usually smaller than the others. The large V-shaped spot, so conspicuous in the cell of *Manitoba*, is inconspicuous and frequently absent. The spot at the base of the submedian interspace seldom present or very small. In the males the light colour of the spots has a tendency to run out along the veins, both towards the margin and to the base of the wings, in the same way as in *P. uncas*.

Alar expanse, males 28-31 mm., females 30-32 mm.

Locality.—Up to the present time I have only taken this species at Nepigon, Ont., and Sudbury, Ont. Specimens sent to Mr. Henry Edwards many years ago were at first named by him *Pamphila sylvanoides*, but he subsequently wrote to me: "Your Northern Ontario *Pamphila* is not *sylvanoides*, but must come nearer to one of the forms of *comma*, such as *Manitoba* or *Colorado*; but the under side shows that it is quite distinct from either of these."

P. Manitoboides occurs at Nepigon, as stated above, from the third week in June until the middle of July. A month or six weeks later than this the true *P. Manitoba* appears, which is a rather large insect, with a greenish tinge on the under side and distinct silvery white markings. The eggs of *P. Manitoboides* hatch about a fortnight after they are laid, but, as has been shown by the Rev. T. W. Fyles [CANADIAN ENTOMOLOGIST, XXVII. (1895), p. 346], the eggs of *Manitoba* laid in August do not hatch until the following spring. The larva of *Manitoboides*, as described by me in the Report of the Entomological Society for 1888, does not quite agree with Dr. Fyles's description of *P. Manitoba*. I have no idea that this species is very closely related to *P. Manitoba*, and the name was only given to indicate a somewhat close resemblance on the upper side to that species. I did not intend, when publishing the description of the larva, that the name *Manitoboides* should stand, and particularly mentioned in the article referred to, that, as I did not wish to

cause confusion by naming what might prove to be a described species in a difficult genus which I had not specially studied, I refrained from further describing the perfect insect. Unfortunately, this precaution seems to have been unavailing, for several have written to me for further information on the species; and, as the name has been introduced into published lists of North American Lepidoptera, I have thought it best to prepare the description here submitted, particularly as further study has convinced me that the species here named does not agree with any of the described species of this genus.

Described from 9 specimens (3 males and 6 females). Types of both sexes deposited in the U. S. National Museum.

A NEW GENUS AND SPECIES OF NORTH AMERICAN CHOREUTINÆ.

BY PROF. C. H. FERNALD, AMHERST, MASS.

Genus KEARFOTTIA

Frons smooth and rounded, with the scales inclining downward, not closely appressed, erect on the vertex; labial palpi ascending, the second segment with more or less separated scales beneath, recalling the genus *Choreutis*, third segment a little shorter, naked and somewhat pointed; maxillary palpi present; proboscis very short; eyes hemispherical; ocelli absent; antennæ not quite half the length of the costa, ciliate, the ciliæ nearly as long as the diameter of the shaft; thorax with a small tuft at the end above.

Fore wings subelliptical, nearly three times as long as wide; vein 1b with a long fork at the base and ending near the outer third of the hind margin; cell about two-thirds of the length of the wing; vein 2 arises before the end of the median, a little further from 3 than that is from 4; veins 3 to 10 nearly equidistant at the origin; 11 arises from the subcostal vein near the end of the first third of the cell; 7 ends in the outer margin and 8 in the costa; the anterior intercellular vein arises from the subcostal intermediate between the origin of veins 10 and 11 and forks near the cross vein, the forks running into 7 and 8; the posterior intercellular vein arises at the base of the wing and continues beyond the cell as vein 6.

Hind wings about half as long as wide, subsemicircular; median vein not pectinate above towards the base; three internal veins, vein 1b forked at the base, 2 from near the beginning of the outer third of the

median vein ; 3 and 4 coalesce and arise from the lower angle of the cell ; 5, 6 and 7 nearly equidistant, 7 from the base of the wing ; 8 arising free from the base of the wing, running nearly intermediate between the costa and subcostal vein, ends in the costa a little below the apex ; cross vein very oblique from the base of 5 till it joins the cellular vein from the base of the wing, then runs up and joins vein 7 a little before the middle.

This genus is more closely related to *Choreutis* than to any other genus known to me, but is without the metallic scales and some other characteristics of *Choreutis*. The venation of the fore wing is like that of *C. onusta*, Walk., but that of the hind wing differs in the course of the upper part of the cross vein and in having a much stronger intercellular vein.

Named in honour of Mr. W. D. Kearfott, who has so successfully begun the study of the North American Microlepidoptera.

Kearfottia albifasciella, n. sp.—Expanse of wings 9 to 10 mm. Head, thorax, base and outer part of fore wing dark brown with bronze reflections ; middle of the wing cream-white, with four equidistant dark brown dots on the costal and three on the hind margin of this white fascia ; these dots are not present in all the specimens. The dark basal area has a vertical nearly straight outer edge, though there is a slight indentation on the submedian fold. The terminal dark bronzy-brown area which covers about a third of the wing has an oblique wavy inner edge, varying somewhat in the different examples. Fringe concolorous, with a whitish fleck near the anal extremity.

Hind wings and fringes above and beneath, and also the abdomen above, fuscous. Under side of fore wings fuscous, lighter beneath the median fascia. Under side of thorax and abdomen and the legs dull yellowish-white ; the fore coxæ, femora and tarsi in front and the middle tibiae and tarsi in front, dark fuscous.

Described from three specimens, two taken at Plummers's Island, Md., July 1893, by Mr. August Busck, and one in Cincinnati, Ohio, July 7, 1903, by Miss Annette F. Braun. One cotype is in my collection, one in the National Museum, Washington, D. C., and one in the collection of Mr. W. D. Kearfott, Montclair, N. J.

AN ARBOREAL ORCHELIMUM.

BY WM. T. DAVIS, NEW BRIGHTON, STATEN IS., N. Y.

Those who visit the pine-barrens of New Jersey know what a pleasure it is to ramble along the narrow wooded-paths among the pine trees ; old paths that after once being made continue for many years, and may seldom entertain a pedestrian. Along these paths and by the side of the sandy roads, any time during late summer and until frost, one may hear a faint, lisping little song from a grasshopper coming from the pines, often from their topmost branches. It is an easy matter to climb the pitch-pine, which is usually arranged admirably for the purpose, and the grasshopper is also friendly to investigation, and commonly continues to stridulate.

Two stout insect-nets clapped together suddenly about the centre of the music will often disclose the grasshopper in one of them, but not always. He is a tree-loving insect, and being subject to the tossings of the wind, holds on tighter than most grasshoppers that I have had dealings with. It is, in fact, the only arboreal *Orchelimum* that I have found in New Jersey.

When he is captured, it will be discovered that he is a small affair, only 22 to 23 mm. long, including the wings, and that he has decided colours ; the green is very green in places, and the brown markings are conspicuous. The brown stripe on the prothorax is particularly dark, and the same colour continues on the wing-covers. The female is usually two or three mm. larger than the male.

In the CANADIAN ENTOMOLOGIST for April, 1891, Prof. Laurence Bruner writes of a single female specimen of this species taken in the District of Columbia. He says : " This latter form is also undescribed, and can be known temporarily as *Orchelimum minor*, from its rather small size and short wings. In colour it is rather less green than usual, and has the brown markings very decided. Its ovipositor, which resembles that of *gladiator*, is also brown instead of green." I have sent Prof. Bruner other specimens, and he has confirmed my identification.

Sometimes *Orchelimum minor* can be observed on the low branches of a pine, especially if the tree stands in the open, and the insect may occasionally be beaten into an umbrella. When the trunks of the pines are " sugared " for moths the little *minor* also attends, and, like many other members of the genus, it is active and musical both by day and night.

THE SPINNING HABITS OF NORTH AMERICAN ATTACK.

BY F. M. WEBSTER, URBANA, ILL.

The note in the CANADIAN ENTOMOLOGIST for April 1903, by the late Prof. A. R. Grote, the one by Mr. J. Wm. Cockle, in the May number for the same year, and the one in the April 1904, number, all relating to this subject, have interested me greatly.

Over 25 years ago I observed and recorded for the first, I believe, the destruction of the pupæ of our very common *Samia cecropia* by the Downy Woodpecker, by puncturing the cocoons and feasting on the juices of the occupant. The habit of the insect in attaching its cocoon firmly to and parallel with the twigs and smaller limbs of trees places them at the mercy of these birds, especially during that part of the year when the trees are devoid of foliage. It has seemed me that this habit of the bird has become more apparent during this time, but this may be on account of my paying more attention to the matter, and thus having seen more of their work.

I have been watching to see if the insect would gradually come to adopt a less dangerous cocooning habit, but up to the present time have not myself observed any notable variation from the old-time custom. In the case of *Tropæa luna*, the problem appears to have been solved by the larvæ cocooning on the ground among the fallen leaves, while *Telea polyphemus* seems to have but partly arrived at a similar solution by largely cocooning on the ground, while *Callosamia promethea* has entirely outgeneralled the woodpecker by swinging her cocoon, enclosed also within a folded leaf, and attached to the twig or limb by a stout silken thong, which allows the whole structure to dangle some distance below the point to which it is thus anchored. In this position the cocoon responds to the impact of the beak of the bird, which, instead of penetrating the cocoon, simply pushes it away, to at once swing back into place uninjured. Whether these are the results of a gradual change of cocooning habits or not, the effects are as given. *Telea polyphemus* has long been known to spin her cocoon largely upon the ground; the experience of Mr. Denny about Montreal being exceptional, and therefore very interesting, and especially so as the habit appears to vary with different years. If Mr. Denny would consent to observe, if possible, the interrelation of the woodpeckers with this species, and especially if the cocoons fastened to the twigs or limbs of trees are destroyed by these birds, it will be possible for him to make a decided accession to our

knowledge regarding this interesting subject, for the tree-cocooning habit in this instance seems to be rather abnormal, and raises the question as to whether it is in that locality rather behind in adopting the terrestrial habit of cocooning, or in advance in abandoning that and adopting that of cocooning in the trees inhabited by the larvæ. This will also aid Mr. Cockle in solving his equally interesting puzzle as how to account for the same insect in his locality cocooning after the manner of *C. promethea*. And this last gentleman can also do science a lasting service if he can throw any light on the interrelation of the species and the woodpeckers in his locality. We have in these notes some very interesting facts relative to the habits of some of our common species of *Attaci*, but we cannot without further observation and more facts decide whether these phenomena are due to natural selection and a change of habit or whether they are perplexing coincidences. Then, too, possibly others may have some observations to offer that will help us in getting more light on the subject.

A COUPLE OF QUERIES.

BY REV. G. W. TAYLOR, WELLINGTON, B. C.

In his Monograph of the Geometrid Moths, Dr. Packard described and figured two moths as *Metanema quercivoraria*, Guenée, and *Endropia textrinaria*, Grote and Robinson. He placed them in different genera and had apparently no doubts as to their distinctness.

With regard to *M. quercivoraria* (page 544), he does not state what material he had before him, but his figure, pl. XII., fig. 39, clearly represents a female with simple antennæ. In giving the dimensions of the moth, however, he speaks only of the male. Packard suggests that *M. aeliaria* of Walker may be a synonym, and Hulst (Ent. News, VI., 14), from an examination of the type, confirms this. *M. aeliaria* was described from the female only.

M. quercivoraria is also figured by Holland in the Moth-book, pl. XLV., fig. 28, and again it is the ♀ that is represented.

Endropia textrinaria was described and figured by Grote and Robinson from the male only. Packard (Mon., 507), redescribes it from 3 ♂ specimens. His figure is also of a ♂, and he makes no mention of the female.

Hulst, in his "Classification" (Trans. Am. Ent. Soc., XXIII., p. 378), brings the two insects together, placing them side by side in the genus *Metanema*.

Both forms have the same range, and both occur with us in British Columbia.

All the specimens of *quercivoraria* which have so far been taken by our B. C. collectors, and all the specimens I have received from various localities in the United States and Canada, together with, so Dr. Dyar informs me, all the specimens in the United States National Museum, are females, and all the specimens of *textrinaria* are males.

The inference would seem to be that these forms are sexes of one species which would retain the older name of *quercivoraria*, and that Packard made a slip of the pen in giving dimensions of ♂ *quercivoraria*.

If this is not the case, then we must be confounding the males of two species under the name *textrinaria*, and similarly the females of two species under the name *quercivoraria*, which seems very unlikely. Will readers of the CANADIAN ENTOMOLOGIST kindly examine their series under the above names and tell us whether they find two species or one?

My second query relates to the insect described and figured by Packard in the Proc. Bost. Soc. Nat. Hist., 1874, and again in the "Monograph," p. 453, as *Cleora umbrosaria*. The type was one male from California (Edwards), but the description in the Monograph is from four males, the additional ones being from Victoria, Vancouver Island (Crotch), and it is one of these that Packard figures on plate XI., fig. 33.

This figure shows a moth with *pectinated* antennæ. In his description Packard says "antennæ broadly pectinated as usual," and he places the species in *Cleora*, in which genus, of course, the ♂ antennæ are always pectinated. Hulst removed the species to his genus *Nepytia*, in which also the antennæ of the males are pectinated, but at the same time he changed the termination to "ata," signifying that the antennæ are *simple*. But this moth is common in British Columbia, and our specimens, some of them from Victoria one of the type localities, agree exactly with Packard's description, except that in the male the antennæ show no signs of pectination. Our species, then, cannot be a *Cleora* in any sense, or a *Nepytia*. It, in fact, belongs to the genus *Enypia*, Hulst.

The question then is this: Is there in California a species of *Nepytia* with pectinated antennæ to which Packard's original type belonged and which he failed to distinguish from the Vancouver Island specimens, or was Packard, who had four males before him, in error with regard to the "broadly pectinated antennæ," which he both described and figured?

In the first case the Vancouver species will require a new name. In the second case all that will be needed will be to transfer the species *umbrosata*, Packard, to the genus *Enypia*.

NOTES ON *INCISALIA AUGUSTUS*.

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

On the 6th of June, 1903, we found a *Thecla* caterpillar unknown to us feeding openly upon the berries of *Vaccinium corymbosum*. Its general colour was bright yellowish-green, which served to render it comparatively inconspicuous while feeding in the midst of a cluster of the unripe fruit. A faint, darker, dorsal stripe and a very minute coral-red spot in the middle of each segment, just above the lateral fold, were the only markings. The head was of a uniform light brown, and the body was clothed with short pile. Length, 12 mm.

This larva fed voraciously, biting a hole in the side of each berry attacked and eating only the interior. One afternoon, having exhausted the immediate supply of fruit, it was observed to crawl to a leaf, upon which it fed readily enough until a fresh supply of the berries was introduced into the breeding cage.

On the 12th of June the caterpillar ceased eating, and the next morning was found fastened to the floor of the cage by a silken girth.

At 10 p. m., June 15th, it changed to a chrysalis. To the naked eye this was a pitchy-brown, with the sutures between the abdominal segments red. Under a microscope the surface was seen to be covered with a raised reticulation and sparsely clothed with short hairs, while the colour was dull reddish-brown, profusely sprinkled with pitchy-brown spots and irregular blotches less numerous, and further apart on the wing-cases than elsewhere.

On Feb. 4th, 1904, this chrysalis produced a ♂ *Incisalia Augustus*.

The caterpillars of *Augustus* hitherto described have been carmine-red or pink (see Scudder's *Butterflies of the Eastern U. S. and Canada*, and *Entomological News*, Vol. XV., p. 107), and it is to be noted that these larvæ have all been found in the Sierra Nevada range. The larva here described was found about two miles west of Albany, N. Y., and at no stage of its existence while in our possession did it show any trace of colour other than that which marked it at first. Is the discrepancy to be explained on the ground of variation among the larvæ—geographical or otherwise—or is it possible that the eastern and western forms are specifically distinct?

[*Thecla iroides*, which is thought by some to be a western representative species of *Augustus*, has been reared from larvæ found feeding on young apples in June, 1897, near Victoria, on Vancouver Island, by Mr Carew Gibson; but no description was taken of the larvæ.—ED. C. E.]

NEW TORTRICIDS FROM KASLO, B. C., AND THE
NORTHWEST.

BY W. D. KEARFOTT, MONTCLAIR, N. J.

(Continued from page 114.)

Enarmonia Cockleana, sp. nov.—Palpi pale fawn, tipped with black. Front of head or face very pale fawn, top of head and thorax a shade deeper. Fore wing rich reddish chocolate brown, by refracted light, scales prismatic, like burnished copper. A broad fawn-coloured fascia from costa at inner third obliquely to dorsal margin beyond half. A second oblique fascia parallels the first, begins on costa at outer two-thirds, and ends at anal angle; this is broader on costa, and lower half is not so well defined. The inner fascia is nearly straight on inner margin, which is sharply defined by a line of shining pearl-white scales, interrupted three times; the outer edge of fascia is indented by four similar pearl-white patches projecting outward over the brown ground colour. The upper pearly-white spots do not touch the costa, but the lower ones are on the dorsal margin. The outer fascia is not so conspicuous as the inner. On its inner edge is a line of pearly-white scales beginning on the costa, interrupted the middle of its length, and terminating just above the anal angle. On its outer edge is a small pearl costal spot, below this a short vertical streak. Just before the outer margin is an irregular row of five small pearly-white spots. The last named and the lower streaks on outer fascia have a metallic blue reflection. The base of wing to inner fascia and the space between the two fasciæ is thickly sprinkled with fawn-colour scales. Costa, to outer fascia brown, sprinkled with fawn, with four pure white dashes or patches beyond; the first is geminate, and with the second, is in the outer fascia, the third makes an extension of this fascia, and the fourth between third and apex. The fourth is narrowly lined before and beyond with black, and on it is the upper of the submarginal row of pearl-metallic-blue dots. Costa between third and fourth white patch and beyond latter to apex is black. Beneath this black, at apex, is an ovate spot of ochreous-brown, enclosing a darker brown dot. Cilia white below apex to middle, below this and around anal angle fuscous. Hind wing and under side both wings dull metallic dark fuscous, or dark-coppery-fuscous. Cilia lighter. Abdomen, upper side dark shining gray, anal tuft yellowish brown or fawn, under side same as tuft. Legs same. Tarsi with dark annulations. Alar exp., 12 to 13 mm.

Twenty-eight specimens, twenty-six collected and bred by Dr. Dyar, Kaslo, B. C. Larvæ June 17, on willow, issued and flown specimens July 25; and two specimens taken by Dr. Barnes, Aug. 9, Banff, Alberta. U. S. Nat. Mus. Type No. 7787.

Named in honour of Mr. J. W. Cockle, the enterprising and indefatigable collector who is making Kaslo famous.

Acleris Britannia, sp. nov.—Head light brownish fuscous, tips of scales shaded with deeper brown. Palpi fuscous, beneath and inside, brown outside. Antennæ fuscous beneath, reddish brown above. Thorax ochreous brown, with scales arranged in a tuft. Fore wing ochreish-brown. Costa at base dark brown. A faint brown outwardly-curved oblique line begins at costa at about one-fifth, touching dorsal margin at one-quarter. Parallel to this line is a second brown line, beginning on costa at two-fifths and touching dorsum just beyond middle. The space between these two lines is paler than the balance of wing, forming a well-defined oblique fascia. The usual triangular costal patch begins at this second line, and is unusually large and dark. It extends along costa to but not touching apex, more than half length of costa, and the lower point nearly to centre line of wing; colour of patch rich dark coppery brown, roughly arranged in parallel oblique rows, between the rows brownish fuscous; heavily overlaying the patch are clusters of dark gray scales. These are particularly grouped at the lower point, just beyond inner point, and before outer point, and a row of dots below but not on costa. The costa along the patch is paler. Tips of scales, on outer margin, overlapping, cilia are darker brown, forming a fine marginal line.

There are a number of dots of black raised scales; the largest and highest is just above dorsum, on the inner of the above parallel lines, on the outer of these lines five or six small clusters, the cluster in centre the largest, the lowest one is on the dorsal margin, another small dot is just beyond this and just above the dorsal margin. Seven small clusters form an acutely outwardly curved line, its upper end beginning in the dark costal patch about half way between the lower and outer points of the patch, and curving outward towards outer margin, thence evenly and regularly curving to the anal angle. Another dot is below outer end of costal patch and before apex. The ground colour of the fore wing is more of a tawny yellow than ochreous brown; under a low-power lens the ground colour is seen to be a series of wavy lines, alternately tawny yellow and a lighter cinereous yellow. These lines are generally parallel and

oblique. They are an entirely independent ornamentation to the lines, spots, etc., in above general description. Cilia same as ground colour, tinged with fuscous, and bordered on the inner side by a thin brighter line. Hind wing very pale ash gray, with a reticulated effect on the outer half, and especially the apical third, caused by a series of parallel brownish fuscous lines, broken into short dashes. Cilia long, concolorous. Under side, fore wing shining fuscous, with the lines and dots of upper side repeated by darker fuscous. On the inner half of costa are several oblique dark fuscous dashes. Cilia concolorous, shading into brown at extreme edge and apex. Under side, hind wing same as upper side. Abdomen fuscous. Legs fuscous, annulated with dark fuscous on last joint.

The type described above is like the majority of the specimens before me. Two extremes may be noted.

In one, A, the costal patch is so heavily overlaid with nearly black, slate-coloured scales, that the ground colour is entirely hidden, except a line along the costa, and a small enlargement of this line in the middle of the patch.

In another, B, the general colour is lighter all over, with barely a trace of the dark slate scales in the patch. In this specimen the wave-like lines of the ground colour are not nearly so well defined, but the lighter and darker scales are broken up into small patches; one is particularly well marked, near base on dorsum, and surrounding the large dot of black raised scales.

The general appearance of all specimens is much the same, these differences only becoming prominent through a lens. Alar exp., 17 to 19 mm.

This species is close to the European *Acleris aspersana*, Hbn., but is quite distinct, especially larger average size, pair of basal lines absent in *aspersana*, and hind wings of latter are evenly smoky fuscous, no lines or reticulations.

Described from 23 specimens, 16 from Kaslo, B. C., collected by Dr. Dyar, also bred by him on rose, and 6 specimens collected by Dr. Taylor and one by Theo. Bryant in the vicinity of Wellington and Victoria, B. C. I have also seen one specimen in the Museum of Comp. Anat., Cambridge, labelled "B. C.," and I have so named it after British Columbia.

Larva taken July 21. Moths emerged and dates of capture, July 31 (Bryant), Aug. 20 (Taylor), and Sept. 5 (Dyar).

U. S. Nat. Mus. Type No. 7784.

Acleris fragariana, sp. nov.—Head and palpi dull smoky black, tips of scales gray, giving a mottled appearance, prothoracic legs and under side of thorax the same; the gray colour predominates on inside and under side of palpi. Thorax, patagia and fore wings yellowish brown. Scales on thorax long, arranged in a well-defined tuft. Fore wing: the inner half, including the base, is of ground colour, mottled by four evenly spaced, transverse, narrow, interrupted bands of a shade darker brown. The dorsal margin, within this space, beginning just beyond the base, is overlaid with dark blue-gray scales, formed into short vertical bars, between the bars the ground colour is darker brown. This dorsal band extends out to anal angle, but merges beyond the middle with the darker outer half. The latter is sharply defined by line beginning on costa, just before the middle to the dorsum, oblique and curving slightly outwards. The lower two-thirds of this line is of darker brown raised scales. Adjoining this line outwardly is a band of mixed rust brown, gray-blue and dark brown scales; in this band, where it touches costa, are two small dark brown costal spots; this oblique band continues down and merges into dorsal dark band; beyond this band on the costa is a small triangular patch of ground colour scales, with a short oblique streak of dark brown on costa just before outer end of patch. Beyond this on costa, and just before the apex, is an almost circular patch of dark gray-blue scales, bounded by short raised scales tipped with black. Below this circular patch the general colour is lighter, the lighter colour circling the patch on outer side and running up to costa at apex. Beginning at apex and continuing to outer margin, just above anal angle, is a perfectly straight vertical line of black raised scales, interrupted by a short break one-third below costa; and opposite this break, closer to outer margin, is a short line of the same scales, slightly overlapping the inner line at the lower end, and continuing up to apex, roughly margining the cilia. At the inner third, just above dorsal margin, on lower median line, is a large cluster of raised scales, dark brown mixed with black; above this, a little nearer to base, on median line, is a small cluster of brown raised scales, with a black dot in centre; a third small cluster is between these two, but a little beyond them. These three clusters are all on the inner yellowish-brown half of wing, the first mentioned and largest resting on the dark dorsal band. Cilia long, mottled light and dark brown at apex, with a scale or two of black. This colour continues to middle of outer margin, where it gradually

merges into blue-gray, which latter colour is solid at and around anal angle. A faint line of this gray runs up through centre of cilia to apex. Hind wing shining light fuscous, cilia same. Under side fore wing: inner half pale yellowish brown, lighter than upper surface; outer half light lead colour, a dark brown, short, oblique dash on costa at inner fourth, and a small black dot at middle of costa. Apical portion of under side and cilia mottled with brown, and the colour of the raised scales of upper side are repeated. Under side hind wing very light fuscous, marked by a few brownish black broken lines, paralleling outer margin, in apical and costal regions. These lines are faintly visible from the upper side. Abdomen: above shining fuscous, anal tuft faintly tinged with brown; under side same, but a shade darker. Meso- and metathoracic legs dark gray on upper joints; outer cinereous, annulated with dark brown. Alar exp., 14 to 15 mm.

Described from four specimens, bred on strawberry, at Ellensburg, Wash.; forwarded by S. W. Maxey, through F. H. Chittenden. Issued Aug. 22.

U. S. Nat. Mus. Type No. 7785.

Commophila fuscodorsana, sp. nov.—Head white, shaded with brown on the sides. Palpi and thorax white. Fore wing pure white, except basal patch and band on dorsal margin, nearly one-third width of wing, extending two-thirds length of wing, and at outer end merging into a patch covering lower end of cell, greenish fuscous; overlaid along dorsal margin with striations of pearly white. On the extreme dorsal edge the fuscous is interrupted by a row of pure white dots. At apex are two short rounded lines of dark greenish fuscous, one margining the cilia and one paralleling it just before apex, both touching costa. On the costa at middle of wing are two pale greenish dots, below these a shade of light yellow, running into or forming a continuation of the fuscous patch terminating the dorsal band. The faint vertical streaks of very pale greenish fuscous traverse the white outer third between the dorsal fuscous patch and apical lines. Cilia white, except at apex, fuscous. Hind wing light fuscous, cilia paler. Under side fore wing smoky fuscous, darker at apex; hind wing light fuscous. Abdomen yellowish fuscous, anal tuft lighter, legs same. Alar exp., 18 mm.

Described from two ♂♂, one Kaslo, B. C., June 7, J. W. Cockle; one Fieldbrook, Cal., May 21, H. S. Barber.

Type, U. S. Nat. Mus., No. 7876.

THE CRICKETS OF ONTARIO.

BY E. M. WALKER, B.A., M.B., TORONTO.

The crickets, or Gryllidæ, like the other families of Orthoptera, have received so little attention from Canadian entomologists that very few species have been reported from the country, and most of these few records are of little value, as they were made at a time when the family had been little studied, and the species were ill defined. Much has been done of late, however, by American entomologists, notably Scudder and Blatchley, to unravel these difficulties, although the family is still a very difficult one to deal with, and much patience and close observation is necessary in order to separate the species satisfactorily. As the writer has paid a good deal of attention to the Orthoptera for the past ten years, a number of species of crickets have been added to the Ontario fauna, and the following notes upon these species may serve as a guide to the further and more complete investigation of the species of Gryllidæ in this part of the country.

Briefly, the Gryllidæ may be characterized as follows: They are jumping Orthoptera, in which the body is more or less depressed. The wing-covers lie flat upon the dorsal surface of the body, with the outer part bent abruptly downwards at the sides. The tarsi are 3-jointed, without pads between them, and the fore coxæ are longer than broad. The antennæ are usually long and filiform; the hearing organ, when present, is situated at the base of the fore tibiæ, and the shrilling organ of the male is near the base of the tegmen, and is longer and broader than in the Locustidæ. The ovipositor when exposed is long and spear-like, and apparently consists of two lateral pieces, grooved internally. Each of these pieces, however, is made up of two separate parts closely fitted together. A tube is thus formed, down which the eggs are passed during oviposition.

Three subfamilies of Gryllidæ are represented in Ontario, the Gryllotalpinæ or mole crickets, the Gryllinæ or ground crickets, and the Ecanthinæ or tree crickets. These subfamilies may be separated by the following table, which, with the succeeding ones, has been taken from Blatchley's excellent report on the Orthoptera of Indiana (27th Ann. Rep. Dep. Geol. Res. Ind., 1902), such changes having been made as were necessary to adapt them to the Ontario fauna. I am also indebted to Mr. Blatchley for the loan of specimens, and for his kind assistance to me in the determination of difficult species.

Subfamilies of Ontario Gryllidæ.

- a. Fore tibiæ enlarged, fitted for digging; female without exposed ovipositor (Mole and Sand Crickets) Gryllotalpinæ.
- aa. Fore tibiæ not enlarged; female with well-developed external ovipositor.
- b. Hind tibiæ rather stout, armed with stout spines, without teeth between them (Ground Crickets) Gryllinæ.
- bb. Hind tibiæ slender, armed with delicate spines, with minute teeth between them (Tree Crickets) Ecanthinæ.

Subfamily GRYLLOTALPINÆ.

Two genera are represented in Ontario, each with a single species.

1. GRYLLOTALPA BOREALIS, Burm. The Northern Mole-Cricket.

G. borealis, Burm. Handbuch der Ent., II., 1838, 740.

G. brevipennis, Serv. Hist. Nat. des Ins., 1839, 368.

G. columbia, Scudd. Mem. Peabody Acad. Sc., I, 1869, 26.

This insect cannot be mistaken for any other Canadian species. It is a large seal-brown insect, about 30 mm. long, with enormously dilated fore femora and tibiæ, the latter with the tarsi forming a sort of hand very like the fore foot of a mole in appearance, and similarly adapted for burrowing. The hind legs are short and not fitted for jumping, and this alone serves to distinguish it from all our other Gryllidæ.

This species has been taken at Leamington, Essex Co. (Fletcher, An. Rep. Ent. Soc. Ont., 1892, 87), but as I have never met with it in the field; I have nothing to add to the published accounts of its habits. These have been dealt with in a very interesting manner by Dr. Fletcher, under the above reference, and also by Blatchley in his recent work on the Orthoptera of Indiana.

2. TRIDACTYLUS APICALIS, Say. The larger Sand Cricket.

T. apicalis, Say. Journ. Acad. Nat. Sc. Phil., IV., 1825, 310.

Xya mixtus, Hold. Proc. Acad. Nat. Sc. Phil., VI., 1853, 364.

Length of body, 9.5 mm.; pronotum, 1.75 mm.; tegmen, 2.7 mm.; hind femur, 4.5 mm.

This little insect much resembles a diminutive mole-cricket in appearance, but differs in having greatly swollen hind femora, and in the fore tibiæ, which are much less expanded, and bear three or four spines at the apex. The antennæ are extremely short for a cricket, being shorter than the pronotum. The tegmina cover about half the abdomen, and the wings project slightly beyond the tip of the abdomen.

I first came across this interesting little cricket on Sept. 21, 1895, when I found two specimens on the borders of a small pool near the Humber River. The pool was on sandy soil, and supported a large number of aquatic insects and other animals. Since then I have taken it at several different localities near Toronto, usually on the sandy margins of streams. On June 25, 1901, I found it in considerable numbers on a certain part of the margin of a small stream near York Mills, Ont., a few miles north of Toronto. Here they were to be found upon the damp sand a few yards from the water's edge, and when approached would leap vigorously. They never flew more than a few yards, however, and were fairly easily "marked down" on account of the bareness of the sand. They were often seen peeping from their burrows, into which they would immediately retreat on being approached.

The spot where these crickets were found extended only some 15 or 20 yards along the margin of the stream, and although the banks were explored for half a mile or more, and many other spots of similar character passed, no more specimens of the insect were seen.

(To be continued.)

The notes on "Spring Methods of *Telea Polyphemus*," in the April, 1904, number of CANADIAN ENTOMOLOGIST, were very interesting, and recalled to my mind a cocoon of this insect sent me from South Carolina in 1899, securely fastened to a twig by a silk wrapping running up the twig, after the same manner as *cynthia* and *promethea*. Among the many cocoons of *polyphemus* taken in various parts of New Hampshire, I never saw one suspended in this manner, and had hitherto supposed my Carolina specimens to be entirely exceptional. Mr. Cockle's suggestion, that the habit of suspending the cocoon may have a relation to the climatic conditions and be of advantage in regions where there is no continuous snow-carpet in winter, may be found to hold true. It would be interesting to hear from other localities on this question.

F. H. FOSTER, Claremont, N. H.

LITHOBII FROM CALIFORNIA: A CORRECTION.—In my paper on "Lithobii from California and Oregon," published in the Proc. Phil. Acad. for 1903, page 152, a peculiar transposition of part of the key to species occurs, this having been overlooked in the reading of the proof. The two species, *Aztecus* and *Chumasanus*, in the key are placed in division a, of series A, with forms having the coxal pores in several rows. As is evident from the statements in the key itself, and from the descriptions of *Chumasanus* following it, these two species belong in series B, division a, the coxal pores being in a single row. R. V. CHAMBERLIN.

NOTES ON GENERIC CHARACTERS IN THE LYCOSIDÆ.

BY RALPH V. CHAMBERLIN, ITHACA, N. Y.

Scarcely any two men who have studied the *Lycoside* have interpreted or defined the genera of the family wholly in the same way. The purely relative nature of the characters most frequently used in separating the species into genera leaves room for much diversity in opinion and usage; and, in consequence, it is not surprising to find that genera used without question by one arachnologist are by others unhesitatingly relegated to synonymy.

Various genera that have been proposed in this family are clearly artificial, having been erected on single characters without reference to the existence or non-existence of correlated differences. That is, the species in such cases are grouped with a view to convenience rather than with the intent to express generic relationship. There can be little doubt, however, that some of the more commonly accepted genera represent in the main natural associations of species, the difficulty here being encountered in the choice of characters for definition and diagnosis.

It is true that *Pardosa*, for example, may promptly be recognized by an experienced student of the group from the shape of the face and the relations of the eyes of the first and second rows, but no statement of their features has been given that does not become uncertain somewhere, and restriction to them in study has led authors to the incorrect reference of many species. The difference between *Lycosa* and *Pardosa* in the armature of the furrows of the chelicerae, pointed out by Mr. Simon, will also often not hold good. It is sometimes stated that in *Pardosa* and its relatives the metatarsus is longer than the combined length of the tibia and patella of the same leg, whereas in *Lycosa*, etc., the reverse is true, but exceptions to this are not rare on either side; and so it is likewise with other characters which might be selected singly.

The labium in its form and proportions affords characters of considerable significance. It has been stated that the labium of *Pardosa* and its close allies is nearly always wider than long, and that it is never longer than wide, whereas in *Lycosa* it is always longer than wide. For the use of this distinction very careful measurement is essential. The value of the character I find to be increased and its use made safer by considering in connection with it the shape and relative length of the articulating notch or excavation at the base of the labium. In *Pardosa* the notch is short, averaging one-fourth, or less, the total length of

the labium. In *Lycosa* the excavation is relatively long, usually one-third the total length of the labium. In *Pirata*, in which the labium is longer than wide, as in *Lycosa*, the notch is shorter than in either of the two preceding genera, varying between one-fourth and one-fifth of the length of labium, with the average toward the lesser limit.

It is my opinion, however, that the clearest and most definite characters for limiting the more important genera of *Lycosidae* are presented in the structure of the copulatory organs, especially of the male, although slight use has been made of them in such connection heretofore. In a more extended paper, to appear later, I shall give a detailed treatment of the structure and homologies of the reproductive organs in this family, with application to the arrangement and classification of its American members. In the present place are presented only a few notes on the structure of copulatory organs in the commoner genera *Lycosa*, *Pardosa* and *Pirata*, although other genera might be used equally well so far as concerns the validity of the points it is desired to make.

Van Hasselt*, who uses the term "epigynum" as applying strictly to the median piece or "process" of the female genital plate, attempts to establish with respect to its structure and functions in the *Aranee* several theses, the more essential of which are certainly not true for the *Lycosidae*. Thus in no degree whatever in this family can the median body, when such is present, have any mobility independent of the whole epigynum "*avec érection in longuer et flexibilité latérale,*" and cannot be considered "*du moins fourtionnellement comme analogue a l'ovipositor de quelques Insectes,*" such as could be used in arranging eggs in a cocoon. The median body here is simply a ridge-like elevation of the floor of the depressed area of the plate.

In most cases at or near its posterior end the median ridge is extended transversely on each side to the marginal walls, which they meet immediately behind the openings of the receptacula. The ridge thus divides the epigynal depression into two furrows or channels, each of which leads to the opening of the receptaculum of the corresponding side. Posteriorly the free ventral edges or the septal elevation and its transverse arms are produced out horizontally to a varying distance over the lateral channels, the median piece thus being in effect grooved along its sides. Sometimes these plate-like extensions are very wide, and may cover over most of the epigynum behind, as is the case in *Pardosa Californica*, Keys.

*Vid. "L'Épogyne des Araignées Femelles," Tids. v., Ent., Vol. 35 (1891-'92), pp. 87-121. Pls. 7-9.

The lateral plates are mostly thin and partially transparent, the result often being an appearance confusing to one not understanding their structure, especially so when the epigynum is examined in a liquid medium. Various published drawings of epigyna represent the septum as narrowest at the free surface and gradually broader and broader toward the base or dorsal part in cases where the free edge in reality is widely extended horizontally over the basal portion.

The function of the median body, or variously termed "process," "ovipositor," "finger," etc., seems clearly to be that of a guide to the male embolus, controlling the course of the latter and facilitating its entrance to the spermatheca. Intimately associated with specific and generic differences in the epigynum are naturally corresponding differences in the male palpus. The unusual structure of epigynum in *Lycosa pulchra*, Keys (= *L. Kochii*, Keys, of Em., Banks, etc., but nec., Keys; = *L. Purcelli*, Montg., the true *Kochii* being a western species), is matched by an equally, if not more, peculiar palpus in the male. The characteristic epigyna of *L. ocreata*, *gracilis* (= *verisimilis*, Montg.), *bilineata* and their allies (group *Schizogyna*), are likewise associated with correspondingly peculiar palpal organs.

The epigyna in the genus *Pardosa* agree in having the depressed area relatively large and deep on each side adjacent to the opening of the receptaculum, the depression anteriorly becoming narrower and shallower, usually strongly so. The depression in front, in fact, is often but slightly indicated, although ordinarily more developed at its extreme anterior end than in the region immediately posterior to that part. The guide frequently quite fades out in front of the middle, leaving the depression anteriorly undivided (*P. lapidicina*), and in other cases it is relatively but weakly indicated in that region. Sometimes the depth and width of the furrows increase very gradually from in front posteriorly, as they do in *P. nealota* (an undescribed Texan species allied to *littoralis*), but leaving the guide narrower anteriorly. In other forms the deeper posterior areas or foveæ may be formed abruptly, as is very conspicuously the case, for example, in *P. sternalis* and *P. atra*. The posterior foveæ may be relatively very large, with the shallower front region much reduced (*Groenlandica*, *brunnea*) or relatively small (*sternalis*, *atra*). In *xerampelina*, Keys (= *tachypoda*, Th., and *Montana*, Em., etc.) the transverse arms of the guide are but weakly developed, and the median septal part widens conspicuously anteriorly.

In *Lycosa*, conditions as to the median depression are nearly the reverse of those found in *Pardosa*, the furrows being deepest and widest at

the front, and becoming shallower and narrower posteriorly in the region of the spermathecal openings. The narrowing of the furrows is produced principally by the bulging inward of the side ridges of the epigynum, the posterior face of the tubercle so produced usually being close to and parallel, or nearly parallel, with the corresponding transverse arm of the guide. Sometimes the lateral plates of the guide extend over the narrowed channels behind in such a way as nearly completely to roof them over. In most cases the tubercles are conspicuously more elevated than the depressed posterior ends of the lateral ridges which embrace the ends of the arms of the guide. The form of epigynum typical of the genus is well presented in *L. helluo* (*nidicola*, Em., etc.), *riparia* and related species. From this form the epigyna of other species depart in varying degrees.

The epigyna in the genus *Priata*, as also in the American species (*funerea*, *evagata*) of *Tricca* (*Anocosa*), present no distinct guide, although they are sometimes weakly furrowed. In no case is any transverse restraining ridge developed. The spermatheca practically always open free each upon the inferior or the inner face of one of two posteriorly-directed tubercles, between which is an open space or excavation. The tubercles may be separated by a rather narrow space, as in *insularis* and *agilis* (= *wacondana*, recently described by Mr. Scheffer), may be more widely divergent, as in *priatria*, Cl. (Em.), or may be scarcely evident, leaving the posterior margin of the epigynum nearly straight, as in *Montana*. The *Priata* type of epigynum is very similar to that of some *Agalenide*. The species described by Mr. Tullgren, from Florida, as *Pardosa bilobata*, which has an epigynum of this kind, is, there seems scarcely room for doubt, a *Pirata* (probably *insularis*, Em.).*

The bulb of the male palpus consists of an upper lobe folded more or less transversely upon a larger and more protruding basal division, in which is contained all but the apical portion of the coiled semiferous tube. The slender terminal portion of the tube passes forward into and opens near the end of the intromittent organ, the *embolus* or *style*. The embolus arises toward the upper and inner side, near the base of the anterior lobe, and in rest lies more or less transversely across the bulb, either in a fold of the apical lobe itself (as usual in *Pardosa* and *Priata*) or upon a special fold developed along the front margin of the basal lobe (*Lycosa*). This special fold, which may be termed the *lectus*, in *Lycosa* is produced at the end into a lobe of varying size, which normally bends forward at the margin of the alveolus, and which supports during quiescence the terminal portion of the embolus. This apical lobe or auricle may be long, and may extend forward along the side of the *conductor emboli*, to be mentioned later, even to the front margin of the alveolus, as it does in *L. ocreata*, *bilineata*, etc.

*Vid. A. Tullgren, "Spiders collected in Florida by Dr. Einar Lönnberg," Vet. Ahad., Handl., B. 27, Afd., IV., No. 1 (1902), p. 22, fig. 12.

(To be continued.)

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