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A KEY TO THE GENERA AND NOTES ON THE SYNONYMY OF THE TRIBE CALLIPTERINI, FAMILY *APHIDIDÆ*.

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With a view to correcting various incorrectly used terms of this group, the author has made a careful study of American and European forms and type species. So far as he has been able to determine from the specimens studied, only a single American species can be placed in the genus *Callipterus*, which also includes but one European species, while the majority of the American forms belong to the genus *Myzocallis*. A detailed description of each type species has been given, and the synonymy was made after a study of specimens for each genus involved. It is hoped that the key for generic determination will fully cover all the known American species.

I am indebted in this paper to Prof. C. P. Gillette, of Fort Collins, Colo., who was kind enough to help me with the key for the genera.

Tribe *Callipterini*.

Antennæ six segmented, variable in length, and usually quite slender; sixth segment with a more or less variable spur, which in some species is short and stout, in others exceedingly long and slender. Beak short and thick, wings long and slender, the cubitus with two forks. Nectaries variable in size and shape, but usually short. Cauda usually globular at the tip and constricted towards the base; beneath the cauda is the anal plate, which is usually large and formed into two lobes.

All of the species in this group are marked in such a way as to give them a beautiful delicate appearance, and they are quite easily distinguished. The larvæ are covered with fine bristles, each of which arises from a minute tubercle. The sexual females have the abdomen considerably elongated, and this elongation can be pushed into crevices where the eggs are deposited.

KEY TO GENERA OF CALLIPTERINI:

1. Antennal tubercles prominent; antennæ always exceedingly long..3.
2. Antennal tubercles wanting or very small; antennæ variable in length, sometimes shorter than the body.....4.

3. Nectaries very long and large..... 5.
Nectaries very short and more or less constricted at the middle...6.
Nectaries little more than pores..... 10.
4. Nectaries distinct, usually being longer than broad at middle..... 7.
Nectaries little more than pores and broader than long..... 10.
5. Nectaries as long as one-fourth the body or more, and swollen in the middle..... *Drepanosiphum.*
Nectaries large and nearly one-fourth the length of the body, swollen at the base and tapering toward the middle..... *Drepanaphis.*
6. Spur of sixth antennal segment longer than the segment... *Calaphis.*
Spur of sixth segment not longer than segment..... *Euceraphis.*
7. Antennæ longer than the body, spur of sixth segment long and about the same length as the segment..... 8.
Antennæ shorter than the body, spur very short, often being little more than a nail-like process, segment short..... 9.
8. Antennæ with spur at least as long as sixth segment, and with little or no antennal tubercles. Nectaries twice as long as broad and constricted in the middle..... *Myzocallis.*
Antennæ with spur shorter than sixth segment, nectaries much broadened at base..... *Eucallipterus.*
9. Antennal spur less than one-half the length of the sixth segment, nectaries not longer than broad at base, and constricted in the middle..... *Chromaphis.*
Antennal spur at least half as long as the sixth segment, nectaries short, about as long as broad and placed on a broad base... *Callipterus.*
10. Antennæ situated on distinct tubercles and much longer than the body, nectaries but pores with raised edges, spur of sixth long and tapering..... *Monaphis.*
Antennæ not on tubercles and scarcely longer than the body, nectaries reduced to pores, spur of sixth joint nearly as long as the joint..... *Monellia.*

Drepanosiphum Koch, 1855.*
type, *A. platanoides* Schrank.

Characters: Antennæ exceedingly long and placed on distinct tubercles, spur of sixth segment about six times as long as the segment, which is very short; third segment longer than the sixth and spur together. First segment large and gibbous on the inner side; antennal

*Die Pflanzenläuse Aphiden, p. 201.

tubercles elevated on the inner side, forehead flat, moderately wide. Wings long and slender, with cubitus twice forked. Nectaries one-fourth the length of the body and very robust, being enlarged at the middle and base. Cauda one-fourth the length of the nectaries, oblong and globular at the tip; base broad, tapering to a constriction at the connection with the base. Anal plate broad and slightly emarginated.

Drepanaphis Del Guercio, 1909.*
type, *D. acerifoliæ* Thomas.
Syn.: *Phymatosiphum* Davis,[1] 1909.

Characters: Antennæ at least twice as long as the body and situated on distinct antennal tubercles; spur of sixth segment eight times as long as the segment; third segment shorter than spur of sixth. Antennæ very slender and tapering. Forehead convex, body robust, and bearing finger-like projections on the dorsal portion of the abdomen. Nectaries about one-fifth the length of the body, swollen at the base and tapering outwardly. Cauda one-half the length of the nectaries and globular at the tip, base broad and tapering towards the constriction between the base and the tip. Anal plate seemingly divided longitudinally and slightly emarginated in the middle.

Calaphis Walsh, 1863.†
type, *C. betulella* Walsh.

Characters: Antennæ much longer than the body, with segments 3, 4 and 5 more or less hairy, and sixth about one-half the length of the spur. Antennal tubercles large and broad, with bases almost together, giving the forehead a narrow appearance and forming with it a U. Thorax long and slender, nectaries spindle-shaped and short, being equal in length to the cauda. Cauda, thick, short and globular at the tip; base broad and about two-thirds as wide as long. Anal plates slightly emarginated, lobes rounded. Sides of abdomen with prominent tubercles, each one bearing a single hair. Wings long and slender, veins thick and dark, deflexed when at rest.

Euceraphis Walker, 1870.‡
type, *A. betulæ* Linnæus.

Characters: Antennæ about one and one-half times as long as the body, and placed on large tubercles; spur of sixth segment slender and

*Rivista di Patologia Vegetale, Vol. p. 2.
1. Annals of the Entomological Society of America, Vol. 2, p. 196.
†Proceedings of the Entomological Society of Philadelphia, Vol. 1, p. 301.
‡The Zoologist, p. 2001, 1870, London.

slightly shorter than the segment. Third segment four to five times as long as the sixth and spur ; first segment gibbous on the inner side. Inner side of antennal tubercles with slight projection. Forehead narrow, body long, wings long, with cubitus twice forked. Nectaries short, slightly longer than broad, and somewhat tapering, but constricted in the middle ; ends oblique to the axes of the nectaries. Cauda longer than the nectaries and knobbed at the tip ; base tapering and strongly constricted at junction with the tip. Anal plate rounded and without an emargination. *Callipterus mucidus* Fitch belongs in this genus.

Myzocallis Passerini, 1860.[1]
type, *A. coryli* Gœtze.
Synonyms : *Pterocallis* Passerini, 1860.[1]
Callipteroides Mordwilko, 1894.[2]
Tuberculatus Mordwilko, 1894.[2]
Subcallipterus Mordwilko, 1894.[2]
? *Therioaphis* Walker, 1870.[3]

Discussion : This genus was first formed in 1860 by Passerini, with *Aphis coryli* Gœtze as the type. At the same time he formed the genus *Pterocallis*, with *Aphis alni* Fabricius as the type, and included with it *Aphis tiliæ* Linn.

In 1906 Schouteden formed the genus *Eucallipterus*, with *A. tiliæ* Linn. as the type.

After studying specimens of the above species I am of the opinion that *A. alni* Fab. is too closely related to *Myzocallis* to form a new genus, and so *Pterocallis* is a synonym. The second species included by Pass., under the genus name *Pterocallis*, is entirely distinct from the type, and so the genus *Eucallipterus*, as formed by Schouteden with *A. tiliæ* Linn. as the type, is valid.

In looking over specimens which are supposed to be *Aphis ononodis* Kaltenbach, I fail to see any characters distinct enough to separate this species from the genus *Myzocallis*, and so I have placed *Therioaphis* Walker as a questionable synonym of that genus.

In 1894 Mordwilko used *A. coryli* Gœtze as the type for his genus *Callipteroides*, but as this species was used for *Myzocallis* it must go under *Myzocallis*. In looking over specimens of *Aphis quercus* Kalt, I was

1. Gli Afidi, Parma, p. 28, 1860.
2. Raboli Laboratorie Zoologischeskago Kabineta Imperatorskago : Varshavskago Universiteta.
3. The Zoologist, p. 1999, 1870.

unable to separate this species from *Myzocallis*. Mordwilko also used *A. alni* Fab. for his genus *Subcallipterus*, but as this species is the type of *Pterocallis* then must *Subcallipterus* be a synonym.

Characters: Antennæ slightly longer than the body and without antennal tubercles, spur of sixth segment not more than twice as long as the segment. Forehead formed into a pointed projection supporting the frontal ocelli. Prothorax and body elongated, wings long but variable in width. Nectaries almost as broad as long and tapering. Cauda short globular at the tip and placed on a narrow base. Anal plate shaped like the larger part of a heart and emarginated by a median wide groove Notes taken from American and European species. The following American species belong in this genus: *M. punctatus* Monell, *M. ulmifolii* Monell, *M. trifoliæ* Monell, *M. alnifoliæ* Fitch, *M. discolor* Monell, *M. genevi* Sanborn, *M. ulmicola* Thomas, *M. asclepiadis* Monell.

Eucallipterus Schouteden, 1906.*

type, *A. tiliæ*, Linnæus.

Characters: Antennæ slightly longer than the body, slender and tapering. Spur of sixth segment not longer than the segment; first segment not gibbous on the inner side. Front of head wide and with two frontal tubercles, one on each side of the frontal ocelli, and giving the appearance of three ocelli or tubercles, each side tubercle bears a single bristle. Body tapering, wings long and slender, with dusky markings. Nectaries short and much enlarged at the base, outer part cylindrical, ends irregular as if broken. Cauda three times the length of the nectaries, slightly constricted in the middle and globular at the tip. Base as long as globular part and slightly wider at the base. Anal plate strongly lobed, the lobes forming a regular V.

Chromaphis Walker, 1870.†

type, *A. juglandicola* Kaltenbach.

Characters: Antennæ shorter than the body and not placed on antennal tubercles, spur of sixth segment about one-eighth the length of the segment. Forehead wide, with one large tubercle in the centre and a smaller one on each side. At the inner side of the base of each antennæ the head is slightly projected. Body short and stout. Wings long and slender. Nectaries short, small, and constricted in the middle. Cauda short, globular at the tip and constricted towards the base. Anal plate

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†The Zoologist, 1870, p. 2001.

shaped like the large part of a heart. The larvæ of this genus have but three-jointed antennæ.

Callipterus Koch, 1855.[1]
type, *A. juglandis* Kaltenbach.
Synonyms: *Callaphis* Walker, 1870.[2]
Ptychodes Buckton, 1881.[3]
Panaphis Kirkaldy, 1904.[4]

This species was originally described by Frisch, but as that was prior to the 10th edition of Linnæus, and as Kaltenbach was the first one to describe this species after Linnæus, the species belongs to Kaltenbach.

In 1860 Passerini made this species the type of the genus *Callipterus*, and in 1870 Walker used the same species for the type of his genus *Callaphis*. In 1881 Buckton erected for this species the genus *Ptychodes;* the name being preoccupied, Kirkaldy, in 1904, suggested the name *Panaphis*.

Characters: Antennæ shorter than the body, stout, and without antennal tubercles. Forehead broadly rounded, with the inner edges projected at the base of the antennæ. Body oblong and stout; nectaries short, stout and subconical, distal edge being nearly parallel with axis of the body. Cauda twice as long as nectaries, tip elliptical, constricted into a broad base. Anal plate divided into two parts, each division forming a broad blunt tooth-shaped piece, the two being widely separated at the top and converging at the base to form a U. Wings short and broad.

Callipterus caryæfoliæ Davis is the only American representative of this genus.

Monaphis Walker, 1870.*
type, *A. antennata* Kaltenbach.
Synonym: *Bradyaphis* Mordwilko, 1894.†

This genus was made in 1870 by Walker, and was not again referred to by later writers. Mordwilko, probably never having seen Walker's paper, used the same type species to form his genus *Bradyaphis*, which must fall as a synonym of the first. So far as known at the present time, there are no representatives of this genus in North America.

1. Die Pflanzenläuse Aphiden, p. 208.
2. The Zoologist, Vol. 5, p. 2001.
3. Monograph British Aphididæ, Vol. 3, p. 39.
4. The Entomologist, Vol. 37, p. 279.
*The Zoologist, p. 2001, 1870.
†Rab. Lab. Zool. Kab. Varch. Univ., p. 46 of separate.

Characters: Antennæ longer than the body and situated on large broad tubercles; spur slender, and about twice as long as the segment; first segment broader than long and gibbous on the inner side. Forehead narrow and oblique to the sides of the antennal tubercles. Body elongated, wings long and slender; nectaries hardly more than pores with a chitinous ring around the edge. Cauda short and broadly pointed, differing from the rest of the genera by the absence of the knob at the tail-end. Anal plate short, separated in the middle and forming two distinct lobes. End of cauda and lobes hairy.

Monellia Œstlund, 1887.*
type, *A. caryæ* Fitch.

Characters: Antennæ longer than the body and without antennal tubercles; spur of the sixth segment stout, and equal to the length of the segment. Forehead raised in the middle and projected at the inner side of the base of each antennæ. Body long and tapering, nectaries but pores with a chitinous ring about the edge. Cauda short, globular at the tip and constricted into a broad base. Anal plate long and divided in the centre, forming a deep V. Wings when at rest lie in a horizontal position.

A NEW PTEROMALID PARASITIC ON *TORTRIX FUMIFERANA*.

BY CHARLES T. BRUES, CAMBRIDGE, MASS.

Nasonia tortricis, sp. nov.

Length, 2 mm. Moderately brilliant metallic green, with bluish reflections, which are especially noticeable on the metathorax, pleuræ and coxæ. Legs, except the coxæ and apical tarsal joint, brownish-yellow, with the femora infuscated. Scape, pedicel and ring-joints of antennæ honey-yellow, the following joints piceous. Head, seen from above, two and one-half times as broad as thick, the lateral ocelli as far from the eye-margin as from the median ocellus. Eyes bare, or very indistinctly pubescent, removed from the oral margin by half their length; malar furrow distinct, but very delicately impressed. Antennæ inserted slightly below a line drawn between the lower margins of the eyes, two-fifths as far from the oral margin as from the median ocellus; 13-jointed, with two ring-joints and a three-jointed club. Scape reaching nearly to the median ocellus; pedicel as long as the ring-joints and the first joint of the funicle together; funicular joints quadrate, becoming slightly transverse apically,

*Minn. Geol. Survey Report 4, p. 44.

the last nearly twice as broad as the first; club oval, not much enlarged. Surface of head roughly shagreened above and on the front, more finely so behind the eyes. Clypeus slightly prolonged into a short, almost truncate lobe. Left mandible with three teeth, right one with four. Palpi light yellow. Mesonotum coarsely shagreened or finely reticulate punctate, as long as broad. Axillæ separated by their own width, more finely sculptured than the mesonotum. Scutellum very convex apically, in front finely sculptured like the axillæ, but much more coarsely so at the apex; without cross-furrow. Metathorax with a very distinct median carina. Spiracular sulci present, but not very deep; lateral folds very distinct at the base, but evanescent apically. Mesopleura roughly shagreened, but with a large triangular polished space above. Abdomen nearly as long as the thorax, scarcely produced below, and flat above, with the apex rather suddenly narrowed and pointed. Wings hyaline, veins weak brownish-yellow; marginal vein three-fifths as long as the submarginal, long and slender, and about as long as the postmarginal; stigmal vein slender, three-fourths as long as the marginal, with a small knob at its apex.

Male: Differs from the female by its more slender form, bright metallic green colour and paler legs. The legs, except coxæ, are pale yellow, with only the last tarsal joint blackened, and the antennæ are also pale brownish-yellow, somewhat infuscated toward the apex.

Described from two females and two males received from Dr. C. Gordon Hewitt, Dominion Entomologist, Ottawa, Canada. They were reared early in August by Mr. Arthur Gibson, of the Entomological Division, from pupæ of the spruce bud-worm, *Tortrix fumiferana*, collected at Baskatong, Quebec, where the caterpillars were feeding on spruce and balsam.

This species appears to be referable to *Nazonia* Ashm., although it will not well run to this genus in Ashmead's table. It agrees better with his characterization of *Marmoniella*, which Mr. N. W. Kourdumoff, who has seen the type in Washington, tells me is based on the same type specimen as *Nasonia*, Ashmead having given also the same manuscript name *(brevicornis)* to the type species of both genera. Since Girault has more recently (Psyche, June, 1910) given a full description of *Nasonia*, I prefer to use this name, although it appears on a later page of Ashmead's paper.

I had at first placed the present species in *Habrocytus* Thoms., but believe it is better placed as indicated above.

Bussey Institution, Harvard University, May 20, 1910.

NOTES ON GENUS CATONIA (HOMOPTERA).

BY E. P. VAN DUZEE, BUFFALO, N. Y.

The synoptical table of the species of this genus published by me in January, 1908, has become rather antiquated on account of the discovery of a number of new forms. The following table includes all described species from America north of Mexico:

Apex of the head more or less angled, with the carinæ sharp; the lateral carinæ of the front following its basal margin and forming a distinct angle before the eye, where they join those of the vertex; eastern species ..... 1.

Apex of the head tumid, with the vertex sloping and confounded with the base of the front in a common convexity, the carinæ obsolete there; lateral carinæ of the front following the contour of the eyes; western species ..... 7.

1. Face conspicuously transversely banded ..... 2.
Face not distinctly banded ..... 6.
2. Front entirely black, the clypeus abruptly white; elytra unicolorous brown, nervures impunctate ..... 7, *dimidiata* VanD.
Front transversely banded with white opposite the antennæ ..... 3.
3. Elytra unicolorous, nervures impunctate ..... 6, *impunctata* Fitch.
Elytra variegated, nervures punctate ..... 4.
4. Larger, 7 mm.; front distinctly narrowed at base, which is but obscurely banded ..... 1, *nava* Say.
Smaller, 5–6 mm.; base of the front black ..... 5.
5. Front much narrower at base; vertex narrow, truncated before, its sides considerably produced before the eyes; mesonotum variegated ..... 2, *cinctifrons* Fitch.
Front hardly narrower at base; vertex broad, obtusely angled before, the sides not produced before the eyes; mesonotum unicolorous, castaneous ..... 3, *picta* VanD.
6. Larger, 7 mm.; elytral areoles with numerous incomplete transverse veinlets; apex of the mesonotum with a pair of ocellated black points ..... 4, *grisea* VanD.
Smaller, 5 mm.; elytral areoles without transverse veinlets ..... 5, *pumila* VanD.
7. Front banded, its basal carinæ indicated; elytra fuscous, the areoles dotted and some of the transverse veins white ..... 8, *fusca* VanD.
Front without transverse bands ..... 8.

8. Colour ferruginous, inclining to castaneous; elytra with a transverse clitellate band.....*12, cara* VanD.
Colour some shade of brown or fuscous; elytra not banded.....9.
9. Smaller, less than 5 mm; colour testaceous-brown, with the costa obscurely paler.....*11, costata* VanD.
Larger, 6 mm.; not distinguished by a paler costa.....10.
10. Of a uniform ferruginous- or rufous-brown, sometimes marked with sanguineous on the abdomen and elytral nervures; apex of the elytra infuscated with contrasting nervures.....*10, rubella*, n. sp.
Of a clear fuscous-brown; carinæ of the pro- and mesonotum and elytral nervures mostly whitish.....*9, nervata*. n. sp.

I have omitted from this table the West Indian *intricata* Uhler, and the Mexican and Central American species described by Fowler in the Biologia. Below is a list of the species of *Elidiptera* and *Catonia* known from north of Mexico and the West Indies:

Genus ELIDIPTERA Spinola.

Ann. Soc. Ent. Fr., viii, p. 304, 1839.
Helicoptera Am. & Serv., Hemipteres, p. 526, 1843.
Van Duzee, Proc. Acad. Nat. Sci. Phila., lix, p. 475, 1908.

1. COLORATA Van Duzee.—Proc. Acad. Nat. Sci. Phila., lix, p. 476, 1908.
Habitat.—N. Y. (Approaches genus *Pseudohelicoptera* Fowler.)
2. OPACA Say.—Jl. Acad. Nat. Sci. Phila., vi, p. 239, 1830; Compl. Writ., ii, p. 374, 1859.
vestita Prov.—Pet. Faun. Ent. Can., iii, p. 221, 1889.
pinorum Manee.—Ent. News, xxi, p. 117, 1910.
Habitat.—Canada to North Carolina.
3. PALLIDA Say.—Jl. Acad. Nat. Sci. Phila., vi, p. 240, 1830; Compl. Writ., ii, p. 374, 1859. Van Duzee, Proc. Acad. Nat. Sci. Phila., lix, p. 477, 1908.
Habitat.—Eastern States, Canada.
4. HENSHAWI VanD.—Trans. Am. Ent. Soc., xxxvi, p. 83, 1910.
Habitat.—Washington State.
5. SLOSSONI VanD.—Proc. Acad. Nat. Sci. Phila., lix, p. 478, 1908.
Habitat.—New Hampshire.
6. SEPTENTRIONALIS Prov.—Pet. Faun. Ent. Can., iii, p. 220, 1889.
Habitat.—Canada, New England.
7. FLORIDÆ Walker.—List of Homop., ii, p. 326, 1851. Van Duzee, Trans. Am. Ent. Soc., xxxvi, p. 83, 1910.
Habitat.—Rhode Island to Florida.

8. VARIEGATA VanD.—Proc. Acad. Nat. Sci. Phila., lix, p. 479, 1908.
Habitat.—Canada to North Carolina.

9. FUSIFORMIS VanD.—Trans. Am. Ent. Soc., xxxvi, p. 82, 1910.
Habitat.—California.

[NOTE.—Of the Biologia species, *Helicoptera longiceps* Fowl. appears to belong to this genus.]

Genus CATONIA Uhler.

Proc. Zool. Soc., Lond., 1895, p. 61.
Van Duzee., Proc. Acad. Nat. Sci. Phila., lix, p. 480, 1908.

1. NAVA Say.—Jl. Acad. Nat. Sci. Phila., vi, p. 238, 1830; Compl. Writ., ii, p. 373, 1859.
Habitat.—Eastern States.

2. CINCTIFRONS Fitch.—Third Rept., Trans. N. Y. St. Ag. Soc., 1856, p. 451.
Habitat.—New York, Pennsylvania.

3. PICTA VanD.—Proc. Acad. Nat. Sci. Phila., lix, p. 481, 1908.
Habitat.—New Jersey to Florida.

4. GRISEA VanD.—Proc. Acad. Nat. Sci. Phila., lix, p. 482, 1908.
Habitat.—New York to Canada.

5. PUMILA VanD.—Proc. Acad. Nat. Sci. Phila, lix, p. 483, 1908.
Habitat.—New York, Ohio.

6. IMPUNCTATA Fitch.—Cat. Ins. N. Y. St. Cab., Fourth Ann. Rept., p. 46, 1851.
Lintner's 9th Rept., in 46th Rept. St. Museum, p. 386, 1893.
Van Duzee.—Proc. Acad. Nat. Sci. Phila., lix, p. 482, 1908.
Habitat.—Eastern States.

7. DIMIDIATA VanD.—Trans. Am. Ent. Soc., xxxvi, p. 85, 1910.
Habitat.—Eastern States.

8. FUSCA VanD.—Proc. Acad. Nat. Sci. Phila., lix, p. 481, 1908.
Habitat.—California.

9. NERVATA, n. sp.—(See below.)
Habitat.—California.

10. RUBELLA, n. sp.—(See below.)
Habitat.—California.

11. COSTATA VanD.—Trans. Am. Ent. Soc., xxxvi, p. 86, 1910.
Habitat.—California.

12. CARA VanD.—Trans. Am. Ent. Soc., xxxvi, p. 86, 1910.
Habitat.—California.

[NOTE..—The following Biologia species seem to belong to this genus: *Helicoptera sobrina* and *chiriquensis; Plectoderes basalis, excelsus, notatus, laticollis* and *fuscolineatus*, and possibly *montanus* and *asper*. Genus *Plectoderes* Spinola has the head as wide as the pronotum, which excludes all the species above mentioned.]

Descriptions of new species:

CATONIA RUBELLA, n. sp.

Form and size of *fusca* nearly. Of a uniform brown, more or less inclined to ferruginous and touched with sanguineous on the elytral nervures and abdomen. Front immaculate; apical border of the elytra fuscous crossed by pale nervures. Length, 5–6 mm.

Head more conical than in any of our other species. Vertex broad, transverse, sloping; produced in an obtuse rounded angle; base subangularly emarginate; carinæ nearly straight, forming a regular triangle, but little broader than long, median carina abbreviated just before the apex. Front broad, scarcely widened apically, obviously convex, carinæ prominent, but becoming obsolete on the tumid base; clypeus scarcely distinguished from the front, the sides narrowly laminate. When viewed from the side the head is produced in a blunt cone before the eye for a distance of about one-half the length of the latter, and the lateral carinæ of the front lie close to and are concentric with the anterior and superior borders of the eye. Pronotum less than half the length of the vertex, with the carinæ distinct and the hind edge deeply, angularly emarginate; mesonotal carinæ parallel and distinct. Median tooth of the male genital segment short, abrupt, ligulate and rounded at apex, and less than half the length of the plates.

Colour: Head, pronotum, face, chest and legs testaceous-brown, the eyes and tibial and tarsal spines black; mesonotum and elytra a little darker and obscurely tinged with ferruginous; elytral nervures more or less distinctly sanguineous; apex of the elytra somewhat infuscated, with the apical nervures (about seven in number) whitish or bordered with whitish. Wings quite strongly infuscated, with blackish nervures. Abdomen fuscous or black, with the genital pieces and margins of the segments testaceous or sanguineous.

Described from two male and two female examples from the Cornell University collection, taken at Felton, California, about May 22nd, 1907,

by Mr. J. C. Bradley. This species may be known by the subconical head, resembling that found in *Paracœlidia* in the Jassidæ, the uniformly brown or testaceous-brown colour sometimes tinged or marked with sanguineus in places, and the pale veins on the infuscated apex of the elytra.

CATONIA NERVATA, n. sp.

Form and size of *dimidiata*, but with a shorter and broader vertex. Colour a clear fuscous-brown, elytral nervures and all carinæ, except those of the head, whitish; base of the clypeus with a whitish mark on either side. Length, 5½ mm.

Head very short and blunt; at apex rounded in both diameters. Vertex transverse, its length scarcely one-half the width between the eyes, sloping and confused with the rounding base of the front; carinæ inconspicuous, forming a transverse compartment rounded before and a little longer at the middle than next the eye; hind edge feebly arcuated. Front broad, a little constricted between the eyes; the carinæ distinct below, obsolete on the tumid base; apex rather deeply angularly excavated to receive the clypeus; the latter longer than broad, with prominent median carinæ and narrowly expanded margins. Viewed from the side, the base of the front is but feebly, conically produced, with the lateral carinæ closely following the contour of the eyes, as in *rubella*. Pronotum shorter than the vertex, deeply angularly emarginate. Mesonotal carinæ distinct, parallel. Median tooth of the male genital segment slender and acute, over one-half the length of the plates.

Colour clear fuscous-brown, a little tinged with castaneous on the mesonotum; carinæ of the pro- and mesonotum broadly whitish, the lateral angles of the latter ivory-white. Vertex and front more testaceous-brown, an oblique mark on each side of the base of the clypeus and its apex pallid, pleural pieces broadly edged with whitish; legs pale testaceous-brown; abdomen blackish-fuscous, the slender edges of the segments and genital pieces pallid. Elytra fuscous-brown, becoming paler along the middle of each areole; nervures strong, mostly whitish, but somewhat alternated by dusky in places, the transverse and apical more conspicuously white. Wings a little infuscated at apex with dark nervures.

Described from one male taken on Mt. Wilson, near Pasadena, California, on August 10th, 1909, by Mr. Fordyce Grinnell, jr. This species is very distinct from any other known to me, and is well characterized by the clear fuscous-brown colour veined with whitish. Allied to *Plectoderes lineaticollis* Fowler, but with a shorter vertex and immaculate front.

SOME NEW WESTERN THAMNOTETTIX (HOMOPTERA).

BY E. D. BALL, EXP. STATION, LOGAN, UTAH.

Thamnotettix venditaria, n. sp.

Form and colour of *decipens* nearly. Slightly longer; green, with three large black spots in a triangle on the vertex. Length, ♀, 5.5 mm.; ♂, 4.75 mm.

Vertex bluntly angulate, with the apex slightly conically produced, twice wider than long, one-third longer on the middle than against the eye, disc slightly sloping to the rounded anterior margin, front slightly inflated, distinctly wider than in *decipens*, scarcely more than half longer than its basal width. Elytra not quite as long as in *decipens*, venation similar.

Colour: Vertex straw-yellow, with a pair of large, oval, black spots extending from behind the ocelli obliquely towards the middle of the disc. Another triangular black spot on apex usually narrowly bisected by the median line. Face pale yellow, with the sutures mostly narrowly black-lined, upper two-thirds of the front smoky, with a light median line and about six abbreviated arcs on either side. The front and vertex separated by an arcuated line. Pronotum green, the anterior margin dirty straw. Scutellum pale yellow, a pair of round black spots at the base half concealed by the pronotum. Elytra green, the nervures pale straw. Below straw-coloured, with some dusky on the abdomen and the ovipositor black.

Genitalia: Female segment nearly as long as its basal width, roundingly narrowing from the base to the truncate apex, which is narrowly marked with black. The lateral angles are semicircularly depressed, leaving an elevated median disc as wide as the black marking. Male valve very broad and short, obtusely angular; plates together, long, triangular, their margins slightly concave, and clothed with stiff hairs.

Described from two females and three males from Utah and Reno, Nevada, collected by the author. This species might easily be mistaken for a *Cicadula* in colour and marking, but is readily separated by the venation.

Thamnotettix viriosa, n. sp.

Size and form of *chiragrica* nearly. Broad, stout, powdery green, with five black spots on vertex. Length, 5.75 mm.

Vertex broad and short, nearly three times wider than long, the apex bluntly conical, disc slightly sloping, broadly rounding to the tumid front,

which is as wide as its median length. Pronotum broad and short, scarcely longer than vertex. Elytra broad, only slightly longer than the abdomen.

Colour: Vertex pale yellow, a pair of large, nearly quadrangular black spots on the margin just outside the ocelli, a still larger one on the apex, triangularly forking posteriorly, and two small round ones on the posterior margin equidistant from the median line and the eyes. Face pale, with the sutures black-lined, those around the loræ heavily so; a pair of black spots above the antennæ. Front smoky, set off from vertex by an arcuated black line, the median line pale, triangularly widening below, with about nine pale arcs on each side. Pronotum pale green, the anterior margin lighter, submargin sometimes with faint dusky spots. Scutellum pale powdery green. Elytra pale green, heavily powdered with white. Venation obscure.

Genitalia: Female segment as long as broad, slightly narrowing to the truncate apex; lateral margin depressed, a black line on the posterior margin, sometimes reduced to two spots. Male valve broad and short, bluntly angular, plates together, broadly triangular, their apices broadly, slightly roundingly, truncate, scarcely exceeding the broad swollen pygofers.

Described from eight examples from Beaumont, California, collected by the author. A large and readily recognized species.

Thamnotettix Titusi, n. sp.

Size and form of *melanogaster* nearly. Slender, parallel, vertex right-angled. Green, with the face and tip of elytra smoky. Length, ♀, 5·5 mm.; ♂, 5 mm.

Vertex one-half wider than long, right-angled in front, the disc flat or transversely depressed, roundingly angled with the front. Front much narrower than in *atridorsum*, wider and more nearly parallel margined than in *melanogaster*, distinctly longer than wide. Elytra long, narrow, inclined to be flaring at the tips, giving the insect a parallel-margined appearance. Venation simple.

Colour: Vertex pale straw, inclined to be greenish at base, and smoky or tawny at tip. The smoky front is visible from above on either side the apex of vertex, and often there are a pair of oblique spots at the base. Face pale, the front smoky, growing darker above, with numerous pale arcs. Pronotum green, rarely with dark spots on the submargin. Scutellum pale, sometimes a pair of small black spots at base. Elytra

green, the appendix and apical cells smoky, with the nervures light. Below smoky.

Genitalia: Female segment slightly longer than its basal width, roundingly narrowing to half its basal width, then truncate and black-marked, curving around the long pygofers. Male valve short and broad, obtusely augled, plates together, slightly longer than their basal width, narrow and bluntly rounding at the apices, which slightly exceed the narrow pygofers.

Described from twelve examples from Colfax, California, and Medford and Grant's Pass, Oregon, those from the latter place collected by Prof. Titus, the remainder by the author. The black tip of the elytra and the angled vertex will readily separate this from any other described species. Named in honour of Prof. E. G. Titus, whose industrious collecting has brought to light many good things.

Thamnotettix vastula, n. sp.

Resembling *Titusi* in form and general appearance, slightly shorter and stouter, with distinct genitalia. Length, 5 mm.

Vertex slightly acutely angled in the female, scarcely wider than long, as long as the pronotum, about right-angled in the male; disc flat, roundingly angled with the front. Front much more strongly retreating than in *Titusi*, distinctly narrowing below. Elytra broader and shorter than in the former species, and inclined to be appressed posteriorly. Venation simple, the apical cells not elongated.

Colour: Vertex pale, clear straw. Face in the female pale, the sutures and front pale, smoky, except for the pale arcs on the latter. In the male the face and venter are deep smoky, with a light spot on the clypeus. Pronotum and scutellum pale green, becoming straw-colour towards the margins, the appendix and apical cells abruptly deep smoky.

Genitalia: Female segment much narrower than the penultimate, constricted at the base, roundingly narrowing towards the apex, which is narrow, slightly thickened, and a trifle excavated. The whole segment very much the shape of a blunt-tipped spoon. Male valve as in *Titusi*; plates together, slightly narrowing, and then extending into a long spatulate process between two and three times as long as wide.

Described from five examples from Chico and Salinas, California, collected by the author. The sharper pointed head and longer genitalia render this species quite distinct, and easily separated from the other members of the group.

(To be continued.)

THE ORTHOPTERA OF WESTERN CANADA.

BY THE EDITOR.

The Orthopterous fauna of Western Canada was, until a comparatively few years ago, almost unknown. Several papers, however, have appeared within recent years, which have added considerably to our knowledge of the Canadian species of this order, and during the past four years the writer has examined nearly a thousand specimens from a large number of localities in the four western Provinces, Manitoba, Saskatchewan, Alberta and British Columbia, and a good deal of light has thus been thrown upon the distribution of many species. It seems best, therefore, to bring together in a single paper all the information available on the distribution of Orthoptera in these four Provinces.

The collections examined by the writer, but not yet reported upon, were made chiefly by Prof. W. J. Alexander, of Toronto; and Messrs. N. Criddle, Aweme, Man.; T. N. Willing, Regina, Sask.; and N. B. Sanson, Banff, Alta. My thanks are due to all of these gentlemen for generous gifts of specimens or the loan of material for study, but especially to Prof. Alexander, who, although not an entomologist, devoted a large part of a two months' trip through the Canadian West to the collection of Orthoptera for the writer's cabinet, and although without any experience in collecting insects, succeeded in taking some 400 specimens, representing 40 species.

Prof. Alexander's trip was made in September and October, 1906, and his collecting was almost all done at the various stations along the Canadian Northern and Canadian Pacific Railways. As with few exceptions not more than a day was spent at any station, a list of the stations, with the dates on which the collecting was done, is given below, in order to avoid the necessity of repeating these dates in the list of species.

List of localities and dates of capture of specimens taken by Prof. Alexander in 1906:

Manitoba: Carman, Sept. 6; Swan River, Sept. 8; Elkhorn, Sept. 13; Gilbert Plains, Sept. 18; Grandview, Sept. 18.

Saskatchewan: Findlater and Condie, Sept. 10; Yellow Grass and Pasqua, Sept. 12; Moosomin, Sept. 13; Kamsack and Kuroki, Sept. 19; Langham, Radisson, Vonda and Weyburn, Sept. 20; Medicine Hat, Sept. 26.

Alberta: Vermilion, Sept. 21; Ponoka and Red Deer, Sept. 24; Calgary, Sept. 25; Lethbridge and Macleod, Sept. 27.

British Columbia: Lloydminster, Sept. 21; Cranbrook, Sept. 28; Kitchener, Sept. 29; Nelson, Sept. 30; Greenwood, Oct. 1; Savonar and Kamloops, Oct. 8; Victoria, Oct. 20.

LIST OF CHIEF REFERENCES.

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Caudell, A. N.—Some Orthoptera taken at Moose Jaw, Assa., CAN. ENT., XXXVI, p. 248 (1904).[1]

" The Decticinæ of North America. Pr. U. S. N. M., XXXII, pp. 285-410 (1907).[2]

" Notes on some Western Orthoptera, with descriptions of new species. Pr. U. S. N. M., XXXIV, pp. 71-81 (1908).[3]

Caulfield, F. B.—A sketch of Canadian Orthoptera. Rep. Ent. Soc. Ont., XVIII, pp. 59-72 (1888).

Fletcher, James.—Rep. Exp. Farms, Can., 1888, pp. 47-77 (1889).[1]

" Entomological Record, 1905, Rep. Ent. Soc. Ont., XXXVI, (1906),[2]

" Entomological Record, 1907, Rep. Ent. Soc. Ont., XXXVIII, (1908).[3]

" Entomological Record, 1908, Rep. Ent. Soc. Ont., XXXIX. (1909).[4]

Rehn, J. A. G.—Records of Orthoptera from Western Canada. Ent. News, XXI, pp. 23-27 (1910).

Scudder, S. H.—List of Orthoptera collected on a trip from Assiniboia to Cumberland. Can. Nat. Geol., VII, pp. 283-288 (1862).[1]

" Notice of the Butterflies and Orthoptera collected by Mr. G. M. Dawson, as naturalist of the British North American Boundary Commission. Rep. Geol. Res. 49th par., App. D., pp. 341-345 (1875).[2]

" The Orthopteran Genus Hippiscus. Psyche, VI (1892).[3]

" The North American Ceuthophili. Pr. Amer. Acad. Arts Sc., XXX, pp. 17-113 (1894).[4]

" Revision of the Orthopteran Group Melanopli. Pr. U. S. N. M., XX, pp. 1-421 (1897).[5]

" The species of Circotettix, a North American genus of Œdipodinæ. Psyche, IX, pp. 135-141 (1900).[6]

Walker, E. M.—Records of Orthoptera from the Canadian Northwest. CAN. ENT., XXXVIII, pp. 55-59 (1906).

Family FORFICULIDÆ.

1. *Labia minor* (L.).

MAN.—Aweme, June 18, 1909, 1 ♂; June 28, 29, 1909, 2 ♂'s, 2 ♀'s; Sept. 11, 1909, 5 ♂'s, 2 ♀'s. (Criddle.)

Family BLATTIDÆ.

2. *Blattella germanica* (L.).

MAN.—Winnipeg, Aug. 26, 1906, 1 ♂. (Willing.)

SASK.—Moose Jaw, Sept. 17, 1901, 1 ♀ with egg sac; Medicine Hat, Oct. 1, 1903, 1 ♂, 1 ♀; Strathcona, Nov., 1903 (nymph). (Willing.)

ALTA.—Calgary, Dec. 30, 1904, 1 ♀; Ponoka, April 27, 1903, 1 ♀. (Willing.)

B. C.—Recorded from Agassiz. (Walker.)

3. *Nyctobora holosericea* Burm.

SASK.—Medicine Hat, June, 3, 1903, 1 ♀. (Willing.) (Introduced.)

Family PHASMIDÆ.

4. *Diapheromera femorata* (Say).

MAN.—"Selkirk Settlements on the Red River." (Scudder.[1])*

Family ACRIDIIDÆ.

Subfamily Tetriginæ.

5. *Tetrix granulatus* (Kirby).

MAN.—Aweme, April 16, 1906; May 3, 4, 5, June 7, July 1, 1904; June 9, 1909; 24 ♂'s, 18 ♀'s. (Criddle.) Also recorded from Winnipeg. (Walker.)

SASK.—Regina, Oct. 11, 1901; June 10, 1902; June 3, 1906; 1 ♂, 2 ♀'s; Strathcona, May 20, 1905, 1 ♀. (Willing.)

ALTA.—Calgary, May 17, 1905, 1 ♂, 2 ♀'s. (Willing.) Banff, June 24, July 10, 1908; July 14, 1909, 2 ♂'s, 2 ♀'s. (Sanson.)

B. C.—Recorded from Vancouver (Scudder), Victoria (Fletcher[1]), Agassiz (Walker) and Field (Rehn).

*Small numerals following an authority's name refer to same numerals in the list of references.

The series from Manitoba are all long-winged and exhibit great range of colour variation. One of the specimens from Banff, a male, has the pronotal process and wings somewhat shorter than usual, but is not brachypterous

6. *Tetrix Brunneri* Bol.

ALTA.—Banff, 1 ♀, long-winged; swamp off Hot Springs Road, June 3, 1909, 1 ♂, 1 ♀. (Sanson.)

B. C.—Recorded from Field by Rehn.

7. *Tetrix acadicus* (Scudd.).

MAN.—Aweme, May 1, 3, 4, 1904, 2 ♂'s, 4 ♀'s; May 31, 1904, 1 ♂; June 25, 1907, 1 ♀. (Criddle.)

Also recorded from the Lake of the Woods District. (Scudder.[2]) The specimens from Aweme vary in colour, from pale clay-yellowish to dark gray.

8. *Tetrix ornatus* (Say).

MAN.—Aweme, May 1, 5, 14, 1904, 3 ♂'s, 2 ♀'s; Oct. 20, 1904, 1 ♂. (Criddle.)

SASK.—Moose Jaw, June 8, 1902, 1 ♂. (Willing.)

ALTA.—Calgary, May 5, 1905. (Willing.)

These specimens are all macropterous. They are on the whole somewhat broader between the middle legs than eastern specimens of *ornatus*, but I have specimens from Ontario which are indistinguishable from them, and considerable variability seems to exist in this regard. It may be that some, or all, of these specimens should be referred to *T. crassus* Morse, but I cannot regard them as specifically distinct from *ornatus*.

9. *Tetrix crassus* Morse.

ALTA.—Recorded by Morse from Laggan. (Journ. N. Y. Ent. Soc., VII, p. 200, 1899.)

10. *Tetrix Hancocki* Morse.

MAN.—Aweme, July 30, 1904, 1 ♂, macropterous. (Criddle.)

Also recorded from Sidney. (Walker.)

SASK.—Moosomin, 1 ♂, macropterous. (Alexander.)

Subfamily Tryxalinæ.

11. *Acrolophitus hirtipes* (Say).

SASK.—Medicine Hat, Sept. 26, 1906, 2 ♀'s. (Alexander.)

ALTA.—MacLeod. (Bruner.[3])

12. *Eremnus Scudderi* McNeill.

Recorded from "British America." (McNeill, Pr. Davenp. Acad. Nat. Sci., VI, 269, 1897.)

13. *Akentetus unicolor* McNeill.

SASK.—Walsh, Aug. 23, 3 ♂'s, 1 ♀.

These specimens were determined by Prof. Morse, and are very interesting, inasmuch as some of them possess rudimentary accessory lateral carinæ of the pronotum. In one of the males there is no trace of accessory carinæ, in the female they are indicated only by the margins of the pale median dorsal band, while in the other two males they are slightly indicated, being about as distinct as the true lateral carinæ. These latter specimens are not generically separable from *Amphitornus*, and the genus *Akentetus* will probably have to be reduced to a synonym of the latter.

14. *Amphitornus Coloradus* (Thom.).

Syn.—*A. bicolor* (Thom.).

MAN.—Aweme. (Fletcher.[2] Determinations by Scudder.)

B. C.—Vernon. (Walker.)

15. *Cordillacris cinerea* (Brun.).

MAN.—Aweme, Aug. 1, 1905, 2 ♂'s, 2 ♀'s; Aug. 25, 1905, 1 ♂ (worn). (Criddle.)

Also recorded from Aweme (Fletcher[2]), from specimens determined by Scudder.

16. *Phlibostroma quadrimaculatum* (Thom.).

MAN.—Aweme, Aug. 1, 1905, 2 ♀'s. (Criddle.)

SASK.—Walsh, Aug. 23, 2 ♀'s. (Willing.) Also recorded from Moose Jaw (Caudell[1]), and Medicine Hat (Caudell.[3]).

ALTA.—Banff, below Upper Anthracite Road, Aug. 5, 1908, 2 ♀'s. (Sanson.) Also from Calgary (Caudell[3]), and "British America." (Bruner.[2])

These specimens are much larger than examples from Pine Bluff, Wyoming.

17.—*Chloealtis conspersa* Harr.

MAN.—Dog's Head, east shore of Lake Winnipeg. (Scudder.[1]).

ALTA.—Banff, below Upper Anthracite Road, Aug. 5, 1908, 1 ♀, brachypterous. (Sanson.)

The capture of this eastern species in the Rocky Mountains was unexpected and interesting. The specimen differs in no way from eastern individuals.

18. *Chloealtis abdominalis* (Thom.).

MAN.—Aweme, Aug. 14, 1907, 1 ♂ (rather large); Oct. 3, 4, 8, 1907, 2 ♂'s, 1 ♀. (Criddle.) Grandview, 1 ♀. (Alexander.) Also recorded from the vicinity of Carberry and Neepawa. (Walker.)

SASK.—Kuroki, 2 ♂'s, 1 ♀; Vondo, 1 ♂; Langham, 2 ♀'s; Weyburn, 1 ♂. (Alexander.) Radisson, July 29, 1907, 1 ♀; Saskatoon, Aug. 13, 1906, 1 ♀; Regina, Sept. 7, 1905, 1 ♀, Sept. 8, 1909, 1 ♀. (Willing) Recorded from Radisson also by Rehn.

ALTA.—Mt. Inglesmaldie, Seal's Lake, 7,000 ft., Sept. 11, 1908, 1 ♀; Tunnel Flats, near Banff, Sept. 4, 1908, 1 ♀, two nymphs; Banff, below Upper Anthracite Road, Aug. 5, 1908, 1 ♀; The loop, Banff, July 23, 1909, 1 nymph. (Sanson.) Red Deer, 1 ♀; Vermilion, 1 ♀; Lethbridge, 1 ♂. (Alexander.)

The three females from Regina and Saskatoon are macropterous, the others all brachypterous. The specimens average smaller than those from Northern Ontario, particularly those taken by Prof. Alexander.

19. *Stenobothrus curtipennis* (Harr.).

MAN.—Elkhorn, 3 ♀'s; Gilbert Plains, 1 ♂, 1 ♀. (Alexander.) Aweme. (Criddle. Det. Scudder.) Also recorded from Winnipeg (Scudder[1]), and Brandon (Walker).

SASK.—Condie, 1 ♀; Yellow Grass, 4 ♂'s, 5 ♀'s; Pasqua, 2 ♂'s, 1 ♀; Moosomin, 17 ♂'s, 11 ♀'s; Kamsack, 7 ♂'s, 8 ♀'s; Langham, 1 ♂, 3 ♀'s; Radisson, 1 ♂, 1 ♀; Weyburn, 1 ♂, 1 ♀. (Alexander.) Regina, Aug. 20, 1901, Aug. 15, 1905, Sept. 5, 13, 1909, Sept. 13, 1903, Sept 13, 1906, 3 ♂'s, 9 ♀'s; Leduc, July 22, 1901, 1 ♀; north of Olds,

Sept. 13, 1902, 1 ♂, 1 ♀; Davidson, Aug. 21, 1907, 1 ♂, 1 ♀. Also recorded from Radisson (Rehn), and Swift Current (Walker).

ALTA.—Ponoka, 3 ♂'s, 1 ♀; Red Deer, 5 ♂'s, 5 ♀'s; Calgary, 2 ♂'s, 2 ♀'s. (Alexander.) Banff, Aug. 28, 29, 3 ♀'s; Tunnel Mt., near Banff, Oct. 3, 4, 1908, 2 ♂'s, 2 ♀'s.

B. C.—Lloydminster, 1 ♀; Greenwood, 1 ♀. (Alexander.) Also recorded from Field (Rehn), Sandon and Vernon (Walker.)

These series show the usual range of variation in colour, pattern and length of tegmina. This species appears to be by far the most abundant Orthopteran in the less dry parts of Saskatchewan and Alberta.

20. *Stenobothrus acutus* Morse.

ALTA.—Edmonton. (Fletcher.[2])

21. *Platybothrus brunneus* (Thom.).

SASK.—Regina, June 5, 1903, 1 ♂. (Willing.) Also recorded from Regina by Caulfield.

ALTA.—Rundle Mt., near Banff, lower part of slope, Sept. 13, 1909, 1 ♂, 1 ♀; The Loop, Banff, Aug. 16, 1909, 1 ♀. (Sanson.)

In the male from Rundle Mountain the vertex is somewhat more obtuse than that of the Regina specimen.

22. *Gomphocerus clavatus* Thom.

Syn.—G. clepsydrus (Scudd.).

MAN.—Aweme, June 24, July 4, 11, 1904, 3 ♂'s, 1 ♀. (Criddle.) Also recorded from the Souris River. (Scudder.[2])

SASK.—Yellow Grass, 1 ♂. (Alexander.) Rudy, July 19, 1907, 1 ♂; Regina, Aug. 2, 1903, 1 ♂; Sept. 13, 1908, 1 ♀; Radisson, July 29, 1907, 1 ♂; Walsh, Aug. 23, 1 ♀. (Willing.) Also recorded from Moose Jaw (Caudell[1]), Radisson (Rehn), Waldeck and Pasqua (Walker).

ALTA.—Mt. Inglesmaldie, 6,500 ft., Sept. 11, 1908, 1 ♂; Tunnel Mt., Sept. 4, 1908, 1 ♀; Banff, July 1, Sept. 13, 24, 1909, 3 ♀'s. Also recorded from New Lunnon. (Fletcher.[2] Det. Scudder.)

Considerable range of variation in size and coloration is present in this series. The Manitoba and Alberta specimens

average larger than those from the semi-arid parts of Saskatchewan. The male from Mt. Inglesmaldie is one of the largest examples, and is darker coloured than those from Saskatchewan. It measures as follows: Length of body, 19; head and pronotum, 6.5; tegmina, 12; hind femora, 11.5 mm.

23. *Mecostethus lineatus* (Scudd.).
Reported from Manitoba (Scudder, Hitchc. Rep. Geol. N. H., 1, 373, 1874).

24. *Mecostethus gracilis* (Scudd.).
MAN.—Swan River, 1 ♂ (Alexander); Aweme (Fletcher. Det. Scudder). Also recorded from the Red River (Scudder[1]) and Winnipeg (Walker).
SASK.—Radisson, July 29, 1907, 2 ♂'s, 1 ♀ nymph. (Willing.) Recorded from the same locality, also by Fletcher and Rehn.
ALTA.—Edmonton, July, 1904, 1 ♂. (Willing.) Also from New Lunnon (Fletcher[2]).

25. *Boopedon nubilum* Say.
Reported as occurring north to the "British Line." (Bruner.[1])

26. *Stirapleura decussata* Scudd.
MAN.—Aweme, May 24, 1904, 1 ♂. (Criddle.) Also recorded from Aweme by Fletcher.[1]
SASK.—Medicine Hat, May 30, 1904, 4 ♂'s, 3 ♀'s; Estevan, June 8, 1902, 2 ♂'s, 3 ♀'s; Moose Jaw, May 27, 1901, 2 ♀'s. (Willing.) Langham, 1 nymph; Medicine Hat, 4 nymphs; Condie, 2 nymphs. (Alexander.)
ALTA.—Macleod, July 8, 1904, 1 ♀; Calgary, May 17, 1905, 1 ♀. (Willing.)

27. *Ageneotettix Scudderi* (Brun.)
MAN.—Aweme, Aug. 1, 1905, 2 ♀'s; Aug. 12, 1905, 1 ♂; Sept. 15, 1907, 3 ♂'s. (Criddle.)
SASK.—Reported from Medicine Hat (Caudell[3]), Saskatchewan Valley (Bruner, Pr. U. S. N. M., XII, p. 64, 1890).

28. *Aulocara Elliottii* (Thom.).
B. C.—Vernon (Fletcher[3]).

(To be continued.)

GEOMETRID NOTES.

NEW HYDRIOMENA VARIETIES.

BY L. W. SWETT, BOSTON, MASS.

Hydriomena speciosata Pack.

(a) *Agassizi*, nov. var.

Expanse, 38 mm.

Packard, in his original description (Proc. Boston Soc. Nat. Hist., XVI, p. 22, 1874), had two males of different colour and markings. The one from which most of his description was drawn was a pale pea green form, wholly different from the black margined form, which I shall call the variety, limiting the other as type. In *Agassizi* the palpi are long and slender. Fore wings: basal band black, then a whitish-green space to first line of mesial band, which is narrow, black and angulated on median vein, followed by a narrow whitish-green band and then a wide dark band or γ band, which is twice as broad as in *speciosata*, almost 3 mm. Third line broken just below costa, where it is whitish-green, then begins black on median vein, below which are two whitish-green spots. Extra discal line black and same as in *speciosata*, mesial space so narrow as to be practically absent. Beyond extradiscal line is a broad irregular greenish-white band running to inner margin; beyond this the wing is entirely black except at apex, where there is a green apical streak and two yellow-green spots at centre of outer border.

Beneath fore wings brown and yellow, the bands of above showing through, but broader than in *speciosata*, in which also the black outer border is absent.

This variety was noted by Packard in the original description in the last three lines, and again in the monograph. It is very distinct, and can be recognized by the broad mesial γ band and the black outer margin, which is pea green in *speciosata*. It is a colour variety of *speciosata*, and I shall explain its position in my revision, which I cannot complete as yet, as I have to return at once some of the types, which were kindly loaned me, and do not permit of delay. I shall explain all other varieties to follow in my revision.

Type, 1 ♂, Mendocina City, Cal., collected by A. Agassiz, and in University Museum collection, Cambridge, Mass.

Hydriomena speciosata Pack.

(b) *Taylori*, nov. var.

Expands 31 mm., with the palpi long (2 mm.) and slender, head brownish-olive, as is body and thorax. Fore wings brownish-olive, with a

faint trace of white near discal spot in mesial space, and crossed by five black bands of varying width. A very faint basal black dash close to body, then first line of mesial band starts as spot on costa, and runs to median vein, where it bends towards outer margin, then inward to vein 2, and outward to inner margin. Second band broad and very irregular in its course, as is the case of most of the γ bands, particularly below costa, where it is bent outward at median vein, then inward straight to inner margin; space between all the bands olive brown. Third band very narrow and irregular, bent outward opposite discal spot, then running in scallops to inner margin. Mesial space narrow, olive brown, with shading of white around discal spot, which is black and linear where *speciosata* is green. Fourth band broken opposite discal spot, then a spot beneath which is a hair line running irregularly to inner margin, where it ends in black spot. Fifth band broad at costa and widening opposite discal spot to a patch shaded on inner side by a white line; at vein 4 the black patch narrows to a line, and makes a scollop which is very striking; below it broadens and runs to inner margin, where its width is the same as at costa. A marginal row of black dots, forming a triangular black patch near apex, and connecting with fifth band by black streak; space between 5th band and border olive brown, in *speciosata* pea green. Hind wings brown, with two smoky curved bands near outer margin; edge of wing darkened near fringe, with intervenular black dots. Beneath, fore wings dark smoky-brown, with lines above faintly showing, between each is ochre-yellow on costa. Hind wings gray-brown, with bands above showing through, fringe brown.

This pretty variety I take pleasure in naming after Rev. G. W. Taylor, from whom I first received it for identification. It is a colour variety of *speciosata*, differing in the olive brown, where *speciosata* is pea green, and in the white markings. I shall explain its position in my revision to follow.

Type, 1 ♂ (in Swett coll.), 22, VII, '08, Departure Bay, B. C., from Rev. G. W. Taylor.

Co-types, 1 ♂ (in Croker coll.), 1, VII, '09, Victoria, B. C., from A. J. Croker, and also specimens in Rev. G. W. Taylor's collection.

Hydriomena autumnalis Strom.

(b) *Crokeri*, nov. var.

Expanse, 30 mm. Palpi moderate length, head yellow, stained with reddish, as is thorax and abdomen. Fore wings very light ash, especially the mesial space, the basal and marginal being yellowish, with reddish staining.

Basal portion yellow; basal line runs at right angles from costa to median vein, then goes straight to inner margin, and is black and not very wide, slightly shaded with white; mesial band yellowish, except where the wide irregular black band runs through it. This second band, or γ band, as it is sometimes called, is notched strongly on each vein, and as it approaches inner margin increases in intensity, ending in a black blotch. The third band from body is black, and very narrow, merely a hair line, and runs from costa almost straight to median vein, then on vein 2 forms a prominent projection, whence it curves back to inner margin. This tooth on vein 2 is very peculiar, and is characteristic of this variety in that it is the only projection from the line which runs from costa to inner margin. The mesial space is very light ash, with slight yellowish staining. Discal spot, linear, black and very faint. Extradiscal line narrow, bending outward sharply from costa, then in again, forming a blunt projection opposite discal spot, then curving back to vein 3, where it forms another slight projection, then bending back to inner margin. Beyond extradiscal band the margin is yellowish, with the usual irregular broad band running through the middle; outside of this the veins are dotted with black; usual black apical streak present. Marginal dots at ends of veins in fringe, which is short and yellowish. Hind wings almost white, with traces of two irregular lines near outer margin. Beneath very light ash, with lines above faintly showing through. This is a very striking variety, and I am not positive it is not a good species. It can be easily recognized by the yellow colour and prominent projection on fore wing, vein 2, where at most all other species and varieties have an indentation. I have a female from Newfoundland which is very close to this.

Type, 1 ♀, Victoria, B. C., 1892 (not perfect), in Swett coll.

Co-type, 1 ♀, Victoria, May 22, 1909, in A. J. Croker coll.

There are also specimens from B. C. in the British Museum under *pluviata* Gn, which resembles slightly my *H. edenata*, but has shorter palpi.

Hydriomena autumnalis Strom.

(a) PERFRACTA, nov. var.

Expanse, 30 mm. Palpi moderate, head gray, as is thorax and abdomen; close to thorax there are two black longitudinal dashes. Fore wings greenish-gray except for mesial space, which is light ash, with reddish cloudings. Basal band black, thick, running back from costa to median vein, then waving to inner margin. Mesial band gray, with usual γ band running through in a zigzag manner, ending in dark spot at costa. Third band linear, black at costa, just below which it becomes red and runs zigzag to inner

margin. Mesial space broad, light ash as in *autumnalis*, with faint linear discal dot, but heavily stained with reddish in central portion, and the whole space somewhat shaded. Extradiscal line black, shaded with red externally. Fifth or intermarginal band as in *autumnalis*, sinuate, smoke, outer margin greenish gray, venular spots at base of fringe. Hind wings as in *autumnalis*, with two smoky bands. Beneath lines show through faintly and a slight rose colour to mesial space. This is a very striking variety, and closely resembles *Californiata* Pack, which I believe is a local red race of *autumnalis*. It differs, however, as follows: the basal band in *Californiata* runs almost straight across to inner margin, in *perfracta* outward from costa, then in a scallop to inner margin. Mesial band of *Californiata* is reddish on each side of the second band, as is also the basal space; this is not true of *perfracta*. Third line of *perfracta* is black part way, then red to inner margin; in *Californiata* entirely black; also the mesial space is not so red, and the fifth line is shaded with red only internally in *perfracta*, and not externally also as in *Californiata*. Guenée, in his description of *pluviata* (Hist. Nat. Ins. Spec. Gen. Lepid., Vol. XI, p. 378, 1857), speaks of this variety, but does not give it a name. My specimen is a beautiful fresh one, and shows the markings clearly, and was given to me by Mr. R. F. Pearsall.

Type, 1 ♂, May 26, '06, Catskill Mts., in Swett coll.

Co-types in Mr. R. F. Pearsall's collection.

Hydriomena irata, nov. sp.

Expanse, 30–35 mm. Palpi short; head gray at base of antennæ; thorax gray, reddish-tinted; body gray, marked with black dorsally; fore wings ash gray, with red shadings; except the mesial space, which is ash gray. Next to body a slight black dash on costa, basal space ash, with a slight tinge of red; basal line black and wider than usual, running to median vein in an outward curve, thence almost straight to inner margin. Mesial band much suffused with red, so that it is difficult to see the second irregular band. Third line black and narrow, running almost straight across wing except for slight notches on the veins. Mesial space light ash, discal spot linear. Between veins 2 and 3 there seems to be a tendency for the third and extradiscal lines to unite, as the mesial band narrows there, and there are black streaks on the veins connecting the two. Extradiscal or fourth line black and irregular, connecting in most cases with third line by black dash at vein 3. Beyond extradiscal line the margin is brownish red, with the usual wavy inter-marginal band. Venular spots at base of fringe. Hind wings pale ash, with two dusky bands near outer margin. Beneath lines

of above show through faintly. This species looks very much like *Californiata*, and is confused with it in collections. It can be known by the short palpi and peculiar subdentate antennæ of male, a feature which is very striking, but does not occur in female. It also has the tendency for third and fourth bands of fore wings to connect by black veins at vein 3 and 2. It appears earlier than *Californiata* I shall show its position in my revision to follow.

Type, ♂, April 22, 1909, Victoria, B. C., in Swett coll. Type, ♀, April 22, 1909, Victoria, B. C., in Croker coll.

Co-types, 5 ♂'s, April 19–May 3, 1909, Victoria, B. C., all in Mr. Croker's collection, through whose kindness I received them for study.

Hydriomena nubilofasciata Pack.

(a) *raptata*, nov. var.

Expands 31 mm. Palpi short, with thorax brown, tufted with green. Fore wings marked same as type, and bands have same direction, but instead of the yellow with reddish shading in mesial space, as in *nubilofasciata*, the ground colour is light grass-green between the bands, which are brown. The hind wings are brown, with two smoky marginal bands. Beneath light brown, with bands showing through, between bands on costa of a yellow-ochre colour. The green ground colouring will separate this variety from any of the others; at a glance it is closer to *scalata* Warren, Nov. Zool., XI, p. 53, 1904, than any other, but lacks the pink or red of that variety.

Type, ♂, January, 1878, Sanzalito, Calif. In the University Museum collection at Cambridge, Mass. I will point out its place in my revision to follow.

Hydriomena nubilofasciata Pack.

(d) *cumulata*, nov. var.

Expands 26–28 mm. Palpi short and dark, thorax and abdomen brown. Fore wings dark smoky-brown, with the bands just visible; in one specimen, Feb. 6, 1874, shaded slightly with red. The fore wings are nearly unicolorous, brown being the general colour; the hind wings are lighter, with the characteristic two smoky bands. Beneath of a brown colour, the lines showing through at costa only.

Type, ♂, Feb. 6, 1874, Sanzalito, Cal. In the University Museum. Type, ♀, Feb. 10, 1874, Sanzalito, Cal. Coll. at Cambridge, Mass.

This variety may be recognized by the unicolorous brown wings, and the lack of any of the yellow markings of the type.

Hydriomena nubilofasciata Pack.

(c) *cupidata*, nov. var.

Expands 30 mm. Palpi short. Thorax reddish-brown, with reddish tufts. Fore wings marked as in type, except that the ground colour between the smoky bands is entirely reddish. Hind wings reddish-brown, with two smoky bands. Beneath, the lines from above show through; between them the ground colour is yellow, with a red tinge. This is close to var. *scalata* Warren, of which there is a specimen from California in Packard's collection, Feb. 6, 1874, only it lacks the green and has greenish black bands. This variety can be known by the red ground colour.

Type, ♂, California. In University Museum coll., at Cambridge, Mass.

Hydriomena nubilofasciata Pack.

(e) *vulnerata*, nov. var.

Expands 32 mm. Palpi short and dark. Fore wings marked as in type, only mesial band is shaded with red on either side of first and third band. Mesial space clear white; beyond the extradiscal line the wing is red to outer band, which is smoky. Hind wings slightly reddish, with two smoky bands. Beneath light brown, lines above showing through.

This is a very beautiful variety, and closely resembles *fusco-undata* of Don. It bears the same relative position to *nubilofasciata* that *fusco-undata* bears to *H. furcata (sordidata* Fab.). It can be told at a glance by the reddish border and white mesial space, and has the smoky marginal band of the typical *nubilofasciata*.

Type, ♂, Feb. 6, 1874, California (No. 115, Packard). In the University Museum collection at Cambridge, Mass.

Hydriomena furcata Thünb.

(d) *resecta*, nov. var.

Expands 33 mm. Palpi short. Fore wings have same markings as type, only the ground colour is red, with black specklings, and the characteristic white dot between costa and inner margin of the *furcata* group appears in a white spot with slight tail. This is not always found in *furcata*, but usually occurs, and does, so far as I have seen, in only the most closely-allied species, *reflata* Grote. The markings on hind wings are slightly more pronounced than in var. *quinquefasciata* Pack., and the ground colour is reddish-brown. In one specimen of Mr. Broadwell's the wings are almost suffused with red, so as to make the bands indistinct, but in Mr. Marloff's they are not so heavily irrorated. This variety is close

to *fusco-undata* Staud., Donov. in part, and *testaceata* Prout., but are differently marked, being really varieties of *quinquefasciata*, as there is some doubt in my mind of the true *furcata* Thünb. being found here. This form might be confused with var. *cupidata* of *nubilofasciata*, but the marginal band of the latter will separate them. This seems to be a Californian variety, as have not seen any from other localities.

Type, ♂, Eden Valley, Monterey Co., Cal., in Swett coll. Type, ♀, Eden Valley, Monterey Co., Cal., in Broadwell coll.

Co-type, ♂, Feb. 1, '05, Santa Clara Co., Cal., in Marloff coll.

Hydriomena furcata Thünb.

(e) *periclata*, nov. var.

Expands 30 mm. Head and thorax green and black, palpi short and dark. Fore wings smoky-black, heavily powdered with green speckles; only the mesial and fifth bands showing, the rest of the wing suffused. Hind wings dusky brown, black discal joint and two smoky bands more prominent than usual, and regular fringe very short and dusky. Beneath very deep smoke brown, only two extradiscal lines showing on fore and hind wings; discal spot very plain on hind wings. This variety is close to var. *obliterata* Prout, but differs in the almost black hind wings and style of marking. This is almost an approach to melanism, perhaps due to its late emergence.

Type ♂, Land's End, San Francisco, Cal., Oct. 10, 1909, from Mr. F. X. Williams, and in Swett coll., No. 17.

This variety may be recognized by its suffused appearance and the green speckles. It is allied to *viridata* Pack., but that variety does not have the dark suffused colour.

BOOK NOTICES.

CATALOGUE OF THE ODONATA OF NORTH AMERICA: By Richard Muttkowsky (Bull. Pub. Mus., Milw., Vol. I, No. 1, Milwaukee, Wis).

Those who have been looking forward to the appearance of this much-needed catalogue of North American Dragon-flies will, we think, have no reason to be disappointed. It gives the impression throughout of thoroughness and accuracy.

The classification adopted is based on Handlirsch's recent work, "Die Fossilen Insekten." Four families are recognized: Agrionidæ, Cœnagrionidæ, Æshnidæ, and Libellulidæ. The genera are intended to follow,

as nearly as possible, a natural sequence, while under these the species are arranged in alphabetical order; 494 species and subspecies, besides 27 fossil species, are listed.

Fortunately but few changes in nomenclature have been found necessary, the most important of these being the return to Kirby's use of *Agrion* and *Cœnagrion* for the genera commonly known as *Calopteryx* and *Agrion* respectively. The change was well-founded, according to the decision of the Commission for the International Code of Zoological Nomenclature, to whom Kirby's reasons for the changes were submitted.

The references, among which all that are of taxonomic value appear, include also others relating to the descriptions of early stages, morphology and distribution.

In regard to types, the custody of which is given wherever possible, the author has introduced two new terms, "Allotype" and "Morphotype." The former is used to designate a type specimen of the opposite sex to which the type (holotype) of a given species belongs; while the latter is employed for the second form of a dimorphic sex, as in the dimorphic females of many Cœnagrioninæ.

The only feature in this excellent catalogue which we would criticise is a tendency to unduly restrict the distribution of many of the species. Many species, *e. g.*, are designated "Transition" or "Carolinian," which have been recorded from well within the limits of the Canadian zone, and in many cases are characteristically boreal. These northern records should not be ignored, for frequently they do not indicate the extreme northern range of the species; the more numerous southern records being due merely to the more thorough exploration of the warmer localities.

CATALOGUE OF NEARCTIC SPIDERS: By Nathan Banks, Bull. 72, U. S. National Museum, 1910.

This is a very valuable contribution to North American arachnology. Twenty years have lapsed since Dr. Marx puplished his Catalogue of the described Araneæ of temperate North America (Proc. U. S. Nat. Mus., XII, 1890), and until now it has been a difficult matter indeed for the student to post himself on the many species described since that time. The present list includes 1,330 species, distributed through 270 genera. Mr. Banks's catalogue should considerably stimulate the study of our spiders.—KARL R. COOLIDGE.

Mailed August 5th, 1910.