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No. 1

SYSTEMATIC NOTES ON NORTH AMERICAN TACHINIDÆ*

BY JOHN D. TOTHILL, DIVISION OF ENTOMOLOGY, OTTAWA.

The following is the first of a series of articles on Tachinidæ which the writer hopes to publish in this journal from time to time. They will be of a strictly systematic nature and emphasis will be laid upon Canadian species. This present article contains a description of a new Canadian species of *Winthemia* together with a key for the separation of the North American species of the genus known at the present time; it also contains suggestions for improvement at two difficult points in Mr. Coquillett's generally excellent key to the genera in his "Revision of the N. American Tachinidæ."

Winthemia Desv.

In the course of a study of the parasites of the Spruce Budworm (*Tortrix fumiferana* Clemens) in Canada by the Division of Entomology a new species of *Winthemia* was reared in considerable numbers. A description of this species, which is here named *W. fumiferana* after its host, together with a key for the separation of the North American species of the genus follows.

The genus *Winthemia* Desv. ("Essai sur les Myodaires," p. 173, 1830), is represented in North America by four known species. One of these, *W. quadripustulata* Fab., is an exceedingly variable species. The writer has examined the types of *W. obscura* Coq. and *W. antennalis* Coq. and there seems to be little doubt but that they are both good species. For the privilege of examining these types and for numerous other courtesies while at the United States National Museum the writer is indebted to the authorities of that institution and more particularly to Mr. Frederick Knab.

The four species may be separated as follows:—

1. With 3 sternopleural bristles 2.
- With 2 sternopleural bristles 3

*Contributions from the Division of Entomology, Ottawa.

2. With 3 postsutural bristles, 3rd joint of antenna nearly 3 times as long as 2nd; arista thickened almost to middle. *obscura* Coq.
 With 4 postsutural bristles, 3rd joint of antenna $1\frac{1}{4}$ times as long as 2nd; arista thickened on basal $\frac{1}{3}$ *fumiferanae*, n. sp.
3. Palpi, scutellum and apex of abdomen black. *antennalis* Coq.
 Palpi, scutellum and apex of abdomen yellowish. *quadripustulata* Fab.

Winthemia fumiferanae, n. sp.

Black species with palpi, scutellum and usually antennæ and sides of 2nd and 3rd segments of the abdomen yellowish; thorax, abdomen and legs lightly dusted with whitish pollen; 4 postsutural and 3 sternopleural bristles; hind legs ciliate. Length, 7-9 mm.

Head $\frac{3}{4}$ times as broad as long; front in male $\frac{1}{3}$ width of eye, in female equal to width of eye; frontal vitta in female $1\frac{1}{2}$ times width of parafrontal plate (measurements taken immediately anterior to ocellar triangle); parafacials at narrowest point $\frac{1}{4}$ as wide as facial plate at widest point; genæ $\frac{1}{6}$ eye height; antennæ reaching to lowest $\frac{1}{4}$ of face, 3rd joint in both sexes $1\frac{1}{4}$ times length of 2nd; arista thickened on basal $\frac{1}{3}$, 2nd joint $1\frac{1}{2}$ times as long as broad. Colour of head except eyes whitish pollinose on black ground; frontal vitta black; frontalia, parafacialia, facial plate, occiput and genæ whitish pollinose on black ground; antennæ varying from black to yellowish in all its segments, palpi yellow. A strong pair of proclinate ocellar bristles in both sexes; females with two pair of, males without orbital bristles; frontal bristles to, or slightly beyond base of second antennal joint; parafacials with numerous fine black hairs on upper $\frac{2}{3}$; bristles of facialia on lower $\frac{1}{4}$ only.

Thorax including the pleuræ light grey pollinose on a black ground, the pollen being somewhat irregularly distributed; scutellum blackish at base and yellowish at apex, the extent of yellowish area varying in different specimens. Four pairs of postsutural dorsocentral bristles (in one specimen only 3 pairs), 3 pairs of postacrostichals and three sternopleurals, the latter usually strong but the lower one absent on one side in one specimen; scutellum with three strong pairs of marginal, and a pair of cruciate apical and several weak discal bristles.

Legs black; coxæ and femora strongly, tibiæ and tarsi faintly, whitish pollinose; middle tibiæ with 2 or 3 bristles on front side near the middle;

hind tibiæ ciliate but with two longer bristles near the middle; tarsal claws and pulvilli considerably longer in the male than in the female.

Wings hyaline, becoming somewhat fuscous toward base. Vein M_{4+5} with one to five bristles near base; the medium cross vein quite distinctly S shaped; there is no appendage at bend of R_{1+2} ; the anterior end of medium cross vein is situate at $\frac{1}{3}$ distance from the bend of R_{1+2} to radio medial cross vein.

Abdomen black and polished on the whole of first segment and on posterior margins of the other segments; the narrow anterior margins of segments 2, 3 and 4 white pollinose; the median fascia irregularly white pollinose on black ground; sides of segments 2 and 3 sometimes yellowish. A pair of median marginal macrochaetæ on segments 1 and 2, a row of very long marginals on segment 3; no discal bristles on segments 2 and 3; all the segments are thickly covered with rather long fine hairs, which, especially medially, are erect and not proclinate; fourth segment covered on disc with fine bristles about $\frac{3}{4}$ length of marginal macrochaetæ on segment 3.

Described from 18 males and 18 females bred in the Division from the Spruce Budworm (*Tortrix fumiferana* Clemens). The localities are as follows: Two males and one female from Maniwaki, Province of Quebec; 16 males and 17 females from Duncans, British Columbia, Canada. The adults issued from both larvæ and pupæ, but principally the latter, of the host. Type female from Duncans, B. C., and 33 co-types deposited with Division of Entomology, Experimental Farms, Ottawa; 2 co-types a male and female from Duncans, B. C., deposited in the United States National Museum, Washington, D. C.

Amobia distincta Towns., and *Senotainia trilineata* V. & W.

In a recent attempt by the writer to determine with the aid of Coquillett's "Revision" some Tachinids that have since proved to *Senotainia trilineata* V. & W., considerable difficulty was experienced in deciding whether the species was the above mentioned or *Amobia distincta* Towns.; moreover reference to the original description did not materially facilitate the determination. From an examination of a large series of both species in the United States National Museum it was found that they are abundantly distinct and that the generic separation is fully justified. The following is a table, which it is hoped may prove useful, of some of the more obvious differences between the two species:—

Amobia distincta Towns.

1. Radiomedial cross vein far before tip of R_{2+3} .
2. Palpi black.
3. Parafacials at narrowest point at least 1.5 times length of 3rd antennal joint.
4. The three black thoracic vittæ, broad and conspicuous.
5. The abdominal markings (three rows of black triangles on yellowish gray ground) very distinct even without lens, especially in male.
6. Female with piercing ovipositor.

Senotainia trilineata V. & W.

1. Radiomedial cross vein at or close to tip of R_{2+3} .
2. Palpi yellow.
3. Parafacials at narrowest point about equal to length of 3rd antennal joint.
4. The three or four black thoracic vittæ narrow and inconspicuous.
5. The abdominal markings not all distinct.
6. Female without piercing ovipositor.

Tachinophyto variabilis Coq., and *floridensis* Towns.

Tachinophyto Towns., Trans. Amer. Ent. Soc., Vol. 19, p. 130, 1892, generic synonymy.

Pseudomyothria Towns., 1892, loc. cit.

Methypostena Towns., 1908, Tax of Musc. Flies.

Lixophaga Towns., 1908, Tax of Musc. Flies.

Hypostena of authors (non Meig).

The above synonymy is pointed out by Mr. D. W. Coquillett in his recent and valuable paper "The Type Species of North American Genera of Diptera," p. 611.

In the "Revision," page 62, key section No. 7, two species of the above genus are separated, namely, *variabilis* Coq., and *floridensis* Towns. The key reads as follows:—

"7. Third segment of abdomen pollinose on at least the basal two-thirds, the pollen yellowish, abdomen subopaque ;
length, 4-9 mm *variabilis* Coq.

"Third segment at most pollinose on the basal third, the pollen white, abdomen subshining ; length, 4-9 mm . . . *floridensis* Towns."

The characters made use of are purely colorational and since the publication of Coquillett's valuable "Revision" larger series of the two species have been accumulated which clearly demonstrate that such

characters, at least in *variabilis*, are subject to great variation. A recent examination of the types and of the series both at the Gipsy Moth Parasite Laboratory and at the United States National Museum by the writer brings out two points, i.e., that the species are abundantly distinct and that the pollinosity on the third segment of the abdomen in *variabilis* varies all the way from the typical condition to the condition met with in typical *floridensis*. The following conspicuous structural differences will serve to separate the species:—

T. variabilis Coq.

T. floridensis Tn.

- | | |
|---|--|
| <p>1. Third joint of antennæ 3.5 to 4 times length of 2nd.</p> <p>2. Costal spine very inconspicuous.</p> | <p>1. Third joint of antennæ 2 to 2.5 times length of 2nd.</p> <p>2. Costal spine strongly developed and very conspicuous.</p> |
|---|--|

(To be continued.)

NOTES ON THE PARASITIC HYMENOPTERA.

BY A. A. GIRAULT, BRISBANE, AUSTRALIA.

Superfamily Chalcidoidea.

Family Encyrtidæ.

Subfamily Encyrtinæ.

Tribe Arrhenophagini.

Genus *Rhopoideus* Howard.

1. *Rhopoideus fuscus*, new species.

Dr. C. Gordon Hewitt, Dominion Entomologist, Ottawa, Canada, has sent me among other things eight specimens of an Encyrtine bearing acute edentate mandibles, which agree well with the genus *Rhopoideus* Howard. This species, however, has but 9-jointed antennæ, counting a very short, almost imperceptible ring-joint; its antennal club is solid. Now Ashmead gives as a diagnostic character of the genus in question 10-jointed antennæ (the funicle 5-jointed, no ring-joint mentioned), which would imply at least a 2-jointed antennal club. The original description of *Rhopoideus* leaves one in doubt as to the total number of antennal joints, the only statement made concerning them being to the effect that the funicle is 5-jointed. Nevertheless, this Canadian species agrees so well with the generic description, even to the possible hosts, except in the antennæ, that we have reason to question Ashmead's statement concerning the latter. With this species the funicle is 5-jointed, the first three joints

"small and narrow, each rather broader than long, 4 and 5 broader and longer and as broad as long," as described for the type species, except that in each case here the joints are longer than wide. The antennæ of this species appear to agree in general form with those of the type of *Rhopoideus*.*

Female.—Length, 1.95 mm. Rather long and slender, the body flattened or depressed.

General colour uniformly brown, but the abdomen somewhat paler, the brown emphasized along the caudal margins of the segments (making at least four transverse brown stripes across the abdomen, which, however, are not conspicuous). Antennæ concolorous; legs somewhat lighter, with some yellow, the tarsi pallid yellowish, the distal tarsal joint clouded. Eyes dark. Wings hyaline, with the exception of a slight cloud of fuscous under the stigmal vein and just out a slight distance from the base, and also sometimes slightly touched with fuscous along the caudal margin irregularly, proximad and along the oblique hairless line at either margin of it. Trochanters and bulbs of the antennæ pallid.

Mesoscutum and mesoscutellum polygonally sculptured, as if covered with flat scales, both bearing a few, sparse, short setæ; the concave face finely lined with circular lines (concentric about the rather deep and large, crescentic scrobicular cavity in about the centre of the face); carina of vertex present; tarsi 5-jointed, the joints short yet longer than wide; tibial spurs single, the cephalic spur curved and forked at tip; caudal femora somewhat thickened, legs otherwise slender or usual. Fore wings with an oblique, hairless line running proximo-caudad from the origin of the stigmal vein. Mandibles short, claw-shaped, acute and edentate at tip. Submarginal vein long and slender, the costal cell rather wide, the marginal vein a mere rounded point where the submarginal touches the cephalic margin, the postmarginal vein absent, the stigmal vein distinct, moderate in length, with a slender neck. Fore wing (including the costal cell) densely, finely ciliated, the blade ample and wide, only about twice longer than broad, the marginal cilia short, becoming noticeable only at apex and disto-caudad, where they are moderately short. Caudal wings densely ciliate discally, rather short. Parapsidal furrows absent. Abdomen

*Dr. L. O. Howard has very kindly examined the type of his *Rhopoideus citrinus* for me, and tells me in a letter dated August 8, 1911, that the antennal club of that species is solid, hence the antennæ 8-jointed (excluding any question of a ring-joint). Ashmead's diagnosis of the genus is therefore wrong.

longer than the thorax, cylindrical but pointed at the apex, the valves of the ovipositor slightly extruded. Ocelli in a slightly curved line. Scutellum peltate, angular, as wide as long or nearly. Cephalic aspect of head nearly quadrate.

Antennæ 9-jointed; scape long and slender, slightly thickened in the middle, the bulb rather long, both together over twice longer than the pedicel; the latter obconic, rather long, over twice longer than wide; a very flat, short ring-joint, which has the shape of a mushroom; funicle joints 1-3 short, 4 and 5 longer and wider; 1 and 2 subequal, each slightly longer than wide; 3 of same width but slightly longer; 4 a third longer and broader than 3; and 5 a third longer and broader than funicle joint 4; all much shorter than the pedicel, which is subequal in length to the combined lengths of the first three funicle joints; club solid, long and cylindrical, obtusely pointed, not quite as long as the funicle. Pubescence of antenna short, not dense or conspicuous.

(From eight specimens, $\frac{2}{3}$ -inch objective, 1-inch optic, Bausch and Lomb.)

Male.—Unknown.

Described from eight specimens mounted singly on slides, received for identification from Dr. C. Gordon Hewitt, as noted above, each slide labelled "from spruce budworm material, Province of Quebec," and respectively, "Maniwaki, 27, VI, 11," and "Montcalm, 6, VII, 11," two females, two slides (homotypes in Canada); "Chicoutimi, 3, VII, 11," and "St. Gabriel de Brandon, 3, VII, 11," two females, two slides co-types, as noted below); "Chicoutimi, 3, VII, 11," and "Montcalm, 6, VII, 11," two females, two slides (types); and "Chicoutimi, 3, VII, 11, two females, two slides (homotypes in collection Illinois State Laboratory of Natural History). The supposed host is *Tortrix fumiferana* Clemens, but a coccid is indicated instead. Other coccid parasites, some noted beyond, were reared from the same host material.

Habitat.—Dominion of Canada—Quebec (Chicoutimi, Maniwaki, Montcalm and St. Gabriel de Brandon).

Types.—Cat. No. 14,206, United States National Museum, Washington, D. C., the two females as indicated above. *Co-types*: Accession No. 45,080, Illinois State Laboratory of Natural History, Urbana, U. S. A., the two females, two slides as indicated above. *Homotypes*: The two females as above indicated, in the collections of the Division of Entomology, Central Experimental Farm, Ottawa, Canada, and the two

indicated as being in the collections of the Illinois State Laboratory of Natural History (Accession No. 45,085).

This species evidently differs considerably from the type species, *citrinus* Howard; it must be considerably larger and more slender, the colour is brown, not light orange; the mesonotum is differently sculptured, namely, polygonally, not finely, transversely lined; the sheaths of the ovipositor not nearly black at tip but concolorous; the joints of the funicle somewhat longer, and the antennal club shorter, not as long as the funicle, even; and no oblique hairless line on the fore wing is noted for the type species, nor a ring-joint in the antennæ.

Family Pteromalidæ.

Subfamily Sphegigasterinæ

Tribe Sphegigasterini.

Genus *Urios* Girault MS.

1. *Urios vestali* Girault.

This nearly wingless species, which was described in the Journal of the New York Entomological Society (December, 1911), was captured by Mr. A. G. Vestal at the Devil's Hole, near Havana, Illinois. It was found in an ant's nest (*Pheidole vinelandica* Forel.), April 1, 1911. The nest of the ant was in sandy soil, in a bunch grass area. Mr. Vestal stated that, casually, he was unable to distinguish the pteromalid from the ants. In other words, it closely mimics the host ant.

Family Eulophidæ.

Subfamily Entedoninæ.

Tribe Omphalini.

Genus *Astichus* Foerster.

1. *Astichus bimaculatipennis*, new species.

Normal position.

Female.—Length, 1.85 mm. Funicle not ringed with white, scutellum not smooth, and without grooved lines, parapsidal furrows not very distinct, cilia of wings not in rows, dense; wings with two maculæ. Species large for the genus.

General colour metallic green, the head and pronotum metallic bluish, the face æneous just dorsad, purplish just ventrad, of the insertion of the antennæ; the dorsum of the abdomen, except the metallic green proximal segment, dark, purplish black; metanotum with æneous reflections; scape pallid dusky; thoracic pleura and coxæ metallic dark bluish, the femora

the same, pallid at apical end; trochanters dark; tibiæ and tarsi pallid, the apical tarsal joint dark or black; flagellum dusky; ventum of thorax and abdomen dark, purplish black. Tegulæ dark. Wings hyaline, venation dusky, the fore wing with two dusky blotches along the cephalic or costal margin, the first or proximal one at the junction of the submarginal and marginal veins, rounded and about one-half the size of the apical one, which is situated at the stigmal vein, and is more irregular in outline. Eyes chestnut red; ocelli ruby red.

Head flat from lateral aspect, the occipital margin acute; front broad, concave, vertex narrow, broader laterad; eyes lateral, oval, covering a little over a half of the lateral aspect of the head, the malar space present; antennæ inserted, about on an imaginary line drawn between the ventral ends of the eyes, the scape not reaching to the vertex; lateral ocelli on the narrow vertex at the occipital margin, distant from the eyes, but farther apart from each other than each is from the eye margin, dorsal, an imaginary line connecting them convex; the cephalic ocellus barely visible from dorsal aspect, cephalic, forming a flat triangle with the others, and situated in the cephalic aspect of the vertex front, against the acute occipital margin at the meson and closer to the lateral ocelli than they are to each other. Head delicately shagreened, its surface not as coarse as the surface of the eyes; the entire thorax dorsad moderately, coarsely, polygonally reticulated, the parapsidal furrows mere impressions, inconspicuous, not well defined grooves, and from some aspects seen only caudad; pronotum visible from dorsal aspect, about one-third the length of the mesocutum, the caudal margin of the latter, between the advanced axillæ, convex; scutellum rounded, normal, convex, without grooved lines; mesopostscutellum not large, crescentic, sculptured like the scutellum; metathoracic spiracle margined, distinct, short and broadly oval; metathorax slightly more delicately sculptured than the scutellum and scutum of the mesothorax, and with a delicate median carina, and two others, on each side of the meson, both curved and running caudo-laterad from the caudal margin of the mesopostscutellum; of these two lateral carinæ, the more laterad or cephalic one is the shorter. Coxæ and the thoracic pleura sculptured similarly to the metanotum, the cephalic coxæ less so; caudal coxæ enlarged, subtriquetrous. Abdomen conic-ovate, but very slightly produced or convex ventrad, longer than the head and thorax combined and than the wings; very delicately reticulated.

Fore and hind wings densely ciliate discally, the cilia short and close; marginal cilia of both wings short and close, longer on the hind wings. Marginal vein of fore wings subequal to or slightly shorter than the submarginal vein, the postmarginal vein equal to half the length of the marginal, and nearly twice the length of the stigmal vein, which is bifurcate at apex.

Antennæ filiform, not very long, the scape cylindrical and of moderate length, the funicle 4-jointed, the club 3-jointed, and with a single ring-joint. Pedicel small, obconic, about a third of the length of the long first funicle joint; ring-joint minute; first funicle joint cylindrical, the longest antennal joint, wider than the pedicel and a fourth longer than the following joint; funicle joints 2 and 3 subequal, cylindrical oval, joint 2 slightly longer and slightly narrower than joint 3, and both distinctly shorter and broader than joint 1 of the funicle; funicle joint 4 subquadrate, of about the same width, but only about two-thirds of the length of joint 3; proximal club joint large, half the length of the club, but distinctly smaller than the apical funicle joint; the intermediate club joint smaller, conical, not much larger than the pedicel, about a little over half the size of the proximal club joint; the apical or discal joint minute, nipple- or spur-like. Funicle and club hispid, with white hairs, of which there are about three transverse rows on the first funicle joint, and two rows on each of the following funicle joints and the proximal club joint.

(From a single specimen, $\frac{2}{3}$ -inch objective, 2-inch optic, Bausch and Lomb.)

Male.—Unknown.

Described from a single female specimen received for identification from Mr. R. L. Webster, Iowa College of Agriculture and Mechanic Arts, Ames, Iowa, who reared it as a probable hyperparasite of *Alceris minuta* Robinson. (Bull. No. 102, Iowa State College of Agriculture and Mechanic Arts Experiment Station, Ames, Iowa, p. 210.)

Habitat.—United States, Ames, Iowa.

Type.—Accession No 40,290, Illinois State Laboratory of Natural History, Urbana, one female on a tag, plus one balsam slide with antennæ.

Subfamily Aphelininæ.
Tribe Aphelinini.
Genus *Physcus* Howard.

1. *Physcus varicornis* Howard.

I desire to record the occurrence of this coccid parasite in some Canadian localities. Dr. Hewitt recently sent me four female specimens on slides labelled "From spruce budworm material, Maniwaki, Montcalm and St. Gabriel de Brandon, Province of Quebec, 2, 3 and 6, July, 1911."

In the original description of this genus (Howard, Bull. No. 1, technical series, Division of Entomology, U. S. Department of Agriculture, 1895, p. 43), a statement is made to the effect that the "second and third funicle joints" are "subequal and each longer than joint 1." Later (Id., Bull. No. 12, technical series, Bureau of Entomology, U. S. Department of Agriculture, 1907, p. 72), this statement is used as a diagnostic character in a table of genera to the Aphelinini. The character varies. In the four specimens noted above, three have the joint as described, but the fourth specimen has the first funicle joint slightly longer than either joint 2 or 3. In some Illinois specimens I have noted the same variation, sometimes all three joints equal, sometimes the second shortest, and in others as described originally. The matter is of no great importance, since the table mentioned can do without the line containing the statement about the funicle joints. The variation itself, however, is a rather peculiar one, and important from the standpoint of specific characters.

Genus *Prospaltella* Ashmead.

1. *Prospaltella aurantii* (Howard).

This widely distributed parasite of coccids has lately been received from Dr. Hewitt from several localities in Canada, which I think should be recorded in this connection. There were seven females on six slides labelled "From spruce budworm material, Chicoutimi, St. Gabriel de Brandon and Maniwaki, Province of Quebec, July 2 and 3, 1911." They evidently originated from some coccid concealed in the host material. All of the specimens were compared with the type, and are homotypes, therefore. The fore wings in this species seem to have a tendency to be very slightly clouded out to the end of the marginal vein from base, but this cloudiness is so slight that one cannot always be sure that it is real. From the collections of the United States Department of Agriculture I have a series of six females on a slide, with a number of other coccid parasites labelled "1725. *Aspidiotus* on common wild shrub on streams, California and Cuautla, Morelos, Mexico, July 1, '97, Kœbele."

I have also seen two other series of this species from Mexico, on slides from the same collection, which evidently form a distinct race of *aurantii*, and which I thought at first would certainly prove to be specifically distinct. This form differs in having distinctly broader fore wings (about from 19 to 21 lines across the widest portion of the blade, *aurantii* bearing only about 15), their longest marginal cilia less than a third of the greatest width (in the type form over a third), and the antennæ differing in that each joint of the funicle is longer than the one preceding, the third longest; whereas in the type form the second joint is longest. I have no doubt but that these forms grade into each other. The specimens should be recorded. They are: Three females on a slide with *Signiphora* labelled "1745. *Aspidiotus* on soft wooded fibrous tree. Cordoba, Mexico, 17, 7, '97, Koebele"; and thirteen females on a single slide, with several species of *Signiphora* (*mexicana* Ashmead, *flavopalliatata* Ashmead, and *townsendi* Ashmead), together with an *Ablerus*, labelled "1768. *Aspidiotus* on Hibiscus, Cuautla, Morelos, Mexico, May 29, '97, Koebele." These last specimens varied in colour, most of them having the abdomen wholly black-brown instead of brownish yellow.

FURTHER NOTES ON DIABROTICA. No. II.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

(Continued from Vol. XLIII, page 417.)

D. boucardi, nov. sp.

Head, thorax and scutel smooth shining black; antennæ and feet fuscous yellow; elytra bright purple, lateral margin obsoletely viridescens, with two transverse depressions and also humeral and lateral submedian impressions. Length 7 mm.

One example, Panama, in the Boucard collection of the Tring material;

Belongs in sec. D, near *coccinea* Baly. The palpi are the colour of the antennæ; head with a deep frontal puncture; antennæ more than half as long as body, 2nd joint short, 4 much longer than 3. Thorax elongate, sinuate and sharply angled behind with a deep transverse depression, occupying the rear half; elytra somewhat dilated at the rear; the 1st transverse impression is at the rear of the anterior third, the 2nd is much the larger of the two and occupies the middle of the elytra, the two connected by a depression along the suture; the humeral depression is slightly curved inwards and ends about the beginning of the middle third

the lateral depression is broad and submedian. The depressions give a much swollen or torous effect to the rear of the elytra. The relative length of the antennal joints might place this form in sec. 1, but the general appearance is such that I have put it next *coccinea* Baly; the elytra are sparsely diffusely punctulate, body beneath black.

D. taniollescens, nov. sp.

Head and thorax rufous yellow; antennæ and legs yellow; scutel dark rufous; elytra pale yellow, each with 4 elongate black spots, a humeral and subbasal median, and two behind the middle, in the rear of the anterior ones, giving the appearance of 2 interrupted black vittæ, body beneath black. Length, 5 mm.

One example, Callanga, Peru.

A very well marked form coming next to *taniolata* Gahan, from which it differs in the wholly flavous antennæ and spotted in place of vittate elytra. The thorax is finely punctulate and has a deep oblique fovea on each side and a third round one at the rear; the punctures of the elytra are moderate and arranged in obsolete striæ; the subbasal spots do not attain the margin and are a little short of $\frac{1}{3}$ the length of the elytra; the two rear spots end just over the convexity; the exterior angles of all the spots are rounded; the general appearance on each side of the rear spots on each elytron, is that of an oblong black patch bisected by a narrow yellow stripe.

D. 4-signata, nov. sp. (Jac. in litt.).

Head black; antennæ black, extreme base and joints 8-11 flavous, except extreme tip of 11 and base of 8 which are black. Thorax flavous-rufous, wider than long, smooth, obsoletely trifoveate; elytra flavous, rather coarsely and thickly punctate, each side with 5 short viridicyaneous streaks, a basal median, a humeral, a lateral and two small postmedian spots, placed on the convexity longitudinally behind the first two anterior streaks. Body below and legs testaceous, tibiæ and tarsi fuscous. Length, 6 mm.

Two examples, Marcapata, Peru.

Very close apparently to *humeralis* Gahan. The antennæ, however, seem to differ and the markings are viridicyaneous in place of nigrocyaneous. The species has been distributed with the manuscript name *4-signata* Jac. and two co-types have been sent me by Messrs. Staudinger & Bang-Haas. In my two examples the inner basal marks are not joined to

the outer as in *humeralis*, but I have one or two examples which are puzzling to place in either species, and I feel a little doubtful as to the specific limits of either form.

The antennæ are a little more than half as long as the body, the basal joints piceous below, the punctures of the elytra are fairly well arranged in striæ on the disk and obsoletely biseriate.

D. subangulata, nov. sp. (Jac. in litt.).

Head black with a large triangular fovea; antennæ three-fourths the length of the body, black, with the four or five basal joints fuscous and the three last (extreme tip of the eleventh excepted) white. Thorax transverse, rufous, depressed, bifoveate (third obsolete); scutel black; elytra moderately coarsely punctate, black, a large oblong basilar spot, a median transverse fascia, not attaining either the margin or suture, and a large quadrate apical spot in each elytron, whitish flavous. Legs yellow with black or piceous tibiæ and tarsi. Body below yellow with breast black. Length, 8 mm.

Seven examples, Marcapata, Peru.

Very variable in the light elytral marking, as noted hereafter. The third joint of the antennæ is $\frac{1}{2}$ longer than the second, the fourth shorter than the preceding two, the colour of the basal joints varies somewhat in the amount of black, some being much darker than others; the thorax is much broader than long, with a few fine punctures scattered over the surface; the two side fovea are distinct and the third just before the scutel is obsolete; the sides are widely depressed and moderately sinuate, the surface dull shining; elytra are moderately dilated behind, only slightly depressed behind the scutel. What I consider the typical light spot marking varies at the base so that the basal spot and median fascia may unite and the black band between becomes a curved lunule from the shoulder, running towards, but not reaching, the suture; also the apical spot may unite with the median fascia, leaving the band between as a more or less well defined spot. In one example the spots are so suffused as to indicate that specimens occur which are wholly light flavous, except the margins. The colour of the tibiæ and tarsi seem to vary from black to light piceous according to the predominance of the black markings of the elytra.

This species has been distributed with the manuscript name *subangulata* Jac. I have received 4 co-types from Messrs. Staudinger & Bang-Haas.

D. inconspicua, nov. sp. (Jac. in litt.).

Entirely pallid testaceous, with black eyes; antennæ fuscous in the middle, mandibles dark. Head with a deep frontal fovea, antennæ nearly three-fourths as long as body, 3rd joint nearly as long as 4. Thorax nearly as broad as long, strongly obliquely bifoveate and somewhat depressed behind; elytra slightly dilated to the rear, a faint piceous spot on the shoulder, and with punctures thick, moderate and obsoletely arranged in rows. Length, 6 mm.

Two examples, Callanga, Peru.

This species has been distributed with the manuscript name *inconspicua* Jac. My two examples were sent me as co-types by Messrs. Staudinger & Bang-Haas. The species is analogous to many in the latter part of sec. 1. The elytra are not plicate.

D. guyanensis, nov. sp.

Head shining black; mouth parts flavous; antennæ piceous at base, fuscous in middle, last four joints flavous, extreme tip of 11 dark. Thorax rufous, shining, lightly bifoveate, depressed; scutel black; elytra strongly plicate, flavous, with a short common sutural and a long humeral stripe black; punctation thick and subrugose. Body below flavous, breast black, legs flavous.

Var. with short submedian, subsutural black stripe or spot.

Three examples, Br. Guiana type form, 1 var. do., and 1 Pachitea, Peru. Length, 6-6½ mm.

The antennæ are long and slim, reaching nearly three-fourths the length of the body; the thorax is very slightly sinuate behind, rounded in front, almost square, and noticeably polished; the sutural stripe is of medium width, a little less than one-third the length of the elytra, hardly narrowed behind; the humeral stripe stops just round the bend of the convexity, and is evidently sometimes interrupted at a little behind the middle. Both stripes attain the base. This species resembles the forms in sec. 1, division O.

D. bertonii, nov. sp.

Head rufous; labrum and spots on the vertex piceous; antennæ black, joints 8-9 flavous with bases and tips dark. Thorax rufous, rather

coarsely punctate, deeply trifoveate; scutel piceous rufous; elytra thickly punctate, shining black, the margins, the suture (very narrowly behind) and a median band dilated at the sides and suture, flavous; beneath, thorax red, body black, legs flavous with tibiae and tarsi and apex of femora above, and coxae black. Length, 6 mm.

Type 1 example, Puerto Bertoni Alto Parana, Paraguay, sent me by Mr. Schrotky, also a specimen in the Jacoby collection labelled "1 A.A. 28 In Ocynis."

Should be placed near *borrei* Baly, but the punctuation and flavous markings very different; the thorax is much broader than long, slightly sinuate behind, the fovea connected by a well marked sulcus; the punctuation of the elytra is rather coarse and thick, becoming obsolete behind; the black spots do not attain the basal margin (as in *borrei*) and there is a well marked sulcus on the sutural side of the shoulder; and the elytra are very obsoletely shortly plicate; the sutural yellow stripe is narrowed behind to a mere line just separating the black spots on the elytra; all the spots have the angles rounded.

D. thammii, nov. sp.

Head and thorax rufous; antennae fuscous, tip of last joint dark. Thorax wider than long, trifoveate, the lateral ones oblique and deep; scutel rufous or piceous; elytra thickly punctate, dull shiny black, the lateral margin slightly dilated at the apex and a median transverse fascia more or less dilated up and down the suture, flavous. Beneath, thorax red, body black, legs yellow, tarsi more or less piceous. Length, 5-5½ mm.

Type, Marcapata, Peru, in 2nd Jacoby collection; also Pachitea, Peru; single example in the 1st Jacoby collection, Chanchomayo, Peru (Thamm) labelled "*concula* Er. ♀?" Twelve examples in all.

Very like *bertonii* supra and near *borrei* Baly. The antennae ♂ are $\frac{3}{4}$ as long as body, joint 3 and 4 nearly equal; the thorax is broadly margined and slightly sinuate behind and the surface is sparsely evidently punctate. The black of the elytra varies considerably; in what I consider typical there is a solid basilar fascia; but specimens occur where the fascia is divided into two distinct rounded subbasal spots, leaving a wide sutural yellow stripe and a narrow basilar stripe, flavous, all the flavous marks connected. In this form also the rear fascia is narrowly subdivided by the narrow yellow suture. The elytra are shortly obsoletely plicate.

NEW SPECIES AND GENERA OF NORTH AMERICAN
LEPIDOPTERA.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

*Family Noctuidæ.**Heliothis aetheria*, sp. nov.

Head and thorax clothed with olivaceous hairs; primaries dark olive green, in most cases entirely suffused with rich purplish as far as the sub-terminal line; a blue spot on costa near base, often extending along costa to t. a. line; this latter pale blue, rather broad, strongly and evenly convex; t. p. line narrower, slightly defined by blue, especially on costal and inner margins, perpendicular to costa and well beyond reniform to a point opposite base of same, then strongly incurved to below reniform and again straight to inner margin; median area largely filled with pale yellowish, leaving a narrow costal border and a larger patch on inner margin of the ground colour, and containing a large dark quadrate reniform more or less scaled with purplish, the upper portion of which tends to suffuse with costal border; s. t. line marked by the difference in shade between the purplish subterminal area and the narrow olive terminal portion, slightly waved, on the whole parallel to outer margin; fringes concolorous. Secondaries black, with an irregular pale yellow median band not reaching inner margin, and much constricted in central portion, or even broken into two spots; fringes whitish. Beneath, primaries black, with a broad, sharply defined pale yellow median band containing a large black discal spot corresponding to reniform, terminal area at costa suffused with whitish; secondaries as above, but costal area pale yellowish and median band broader, entirely enclosing black discal spot; costal half of terminal area suffused with whitish; fringes pale, darker at apex of primaries. Expanse, 25 mm.

Habitat: Redington, Ariz, 10 ♂s, 14 ♀s. Types, collection Barnes.

The species is closely related to *sueta* Grt., which, however, lacks the blue shading of the Arizona form; the ground colour is quite variable, at times all traces of the pink suffusion being lost.

Schinia velutina, sp. nov.

Head, thorax, abdomen and wings white, very slightly suffused with a pale ochreous. At first glance apparently immaculate, by holding in certain lights the maculation of primaries is distinctly visible as satiny white lines; t. a. line strongly outwardly oblique to just below cubital

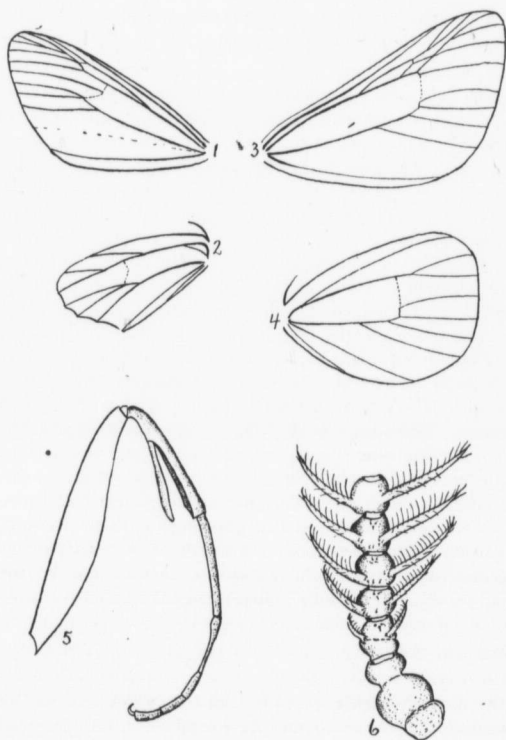


FIG. 1.—Generic features of *Grossbeckia* and *Friesia*.

1. Venation of fore wing of *Grossbeckia semimaculata*.
2. " of hind wing of " "
3. " of fore wing of *Friesia anormalis*.
4. " of hind wing of " "
5. Fore leg of *Friesia anormalis*.
6. Basal portion of antennae of *Friesia anormalis* (much enlarged).

vein, then just as strongly oblique inwardly to inner margin; reniform indistinctly visible as a satiny white patch; t. p. line well excurved around reniform, thence parallel to outer margin to a point on inner margin a little more than two-thirds from base; s. t. line rather indistinct, slightly waved, approached to t. p. line on vein Cu_2 . Secondaries immaculate; all fringes white. Beneath, white, with a very prominent discocellular dusky spot on primaries. Expanse, 25 mm.

Habitat: Eureka, Ut. (Spalding), 2 ♂s. Type, collection Barnes.

The fore tibiae possess one long curved claw on inner side, and a small claw with strong spine above it on outer side.

Grotella parvipuncta, sp. nov.

Head, thorax and primaries creamy white, latter with only faint traces of black dots, consisting of one in the median fold near base of wing, an oblique postmedian row of three parallel to outer margin, the upper just above the origin of vein 5, the second in submedian fold below vein 2, and the third on inner margin; occasionally a trace of a second dot on inner margin about two-fifths from base. Primaries smoky brown, with pale fringes, darker in ♀ than in ♂. Beneath, primaries deep smoky, with ochreous costal margin and pale fringes; secondaries whitish, at times slightly smoky, immaculate. Expanse, 23 mm.

Habitat: Ft. Wingate, N. M.; Deming, N. M., 2 ♂s, 3 ♀. Types, collection Barnes.

The species is close to *dis* Grt., which it resembles in the almost obsolete maculation; it is, however, slightly smaller, the primaries are creamy white and not chalky white as in *dis*, the secondaries are paler brown on upper side, and lack the faint median band and discal dot on under side, which is present in seven specimens of the true *dis* examined by us. It is probably confused with this species in collections, but we have recently had specimens compared with the type of *dis* in the Snow collection by Mr. F. X. Williams, and he agrees with us that the two species are distinct. Hampson's figure of *dis* probably represents that species.

Grotella soror, sp. nov.

Head and thorax white, abdomen ochreous brown; primaries very pale ochreous, white along inner margin; two brown spots on costa in basal third, the outer one larger and oblique, forming the commencement of a broken antemedial line, the continuation of which is formed by a perpendicular brown dash between cubital and anal veins, and a dot on inner

margin about two-fifths from base of wing; a diffuse brown spot just beyond the middle of costa and a faint dot at end of cell; a subterminal line of brown dots, very evenly outcurved to submedian fold, terminating in a straight dash, perpendicular to inner margin but not quite attaining same; a large apical brown blotch, between which and subterminal line are two small brown dashes, placed vertically, the upper resting on costa; two terminal black patches at extremity of veins 2 and 3; fringes broadly checkered with dark brown; outer margin pale. Secondaries whitish, largely suffused with smoky, and with a broad dark brown marginal band, narrowing towards anal angle; a faint discal dot and pale fringes. Beneath, primaries smoky brown, fringes checkered; secondaries as above.

Habitat: Redington, Ariz., 1 ♀. Type, collection Barnes.

Closely related to *binda* Barnes; differs in the more even subterminal line, the presence of an apical brown patch, and patches at termination of veins 2 and 3, and the fact that the brown checkering of the fringes does not extend backward on the terminal area of the wing itself as in *binda*; the secondaries are darker, with more distinct marginal band.

Eriopyga dubia, sp. nov.

Palpi with the third joint longer and less porrect than is generally the case in this genus; head and thorax gray; primaries dark gray, very suffused and slightly shiny in appearance, and with all the maculation indistinct; t. a. line black, single, inclined outwardly, lunulate, preceded by a pale shade; basal area before t. a. line largely suffused with blackish shading; t. p. line excurved around cell, then parallel to outer margin, single, black, crenulate, mostly very indistinct; orbicular a pale, oval, indistinct mark, situated near t. a. line; reniform a black shade more or less hidden by the dark median shade, which is angled slightly below same; s. t. line not recognizable; a terminal black line broken by yellow dots at termination of veins; fringes concolorous. Secondaries smoky; fringes with an ochreous basal line, followed by dark line, beyond which the fringes are lighter. Beneath smoky, with an indistinct postmedian line and discal dot to both wings. Expanse, 20-25 mm.

Habitat: Redington, Palmerlee, Ariz., 10 ♂s, 1 ♀. Types, collection Barnes.

The antennæ in both sexes are ciliate, and the species is quite delicate, more like a *Cerma* species in general appearance; the hairy eyes would preclude this association, however. Considerable variation in size exists in the specimens before us.

Eriopyga antennata, sp. nov.

Antennæ of ♂ very strongly bipectinate; of ♀ slightly ciliate; head and thorax clothed with a mixture of gray and red-brown hair and scales; primaries deep brown or purple-brown, the distinctness of the maculation variable; basal line slightly marked on costa; t. a. line geminate, black, filled with a pale shade of the ground colour, inner line indistinct, slightly outwardly oblique, with an outcurve in submedian fold and another below vein 1; orbicular when present small, round, outlined in dark, filled with ground colour; reniform indistinctly outlined, outer portion filled with yellow above, which is a single white dot and below it two, remainder filled with ground colour; no trace of claviform; t. p. line indistinct, geminate, the outer line being reduced to a series of venular dots, well exerted around cell and slightly incurved in submedian fold; median shade very faint; subterminal space slightly paler than rest of wings; s. t. line pale yellow, rather broken, defined by a dark preceding shade, angled outwardly below apex of wing, incurved slightly opposite cell and in submedian fold; a very faint black broken terminal line and an ochreous line at base of the dark fringes. Secondaries whitish, hyaline, strongly suffused with smoky in all but the basal portion; with small discal dot. Beneath, primaries smoky, sprinkled outwardly with ochreous, with small discal dot and traces of a postmedian line on costa; secondaries whitish, sprinkled along costa and outer margin with ochreous, a small discal dot and broken postmedian line; a faint broken dark terminal line to both wings. Expanse, ♂ 25 mm.; ♀ 28 mm.

Habitat: Redington, Ariz., 4 ♂s, 3 ♀. Types, collection Barnes.

A variable species. The markings of the reniform tend to obsol-escence, and only to well marked specimens is the above description applicable; sometimes the white dots are absent, in other specimens the yellow patch is greatly reduced as well, but a careful examination will usually show sufficient of the typical maculation to avoid confusion with other species. The male antennæ are more strongly pectinate than in other species we have seen.

Eriopyga gigantoides, sp. nov.

♀.—Palpi outwardly black-brown, a few ochreous hairs at tip of second joint; front with a strong tuft of dark-brown hairs sprinkled with ochreous ones; tegulæ and thorax rather lighter brown; primaries purplish-brown, rather shiny, the basal portion of wing to t. a. line sometimes shaded considerably with blackish; in such specimens the basal line is not visible; in lighter forms it may be distinguished as a geminate

black mark on costa; t. a. line black, geminate, the outer line most distinct, filled with the ground colour, slightly outwardly oblique and rather evenly crenulate; orbicular and reniform obsolete; t. p. line black, geminate, crenulate; the inner line only distinct, filled with rather paler shade than the ground colour, strongly outcurved just below costa, then parallel to outer margin, forming an outward angle on anal vein; a strong black median shade, the most prominent feature of the maculation, extends obliquely outwards from costa to below position of reniform and close to t. p. line, where it is sharply angled; its course is then sinuate to middle of inner margin; s. t. line indistinct, at times almost wanting, pale, angled below apex of wing, then rather evenly sinuate and close to outer margin; a terminal series of black dots; fringes dusky, with ochreous basal line. Secondaries smoky, with incomplete dark terminal line; fringes somewhat lighter, with ochreous basal line. Beneath, primaries smoky, shaded with ochreous along costa and outer margin, with a rather rigid dark postmedian line, slightly curved at costa, a slight discal mark, and prominent terminal row of dark dots; secondaries shiny whitish, sprinkled in costal half with ochreous and black; a dark discal spot, crenulate postmedial line, indistinct towards inner margin, and terminal row of dots. Expanse, 32 mm.

Habitat: White Mts., Ariz., 3 ♀s. Type, collection Barnes.

Allied to *gigas* Sm., of which we possess co-types; differs in the much smoother and darker appearance, the narrower wings, and the lack of orbicular and reniform.

(To be continued.)

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The forty-eighth annual meeting of the Entomological Society of Ontario was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, Nov. 23rd and 24th. During the day meetings the chair was occupied by the president, Dr. E. M. Walker, and during the evening meeting by President Creelman, of the college.

Among those present were Messrs. H. H. Lyman and A. F. Winn, Montreal; Dr. C. Gordon Hewitt and Mr. Arthur Gibson, Ottawa; Prof. J. M. Swaine, Macdonald College, St. Anne's, P.Q.; Mr. J. D. Evans, Trenton; Dr. E. M. Walker and Mr. J. B. Williams, Toronto; President Creelman, Professors Bethune, Zavitz, Jarvis, Hutt, Howitt, Messrs. Pettit, Cæsar, McCubbin and Baker, of the staff, and a number of students of the Ontario Agricultural College and Macdonald Institute.

On Thursday morning a meeting of the Council was held, at which the report of the proceedings of the Society during the past year was drawn up and various matters of interest to its members were discussed. In acceptance of an invitation from Dr. Hewitt, it was decided to hold the next annual meeting at the Central Experimental Farm, Ottawa, the exact date to be decided upon later. Prof. J. H. Comstock of Cornell University, and Dr. E. P. Felt, State Entomologist of New York, were elected Honorary Members of the Society. Mr. E. Baynes Reed, Meteorological Station, Victoria, B. C., was elected a Life Member.

In the afternoon the proceedings commenced with the reading of the reports of the following directors on the insects of the year in their respective districts: Mr. A. Gibson, Ottawa; Mr. C. E. Grant, Orillia; Mr. A. Cosens, Toronto, and Mr. R. C. Treherne, Grimsby. Dr. Hewitt then gave an account of the work of the Division of Entomology, which showed that, with a much increased and most efficient staff, gratifying progress was being made along many lines of entomological work, particularly in the establishment of field stations in various parts of the country, in the campaign against the Brown-tail Moth and in the study of the parasites of the Larch Saw-fly and Spruce Bud-worm. Mr. Cæsar then read an extended and valuable paper on the insects of the year in Ontario, which was discussed at considerable length by many of those present. This was followed by a paper by Dr. Fyles, "Notes on the Season of 1911," after which the reports of the Montreal and Toronto branches and of the Treasurer, Curator and Librarian of the Society were read and adopted.

In the evening a public meeting was held in the Massey Hall Auditorium, which, considering the inclemency of the weather, was fairly well attended by students of the college and visitors from the town, as well as by members of the Society.

President Creelman, who occupied the chair, opened the meeting with a short address of welcome in his usual cordial manner. Dr. William Riley, of Cornell University, who was to have been the speaker of the evening, was unfortunately prevented by illness from being present, but his place was ably filled by Dr. Hewitt, whose address on "Insect Scourges of Mankind" was listened to with great interest and attention by those present. He gave a very thorough account of various diseases, the germs of which are carried from one patient to another through the agency of insects, dwelling especially upon the Sleeping Sickness and other tropical diseases caused by trypanosomes and transmitted by Tse-tse flies, and on

malaria and yellow fever, which are transmitted only by particular species of mosquitoes. The address was illustrated by many excellent lantern slides.

On the following morning the members spent a pleasant hour in the Biological Museum, where many interesting specimens were exhibited by those present. At 10.30 o'clock the proceedings were resumed in the Biological Lecture Hall, the president, Dr. E. M. Walker, opening the meeting with the reading of the presidential address, which dealt with the entomological field in Canada at the present time and the directions along which progress in this science may be expected in the near future.

In the afternoon the following papers were read: "Some Forest Insects from De Grassi Point, Lake Simcoe," by Dr. Walker; "Thrips Affecting Cereals," by Dr. Hewitt; "The Stream," by Dr. Fyles; "Blister Beetles," by Mr. Arthur Gibson; "A Parasite of *Hepialus Thule*," by Mr. A. F. Winn; "Common Ipidæ of Eastern Canada," by Prof. J. M. Swaine; "Insect Migrations in Manitoba," by Mr. Norman Criddle; "The Catalogue of Canadian Insects," by Dr. Hewitt; "Entomological Record for 1911," by Mr. Gibson; and "Notes on *Hepialus hyperboreus*," by Mr. Horace Dawson.

The election of officers for the ensuing year resulted as follows:

President—Dr. Edmund M. Walker, Lecturer in Zoology, University of Toronto.

Vice-President—Dr. C. Gordon Hewitt, Dominion Entomologist, Central Experimental Farm, Ottawa.

Secretary-Treasurer—Mr. A. W. Baker, B. S. A., Demonstrator in Entomology, O. A. College, Guelph.

Curator—Mr. Lawson Cæsar, B. A., B. S. A., Lecturer in Entomology and Plant Diseases, O. A. College.

Librarian—Rev. C. J. S. Bethune, M. A., D. C. L., F. R. S. C., Professor of Entomology and Zoology, O. A. College.

Directors—Division No. 1, Mr. Arthur Gibson, Div. of Entomology, Central Experimental Farm, Ottawa; Division No. 2, Mr. C. E. Grant, Orillia; Division No. 3, Mr. A. Cosens, Parkdale Collegiate Institute, Toronto; Division No. 4, Mr. C. W. Nash, East Toronto; Division No. 5, Mr. R. S. Duncan, Port Hope; Division No. 6, Mr. R. S. Hamilton, Collegiate Institute, Galt; Division No. 7, Mr. W. A. Ross, Jordan Harbour.

Delegate to the Royal Society—Prof. J. M. Swaine, Macdonald College, P. Q.

Auditors—Prof. J. E. Howitt and Mr. W. A. McCubbin, Ontario Agricultural College.

NOTES ON THE LIFEHISTORY OF *NEPTICULA SLINGERLANDELLA* KEARFOTT (TINEIDÆ).

BY C. R. CROSBY, ITHACA, N. Y.

The following notes on the life history of the plum leaf-miner are compiled from the notes of the late Professor M. Slingerland, supplemented by observations by the writer:—

The plum leaf-miner is a new fruit pest which was brought to Professor Slingerland's attention in the fall of 1907 by C. M. Hooker & Sons, of Rochester, N. Y., who stated that it had been present in their plum and prune orchards for a number of years and had been gradually increasing in numbers. The mines were so abundant that the trees were partially defoliated and the size and quality of the crop injured.

We have not been able to find this miner in other orchards, and with the possible exception of apple no other food plant is known. That it may occasionally attack apple is quite probable. While examining some old apple trees in a neglected orchard, about a quarter of a mile from the Hooker orchard, on July 7, 1911, the writer found that mines very closely resembling those of the plum leaf-miner were abundant in the leaves of the water sprouts growing at the base of several trees. Infested leaves were brought to the insectary, but the larvæ left the mines while in transit and constructed cocoons indistinguishable from those of the plum leaf-miner. The identity of this apple leaf-miner cannot be settled definitely until the moths are reared next spring.

In the Hooker orchard the plum leaf-miner has shown a decided preference for certain varieties. German and Italian prunes are most severely infested; French and Shropshire Damsons are less subject to attack, although some years ago the former variety was badly infested; Diamond, Bradshaw, Lombard and Rheinclaude are nearly immune.

LIFE HISTORY.

The moth.—The adult of the plum leaf-miner is a small bronzy black moth having an expanse of $1/7$ to $1/5$ inch. The fore wings are crossed by a shining white band on the outer third and the head bears a conspicuous orange tuft. These moths emerge from cocoons at or near the surface of the ground during the daytime in the latter part of May and in early June. During the day they remain quietly on the bark of the trunk and larger branches, none being found on the leaves. Several hundred moths are often found on a single tree; when disturbed they suddenly take flight and most of them settle on the opposite side of the tree. They gradually decrease in numbers and about the middle of June disappear.

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The egg.—The act of egg-laying has not been observed, but probably takes place in the evening or at night as the moths are rarely seen on the leaves during the day. The eggs are attached to the under surface of the leaf, usually at the forks of the more prominent veins. The egg is about .3 mm. long by .2 mm. wide, oval in outline, flattened where attached to the leaf and dome-shaped in profile. The green of the leaf shows through the transparent egg-shell, making it a difficult object to find. They are most easily located by holding a leaf at an angle in the sun so the light will strike it obliquely when the eggs will be seen as minute glistening dots. The exact time required for the hatching of the egg has not been determined, but it cannot be far from two weeks. On June 2, 1908, an examination of the orchard showed that a great number of eggs had been laid; on June 9 no eggs had hatched, and on June 18 hatching had just nicely begun.

The larva.—In hatching the larva eats its way out of the egg-shell on the under side next to the leaf and enters the leaf directly without coming out on the surface. When full grown the larva is about $1/6$ inch in length, greenish white in colour, with the head light brown; the contents of the alimentary canal show through the semitransparent body wall as a greenish or brownish stripe. The larva is legless and only slightly flattened; the constrictions between the segments are rather deep but obtuse; the surface of the body is smooth and clothed with dense, very short, microscopic hairs interspersed with a few larger ones.

The mine.—After entering the leaf directly from the under side of the egg the young larva eats out a narrow linear burrow or mine an inch or less in length, leaving the outer layers of the leaf intact. This portion of the mine usually follows a tortuous course but may be nearly straight. The larva next enlarges its mine into an irregular ovate blotch about one-half inch in length. In the linear portion of the mine the excrement is left as a blackish streak extending along the centre of the burrow; in the blotch mine it forms a broad irregular band along the centre, but does not extend to the tip. The outer leaf layers overlying the mines turn brownish or yellowish; the upper layer seems to be thinner than the lower and the mines are more conspicuous when viewed from above. There are ten or a dozen mines in a single leaf.

The cocoon.—When full grown the larva leaves the mine through a cut in the upper surface of the leaf, falls to the ground and there constructs a small flattened brownish cocoon in cracks in the soil, under

loose stones, or between the base of the tree and the surrounding soil. When the ground is undisturbed they are rarely found more than an inch below the surface. Sod furnishes ideal winter quarters for the cocoons. The cocoon is light brownish in colour, broadly oval and moderately arched; it is about $2\frac{1}{2}$ mm. long by $1\frac{1}{2}$ to 2 mm. wide, and is usually slightly wider at one end. It is surrounded by a thin flange formed by the closely united edges of the two valves of which the cocoon is composed. The cocoons are held in place by a few strands of silk. The time at which the larvæ become mature and construct their cocoons varies considerably with the season. On July 6, 1911, about one-half the larvæ had left the mines; on July 21, 1908, and July 19, 1909, a few larvæ were still present in the mines.

The pupa.—After forming the cocoon the larva apparently does not transform at once; a cocoon opened August 4, 1908, contained a larva. The winter, however, is passed in the pupal stage. On October 10, 1911, the writer opened a number of freshly gathered cocoons and found that all the larvæ had transformed to pupæ.

The pupa is about 2 mm. in length, ovate, pointed behind and somewhat flattened. The ventral surface is brownish yellow, the dorsum greenish. The eyes are dark coloured and the orange tuft on the head of the moth shows through the pupal skin. On the dorsum of the abdomen there are six transverse interrupted rows of short brownish spines. On each side of the dorsum there is a longitudinal row of wart-like protuberances, each bearing a colourless spine. The anterior spines are very short and they gradually increase in length towards the tip of the body. When about to transform to the adult the pupa works itself partly out of the end of the cocoon, probably by the aid of these spines. The empty pupa skin is left protruding from the cocoon.

Parasites.—No parasites were observed infesting the plum leaf-miner until May 11, 1911, when a cocoon was found containing the larva of a Chalcis-fly. The larva is 1.4 mm. long, smooth, whitish in colour and rounded at both ends. On June 2, 1911, two adults of the parasite were found in a vial containing cocoons of the moth. They had emerged through a smooth, round hole in the side of the cocoon. In the fall of 1911 the parasites had increased in numbers so that nearly one-half of the cocoons examined were infested. So far only three adults, all males, have been reared. They are small, four-winged flies, metallic green in colour and about $1\frac{1}{2}$ mm. in length. This species has recently been described as *Derostenus salutaris* Crosby.

GEOMETRIDÆ AS YET UNDESCRIBED.

BY RICHARD F. PEARSALL, BROOKLYN, N. Y.

(Continued from page 253, Vol. XLIII.)

Eupithecia vaporata, n. sp.

Expanse, 13-15 mm. Palpi moderate, rather heavily scaled, dark brown. Antennæ slender, gray, barred faintly with dark brown, shortly ciliate beneath. All above gray, mixed with dusky brown, scaled, the front and first two segments of the abdomen being paler, the latter without tufts. Fore wings narrow, extended at apex, are crossed by a number of ill-defined hair lines composed of the darker scales. The intra- and extradiscal lines appear double and heavier, the former obliterating the discal dot, which it reaches at a sharp angle from costa, and thence with a strongly basal trend to inner margin; the latter, with less of an angle below costa, becomes slightly heavier opposite cell, and wavy to inner margin, nearly parallel to intradiscal. The basal line is obsolete. Beyond extradiscal the usual geminate pale line is present, not clear, but faintly margined outside with a fine hair line of dark scales. These cloud the subterminal space, which is without definite markings. Marginal line broad, black, broken at veins. Fringes rather long, gray. Hind wings with lines as on primaries, but fainter, except at inner margin, the extradiscal being heaviest, with strong outward curve around discal dot, which is a mere pin point. Marginal line and fringes as on primaries. Beneath the body and wings are somewhat paler and more glossy, the lines on wings reproduced as above, and all except the marginal line are fainter.

Types, ♂ and ♀, from San Diego, California (Ricksecker), were taken at light, May 16, 1910, and co-types in a series of fourteen in both sexes, from the same locality, are in author's collection. Also a co-type ♀ from collection of Geo. H. Field, San Diego, Cal., taken by him April 22, 1910, is in possession of Mr. J. A. Grossbeck.

This species is smaller even than *huachuca* Gros., less distinct in markings, and paler in ground colour.

Eupithecia scabrogata, n. sp.

Expanse, 22 mm. Of the same size, and much resembling *subapicata* Guen. Palpi short, stout, loosely scaled, dark brown. Front and vertex rough, with a mixture of dark and pale brown scales. Antennæ dark brown, flattened, slender, ciliate in ♂, almost bare in ♀. Thorax black centrally, crossed from base to base of wings by a broad dusky white band,

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with front and sides dark brown. Abdomen above dark brown, the segments pale ventrally, except the second, which has an irregular black patch above. Beneath generally paler. Ground colour of primaries pale yellowish brown, covered with dark brown and black scales, more thickly massed along costal region, at apex, subterminally at anal angle, and broadly along inner margin below cell to base. This leaves a central patch of yellowish brown, clear of dark scales, from a point at base, broadening out over cell, especially clear about the small, round, black discal dot, thence in an irregular patch, narrowing rapidly, in an upward slant to margin a little below apex. The basal, median and extradiscal are pale geminate cross lines, indicated chiefly at costal and inner margins, the latter a little better defined. The subterminal white line, indicated very faintly, ending in an irregular whitish patch, between veins 2 and 3 at anal angle. Marginal line black, cut with white opposite veins. Fringes long, dusky, having a central dark line, with pale line at base. Veins black-scaled, broken at cross lines, especially beneath cell, and on veins 1 to 4. Secondaries dusky. Inner margin broadly sprinkled with dark scales, cut by the beginnings of pale cross lines, which fade out at centre, the extradiscal pale band being wider and more distinctly outlined. Discal dot very small, dusky. Fringes as on primaries. Beneath dusky, silken, the lines above faintly indicated in dusky dots across wings. Discal dots present on all wings, small, dusky. Thorax beneath and femora darker.

The type, a ♀ from the Hy. Edwards collection, is labeled California, without date, and will rest eventually in the Amer. Museum of Nat. History, N. Y. City, or so soon as the author can obtain a duplicate. The specimen was inadvertently given to him several years ago as *subapicata*. The only other specimen I have seen is a male, submitted to me by Mr. J. A. Grossbeck, from Dr. Barnes' collection, which I have made a co-type. It is labeled Redington, Arizona, also without date, but taken in 1910, and differs only in being rather more strongly and clearly marked than the type. *Subapicata* is taken in December and January, and I doubt not this species appears also about that time.

Genus *Eucymatoge* Hub.

Eucymatoge penumbrata, n. sp.

Expanse, 22 mm. Of same size and shape as *Eup. scabrogata* just described, and might easily be confused with it. Palpi long, moderately

stout, dark brown, almost black. Front covered with an even mixture of dark brown and paler scales, the latter showing more abundantly over vertex, on collar and patagiæ. Antennæ sordid white, ringed with dark brown, simple in both sexes. Above, the ground colour of all wings is a soiled brownish white, overlaid with dark rich brown, mingled with black scales. Thorax above black centrally, has a conspicuous line of pure scales crossing it between wing bases, with front and scutellar region dark brown. Abdomen paler brown, broadly ringed with darker on second segment, without dorsal tufts. The dark brown basal and extradiscal lines cross the primaries, but many hair lines along inner margin in basal and central spaces quickly fade out. The basal composed of three parallel hair lines, the two outer being heavier and black, includes a space, paler than the ground colour, traversed centrally by a fine hair line of brown. It starts from costa one-third out, makes a long sharp angle almost to discal spot, thence backward nearly straight, to inner margin, one-fourth from base. In the male co-type this line is suffused with black scales. The extradiscal two-thirds out runs straight across costa, makes a sharp outward angle below it, and thence nearly parallel to outer margin, slightly waved as it reaches the inner, a little more than two-thirds out. A narrow indistinct geminate pale line borders this outwardly. A pale area occupies the central portion of the wing, with an extension across extradiscal below costa toward apex, and an isolated spot between veins 3 and 4 on subterminal space. The large oblique linear discal spots are rich brown, conspicuous, and are surrounded by a ruddy brown suffusion, which appears again on the apical prolongation, and more faintly on the spot on subterminal space, particularly in the female type. Subterminal space darker, especially opposite cell, where a cluster of black scales starts within extradiscal, extends across it to margin, and upward toward apex. It is traversed centrally by an indistinct volute white line. Terminal line not well marked. Fringes paler than ground colour. Secondaries darkened with brown scales along outer and inner margins, are almost devoid of them centrally and along costa. The geminate pale line and the basal lines are outlined at inner margin, the former traceable nearly to costa. Discal dots round, dark brown. Terminal line black, broken at veins. Fringes pale, cut with black opposite veins. Beneath, all wings pale brownish ashen, darkened apically, the lines as above faintly showing on primaries, and on secondaries, dotted on veins. Discal dots on primaries are large, oblique, linear, black, on secondaries round, black.

Marginal lines black, present on all wings. Fringes paler than above Thorax, abdomen and legs ashen, with dark scales sprinkled heavily on femora and fore legs, and on abdomen toward tip.

The type, a female, has long been a unique in the collection of Mr. W. H. Broadwell, who has kindly allowed me to retain it, and bears the label, Palmerlee, Arizona. The single male co-type is from the collection of Dr. Barnes, submitted to me by Mr. J. A. Grossbeck, and was taken at Redington, Arizona, January 1, 1910.

(To be continued.)

ON *MERRAGATA LACUNIFERA* BERG.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, NEW YORK.

In 1879, in his "*Hemiptera Argentina*,"¹ Carlos Berg described a new Lygæid genus, *Lipogomphus*, placing it near *geocoris*, which contained a new species, *lacuniferus*,² so called because of the white corial *lacuna* bounded by the thickened brown veins. This was founded on three specimens of an unknown bug taken in Buenos Aires by himself, in company with the Argentine Entomologist, Enrique Lynch. Subsequent study caused him in 1884³ to place his new genus near *Hebrus* Curtis (now sometimes *Næogeus* Laporte). No further reference appears to have been made to this species, except its enumeration by Lethierry and Sévérin,⁴ till 1898, when Champion⁵ referred the genus to *Merragata* Buchanan White, whose type, *Merragata hebroides* F. B. White, is from Mexico.

To my good friend, Rev. Longinos Navas, the learned Spanish Jesuit, I owe the possession of four examples of this very interesting form, which were secured at Montevideo, Uruguay—a second locality for the species. These specimens agree very well with the original description, although, being carded and slightly mutilated, the discrepancy in the number of joints in the hind tarsi, which Champion points out, could not be determined without further mutilating them. The number and proportion of the rostral joints in the individuals before me does not agree with the

1. P. 286.

2. P. 287.

3. Add. et Em. Hem. Arg., pp. 116-117.

4. 1896, Catalogue Général des Hémiptères, III, 52.

5. Biologia Centrali Americanaa Het. II, 193 (Aug., 1898).

description, but as in other more easily demonstrable particulars subsequently pointed out, especially in the relative lengths of the antennal segments, there is no material divergence, this is perhaps attributable to an error of observation on the part of the describer. It differs from the Central American species noted by Champion in having the 2nd, 3rd and 4th antennal joints subequal, the first joint being the shortest and stoutest and somewhat curved, and in the bifid scutellar apex, in which last character it resembles the figures of *Hebrus major* Champ. and *H. hirsutus* Champ.⁶ In fact, in regard to the latter species, it would not surprise me at all to find it eventually transferred to *Merragata*, especially since in the unique type the antennæ were broken, but were assumed to be five-jointed, a somewhat risky proceeding in view of the fact that the generic difference lies in this character.

Nothing appears to be known as to the habits of the genus. I secured *M. hebroides* B. White in a ditch draining into the Canal de la Viga in Mexico City, in April of 1910, but made no further note than that it was taken by dredging in grasses growing into the water at the edge.

The recognized species of *Merragata* may be separated by the following key, based on Champion's, in the "Biologia Centrali Americana."

1. (2) Scutellum bifid at apex; antennal joints 2 to 4 subequal, joint 1 shortest, stoutest 1. *Lacunifera* Berg.
2. (1) Scutellum blunt, not bifid at apex.
3. (2) Antennal joints 1 to 3 subequal, 4 rather stout and fusiform 2. *hebroides* F. B. White.
4. (3) Antennal joint 3 slender and very much longer than 2; 4 slender and subfusiform.
5. (6) Pronotum deeply constricted at the sides. 3 *Leucosticta* Champion.
6. (5) Pronotum moderately constricted 4. *Brevis* Champion.

Næogeus (or *Hebrus*) and *Merragata* look extremely like *Microvelia* in the Gerridae, but the apical tarsal claws at once serve to distinguish them from the last named, in which they are subapical and set in a cleft in the tarsus. The two genera of *Næogeidae* (=Hebridæ) are thus distinguished:

Antennæ 4-jointed *Merragata* F. B. White.
 Antennæ 5-jointed *Næogeus* Laporte (= *Hebrus* Curtis).

6. 1898, Biol. Cent. Am., Het. II, pl. VIII, figs. 1 and 2.