JOURNAL

OF THE

NEW YORK

ENTOMOLOGICAL SOCIETY.

Devoted to Entomology in General.

Volume IX, 1901.

Edited by Wm. Beutenmüller

NEW YORK:
Published by the Society,
Quarterly.
1901.

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

Contents of Volume IX.

JOURNAL

OF THE

New York Entomological Society.

Vol. IX. MARCH, 1901. No. 1.

THE GENUS SINEA OF *AMYOT & SERVILLE*.

By A. N. Caudell, Washington, D. C.

The species of the genus *Sinea* are for the most part quite closely allied, and persons other than special students of the Hemiptera are liable to experience difficulty in their separation. In some cases both sexes are necessary for a correct determination.

In my studies I have examined specimens of all the described species of this genus except *integra*. The material in the collections of the United States National Museum, Massachusetts Agricultural College, Colorado Experiment Station, and the Museum of the State of New York, has been examined. In addition Professor Uhler has kindly allowed me to examine the specimens of *Sinea* in his private collection. For authentic specimens of *raptoria*, *caudata*, *sanguisuga* and *defecta* I am indebted to Mr. G. C. Champion, also, for advance sheets of his most excellent article on this genus in the Biologia Centrali Americana. This eminent author has been freely quoted. By reason of his well-known ability as an hemipterist and by his having examined most of Stal's types his dictum may well be accepted as final.

A plate is given showing certain anatomical details. The external appearance of the male and female genitalia is portrayed by drawings made from *Acholla multispinosa*, an insect scarcely differing, in this particular feature, from the species of *Sinea*.

A complete bibliography, so far as known to me, is given with each species. While some of the references are of minor importance it has seemed well to bring them together. All references have been verified except where preceded by a star (*).

I would express my thanks to Prof. C. H. Fernald for various kindnesses, to Mr. O. Heidemann for aid and advice, and to Mrs. Fernald and Dr. Dyar for aid in translating.

The species of the genus *Sinea* vary much both in size and color. In general they are somber colored and in cabinet specimens they vary many shades, from light cinnamon to almost black. If a specimen is killed soon after transformation the integument will not have become fully hardened and as a result the color is liable to be pale. The width of the abdomen varies considerably, especially in the female, where it is often greatly distended with eggs. In short both size and coloration are so variable as to be usually unreliable as specific characters.

Sinea *Amyot & Serville.*

Syn.: AMYOT et SERVILLE (pro parte), Hém., 1843, p. 375; STAL, Stett. Ent. Zeit., XXII, 1861, pp. 137, 139; *ibid.*, XXIII, 1862, p. 443; Hem. Afric., III, 1865, p. 47; Enum. Hem., II, 1872, pp. 67, 70; GLOVER, MS. Notes from my Journ., 1870, p. 110; LETH. & SEVERIN, Cat., III, 1896, p. 198; CHAMPION, Biol. Cent. Amer. Rhync., II, 1896, p. 201.

The genus *Sinea*, which, according to Glover, is from the Hebrew word "sene" meaning a prickly bush, was established in 1843 by Amyot and Serville. *S. diadema* Fab., is the type. The genus is recognized by the species having the anterior legs with a dorsal spine on the femora and spined below on both the femora and the tibiæ.

The species as now recognized may be separated by the following table. *Sinea spinipes* and *sanguisuga* are connected by intermediate forms and it seems questionable whether they should be considered distinct. The extremes, however, are so obviously distinct that I have thought it best to consider them as good species, especially as they are so recognized by both Uhler and Champion.

1. Anterior prothoracic lobe armed on the disk with spines.....2
   Anterior prothoracic lobe armed on the disk only with tubercles, sometimes acuminate but usually blunt.....6

2. Posterior prothoracic lobe armed on the disk with sharp spines.....3
   Posterior prothoracic lobe unarmed on the disk.....4

3. Anterior femora with the terminal spine of the inner inferior row out of alignment, occupying rather a sub-dorsal position.....**complexa** *Caud.*
   Anterior femora with the terminal spine of the inner inferior row not out of alignment.....**integra** *Stål.*

4. Gibbosities on the disk of the posterior prothoracic lobe surmounted by a small tubercle. Sides of the female abdomen very prominently undulate.
   undulata *Uhl.*
   Gibbosities on the disk of the posterior prothoracic lobe not surmounted by a small tubercle.....5

5. Margins of the female abdomen prominently undulate, the undulations usually sub-angulate. Male abdomen varying from almost entire to quite prominently undulate. Length, 12–14 mm. ..... **diadema** *Fab.*

Margins of the female abdomen usually inconspicuously undulate, sometimes more pronounced but rarely so prominent as in *diadema*; the undulations generally rounded. Abdomen of the male entire, or very slightly undulate. Length, 11–13 mm. ..... **confusa,** sp. nov.

6. A pale fascia at the lateral extremity of each abdominal segment. Membrane of the hemelytra with a longitudinal dusky mark extending to the apex. Anteocular spines generally short and somewhat blunt. ..... **rileyi** *Mont.*

The lateral extremity of the fourth abdominal segment without a pale fascia. Membrane of the hemelytra generally without a longitudinal dusky mark extending to the apex. Anteocular spines variable. 7

7. Anteocular spines sharp and well defined, the pair next the eyes usually longer than the terminal pair 8

Anteocular spines blunt, short, usually mere tubercles, the pair next the eyes not distinctly longer than the terminal pair. ..... **defecta** *Stal.*

8. Disk of the posterior prothoracic lobe bigibbous. Lateral margins of the abdomen, especially of the female, undulate, scarcely so in the males. 9

Disk of the posterior prothoracic lobe transversely convex, not distinctly bigibbous. Lateral margins of the abdomen not undulate in either sex. 10

9. Abdomen of both sexes abruptly widened behind. ..... **coronata** *Stal.*

Abdomen of neither sex abruptly widened behind. ..... **confusa,** var.

10. Abdomen of the male emarginate at the apex, subcaudate, margins subparallel. ..... **caudata** *Champ.*

Abdomen of the male sub-truncate at the apex, not caudate. 11

11. Abdomen of the male with the margins sub-parallel, of the female widened to the apex of the fourth segment. ..... **raptoria** *Stal.*

Abdomen of both sexes directly widened to the apex of the fourth segment, but narrower in the male than in the female. 12

12. Abdominal segment four and the basal half of segments five and six generally of the same color as the rest of the abdomen above, or slightly darker. First pair of anteocular spines usually twice as long as the terminal pair. Usually less than 12 mm. in length. ..... **sanguisuga** *Stal.*

Abdominal segment four and the basal half of segments five and six generally much darker than the rest of the abdomen. First pair of anteocular spines longer than the terminal pair, but seldom twice as long. Usually more than 12 mm. in length. ..... **spinipes** *Stal.*

Sinea diadema *Fabr.*

(Plate I, Fig. 1, and Plate II, Figs. 3, 4, 5, 6.)

Cimex multispinosus DEGEER, Mem., III, 1773, p. 348 (pars).

Reduvius diadema FABRICIUS, Gen., 1776, p. 302; *Spec., II, 1781, p. 382; Ins. Mant., II, 1787, p. 313; Ent. Syst., IV, 1794, p. 206.

Cimex hispida THUNBERG, Nov. Ins. Sp., II, 1783, p. 33.
Cimex diadema GMELIN, Syst. Nat., I, IV, 1788, pp. 21, 96.
Cimex setosus GMELIN, Syst. Nat., I, IV, 1788, pp. 21, 44.
**Zelus diadema* FABRICIUS, Syst. Rhyng., 1803, p. 286.
Reduvius raptatorius SAY, Journ. Acad. Nat. Sc. Phil., IV, 1825, p. 327; Am. Ent., II, 1825, p. 72; Comp. Writings, I, 1859, p. 72; *ibid.*, II, 1859, p. 249; WALSH, Prairie Farm., July, 1863; Pract. Ent., II, 1867, p. 43; WALSH and RILEY, Amer. Ent., I, 1868, pp. 207, 249; RILEY, Inj. Ins. Mo., I, 1869, p. 114; SAUNDERS and REED, Can. Ent., III, 1871, p. 49; ROGERS, Can. Ent., V, 1873, p. 155; GLOVER, MS. Notes, Hem., 1876, pp. 64, 131.
Sinea multispinosa AMYOT and SERVILLE, Hem., 1843, p. 375; STÅL, Stett. Ent. Zeit., XXII, 1861, p. 139; *ibid.*, XXIII, 1862, p. 443 (part); WALKER, Cat. Hem. Brit. Mus., VIII, 1873, pp. 138, 9; DODGE, Field and Forest, II, 1876, p. 67; GLOVER, MS., Notes, Hem., 1876, pp. 67, 133; COMSTOCK, Cotton Insects, 1879, p. 169; HUBBARD, Orange Insects, 1885, p. 191; EBERHART, Elem. Ent., 1801, p. 132.
* *Irantha hispida* STÅL, (Efr. Ak. Förh., 1866, p. 264.
Sinea diadema STÅL, Enum. Hem., 1872, p. 70 (part); UHLER, Bull. U. S. Geol. and Geog. Surv., No. 5, 2nd Ser., 1876, p. 326; Bull. U. S. Geo. and Geog. Surv., III, 1877, p. 429; *ibid.*, IV, 1878, p. 508; RILEY, Bull. No. 3, U. S. Ent. Com., 1880, p. 36; Supp. Mo. Rep., 1881, p. 58; 4th Rep. U. S. Ent. Com., 1885, p. 97; LINTNER, 1st Rep. Ins. N. Y., 1882, p. 331; *ibid.*, 11th Rep., 1896, p. 270; POPENOE, Trans. Kans. Acad. Sci., IX, 1885, p. 63; UHLER, Check List, Hem., 1886, p. 23; SAUNDERS, Ins. Inj. Fruit, 1889, p. 70; TOWNSEND, Proc. Ent. Soc. Washington, II, 1891, p. 55; BLAISDELL, Ins. Life, V, 1892, p. 35; HOPKINS, Bull. No. 32, W. Va. Agricul. Exp. St., 1893, p. 232; ASHMEAD, Ins. Life, VII, 1895, p. 321; GILLETTE and BAKER, Bull. No. 31, Colo. Agricul. Exp. St., 1895, p. 59; LETH. and SEVERIN, Cat. Hem., III, 1896, p. 198; HEIDEMANN, Proc. Ent. Soc., Wash., IV, 1899, p. 217; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 292.

Length 12–14 mm. Anterior prothoracic lobe armed on the disk with long spines. Posterior prothoracic lobe unarmed, bigibbous on the disk. Margins of the female abdomen prominently undulate. Abdomen of the male varying from almost entire to quite prominently undulate.

Habitat: United States and Canada. Type, Mus. Holm.

I doubt the synonomy of Thunberg's *hispidus* as it was described from India. In Gmelin's Edition of Linnæus' Syst. Nat., I, (4), p. 2144, 1788, under the name *setosus*, it is said to inhabit America, Australia and India.

This species, as originally defined, occurred in Central America and Mexico as well as in the United States and Canada. But as recently pointed out by Mr. Champion, the form occurring in Central America is not *diadema*. This being true it may be doubted if *diadema* occurs south of the Mexican border.

This is our most common and best known species and is readily separable from all others, except *coronata*, *undulata* and *confusa*, by the distinctly undulated margins of the female abdomen. The spined anterior prothoracic lobe clearly separates it from *coronata* but from *confusa* it can be distinguished only by comparative differences, aided perhaps in some cases by the habitat. It differs from *undulata* only in minute details.

The figure of this species on the plate shows an average female specimen, the undulations of the abdomen probably being a little too much rounded. In a female specimen in the collection of the National Museum that is doubtfully referred to this species the posterior prothoracic lobe is not bigibbous on the disk and the margins of the abdomen are not at all undulate, though the edges show semi-transparent at intervals, giving them a distinctly undulated appearance.

The egg and first stage of the nymph of this species were described by Mr. W. H. Ashmead in Insect Life (Vol. VII, p. 321, 1895). As this, so far as I know, is the only description of immature forms of any of our Sineas the matter is here reproduced in full.

"Ova. Length, 1.5 mm. or a little more than twice as long as thick, of a cylindrical shape, rounded at bottom and truncate at top. The top is surmounted by a broad, silky, white, marginal fringe, in the center of which is a cone-shaped cap or lid, which is removed when the young nymph makes its exit from the egg."

"A freshly laid cluster of these eggs, deposited Aug. 7th, hatched on the 17th, so that the duration of the egg state, under ordinary circumstances, can not be more than ten or twelve days. The eggs are deposited in clusters to the number of eight, ten, or more, on either the upper or lower surface of the (cotton) leaf, and are closely together in a sticky, dark honey-yellow, or reddish-yellow secretion."

"Nymph, first stage. Length 1.8 mm., and of a piceous or shiny black color; the antennæ, except at extreme base, the apical half of middle and posterior tibiæ and all tarsi being brownish yellow, while the middle and hind legs, except as already noted, are dark, piceous. The antennæ are cylindrical, 4-jointed, as long as the body, the first and last joints being nearly equal in length, while the second and third united are a little shorter than the first; the head is large, oblong and smooth, widest anteriorly, and as long as the thorax, the beak is stout, extending to between the middle coxæ; the thorax is divided into two lobes, each of which bears a pair of spines; abdomen short and not longer than the hind lobe of the thorax; the anterior femora are longer and much stouter than the others and armed with strong spines above and beneath, their tibiæ shorter and slenderer, pilose and with three spines beneath; while the middle and hind legs are shorter and more slender, without spines although more or less pilose."

It eats young cotton-worms and other insects in Mississippi.

Sinea undulata *Uhl.*

Sinea undulata UHLER, Proc. Calif. Acad. Sc., IV, 1894, p. 282; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 199.

Brownish-cinereous, pale gray, pubescent, similar to *S. diadema*, but wider, with a shorter neck and femora, with the spines more numerous and crowded together on the front division of the head, with the carinate lines of the middle of the pronotum prominently and sharply defined, and the knobs each side of the base elevated, and surmounted by a little tubercle; three double series of spine-like black tubercles on the anterior lobe of the pronotum. Venter with a series of oblique, white spots on each side near the border; scallops of the lateral border more prominent and placed farther back than in *S. diadema*, the inner margin of corium white. Length to tip of venter 14–15 mm. Width of pronotum, 3 mm.

Habitat: California.

This species, which will probably prove to be a variety or aberration of *diadema*, is quite a characteristic appearing insect. The type has been seen and it seems to agree perfectly with the description. None of the many specimens of *Sinea* examined by me were referable to this species. The author's description is given above.

Sinea confusa, sp. nov.

Sinea multispinosa STAL, Stett. Ent. Zeit., XXIII, 1862, p. 443 (part).

Sinea diadema STAL., Enum. Hemip., II, 1872, p. 70 (part).

Sinea undulata CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 292.

Length 10–13 mm. Prothoracic lobes as in *diadema*. Abdomen of the female generally inconspicuously undulate, sometimes more pronounced but never as prominent as in the typical *diadema*. The undulations usually rounded. Abdomen of the male entire, or very slightly undulate.

Habitat: Arizona. Type, no. 5364. U. S. Nat. Mus.

This species has hitherto been confounded with *diadema*. The two species do approach each other very closely but the extremes are conspicuously distinct. *Confusa* has been also confounded with *undulata*, but it is difficult to see how that could occur. The author's discription of *undulata*, it seems, would preclude such a possibility.

Of this species I have seen specimens from California, Arizona and Texas in the United States and from various localities in Mexico and Central America. Its habitat will aid to an extent in separating it from *diadema*. Specimens sent from Mexico by Mr. Champion have the abdomens of the females very slightly undulate, while those of the males are practically entire.

In the discussion of this species under the name *undulata* Mr. Champion describes a variety thus: "Var. The spines on the head shorter, and those on the anterior lobe of the pronotum reduced to conical tubercles, the neck simply granulate (♂ ♀)." He found intermediate forms connecting the variety with the typical specimens. The variety is represented in the National Museum by both male and female specimens.

Sinea coronata *Stal.*

(Plate I, Fig. 2.)

Sinea coronata STAL, Stett. Ent. Zeit., XXIII, 1862, p. 444; WALKER, Cat. Hem. in Brit. Mus., VIII, 1873, p. 138, 9; UHLER, Bull. U. S. Geol. & Geog. Surv. No. 5, 2nd Ser. 1876, p. 61; UHLER, Check List Hem., 1886, p. 23; LETH. & SEVERIN, Cat. Hem., III, 1896, p. 199; CHAMPION, Biol. Cent. Amer. Rhync., II, 1890, p. 292.

Length, 13–15 mm. Anterior prothoracic lobe without spines on the disk, furnished only with conical tubercles. Posterior lobe unarmed, bigibbous on the disk. Abdomen of both sexes abruptly widened behind.

Habitat: United States, Mexico and Central America. Types, Mus. Holm and Coll. Sign.

This characteristic species is readily distinguished from all others by the abruptly widened abdomen in both sexes, as illustrated at fig. 2 on plate I. *Diadema* is its nearest ally, and from it it is distinguished at a glance by the anterior prothoracic lobe being without spines on the disk. It occurs in the southern and western United States, the specimens in the National Museum being from Texas.

Sinea complexa *Caudell.*

(Plate I, Fig. 3.)

Sinea complexa CAUDELL, Can. Ent., XXXII, p. 67, 1900.

Length 8–11 mm. Anterior prothoracic lobe distinctly spined. Posterior lobe with well-defined spines on the disk, which is transversly convex, not bigibbous. Abdomen with well-rounded sides, margins entire. Anterior femora with the last two ventral spines of the inner row out of alignment, the terminal one the more so, being sub-dorsally located.

Habitat: This is a western species described from California and also collected in Arizona. A specimen in the collection of the National Museum is labelled "Alabama," probably erroneously so. Type no. 4433, U. S. Nat. Mus.

This well-marked little species is at a glance recognized from all the other species, *integra* alone excepted, by the posterior prothoracic lobe

being distinctly spined on the disk. The peculiar armature of the anterior femora serves to separate it from *integra*.

For the drawings illustrating this species I am indebted to Miss Lillie L. Howenstein.

Sinea integra *Stal.*

(Plate 1, Fig. 4.)

Sinea integra STAL, Stett. Ent. Zeit., XXIII, 1862, p. 443; Enum. Hemip., II, 1872, p. 71; WALKER, Cat. Hem. in Brit. Mus., VIII, 1873, p. 138, 9; UHLER, Check List Hem., 1886, p. 23; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 190; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 294.

Both lobes of the prothorax armed with spines, disk of the posterior lobe convex. Abdomen not undulate. Anterior femora with none of the ventral spines out of alignment.

Habitat: Mexico and Central America. Type, Mus. Holm.

Mr. Champion examined the type of this species in the Signoret collection and found it to be a male *confusa* (*undulata*). He also examined the type (male) in the Stockholm Museum and presumably found it with the posterior prothoracic lobe spined as he expressly defines *integra* as a species with this character. By reason of his having seen nearly all the types of Stal's species his definition of *integra* is accepted with confidence.

Of all the specimens of *Sinea* examined by me I have found not one *integra*. Stal described it from Mexico and ten years later while writing of it he gives only Mexico as its habitat. I have seen American specimens labelled as *integra* but in every case they were either obvious mis-identifications or the males of *confusa* which they doubtless much resemble. It will probably develop that American authors have wrongly interpreted this species and that it is not native to the United States at all. Champion saw but six specimens, exclusive of the type. This would indicate that this is a comparatively rare species. It is said to resemble *diadema* in general form but the sides of the abdomen are not undulate and the posterior prothoracic lobe is not bigibbous on the disk. The figure is copied from Champion.

Sinea caudata *Champion.*

(Plate 1, Fig. 5.)

Sinea caudata CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 293.

Length 8–10.5 mm. Anterior prothoracic lobe armed with sharp tubercles, posterior lobe unarmed, convex. Margins of abdomen entire. Male abdomen subcaudate with the apex emarginate.

Habitat: Central America. Type Brit. Mus.

This Central American species is very closely allied to *S. raptoria* but the males may by separated by the apex of the abdomen as given in the table of species. The females are practically inseparable. The tubercles on the anterior lobe of the prothorax are somewhat more acute in *caudata* than in *raptoria*. The author had before him five males and six females.

Sinea raptoria *Stal.*

(Plate I, Fig. 6.)

Sinea raptoria STAL, Stett. Ent. Zeit., XXIII, 1862, p. 444; WALKER, Cat. Hemip. Heter. Brit. Mus., VIII, 1873, pp. 138, 139; UHLER, Bull. U. S. Geol. & Geog. Surv. No. 5, 2d Ser., 1876, p. 61; Check List Hemip., 1886, p. 23; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 199; HUBBARD, Supp. Psyche, 1890, p. 6; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 293.

Sinea denticulosa STAL, Enum. Hemip., II, 1872, p. 70; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 198.

Length, 8–11 mm. Anterior prothoracic lobe armed with short conical tubercles. Posterior lobe unarmed, convex on the disk. Abdomen entire, not caudate, subtruncate at apex.

Habitat: United States, Mexico and Central America. Types, Mus. Holm. and Coll. Sign.

Mr. Champion established the synonymy of *denticulosa* with *raptoria* by critically comparing their respective types and finding them inseparable.

This species is closely related to *caudata* and *sanguisuga*, but may be separated from them by characters given in the table. The males are necessary for a correct determination.

Raptoria is common to the United States, Mexico and Central America, but with us it has been recorded only from the western States.

Sinea sanguisuga *Stål.*

(Plate I, Figs 7 and 8).

Sinea sanguisuga STÄL, Stett., Ent. Zeit., XXIII, 1862, p. 444; Enum. Hemip., II, 1872, p. 71; WALKER, Cat. Hem. Het. Brit. Mus., VIII, 1873, p. 138, 139; UHLER, Check List Hem., 1886, p. 23; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 199; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 294.

Length 10–13 mm. First pair of anteocular spines usually twice as long as the third pair. Thorax as in *raptoria*. Abdomen entire, outer angles of the fourth segment sometimes prominent or subdentiform, especially in the male, where sometimes the fifth segment is also slightly prominent. Segments four and basal half of segments five and six usually of the same color as the rest of the abdomen, sometimes slightly darker.

Habitat: United States, Mexico and Central America. Type, Mus. Holm.

The table will enable the student to separate this species from the other members of the genus. Some difficulty may be experienced in separating it from *spinipes* as the differences here are but relative. The abdomens of the males are usually sharply angulated on the fourth segment, sometimes also on the fifth. The specimens in the National Museum are from Texas.

Sinea spinipes *Herr.-Sch.*

Harpactor spinipes HERRICH-SCHAEFFER, Wanz. Ins., VIII, 1848, p. 82.

Sinea spinipes STAL, Enum. Hemip., II, 1872, p. 71; UHLER, Check List Hem., 1886, p. 23; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 199; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 295.

Length, 12–15 mm. First pair of anteocular spines seldom twice as long as the third. Thorax as in *sanguisuga*. Abdomen entire. The fourth and basal half of segments five and six of the abdomen generally conspicuously darker than the rest of the body, usually more constant in the females.

Habitat: United States, Mexico and South America?

This species was described and figured from South America by Herrich-Schaeffer in 1848, but it has never since been reported from that locality. In 1872 Stal gave its habitat as Mexico. It occurs all over the southern and central parts of the United States. Its closest ally is *sanguisuga* and the differences enumerated in the table will usually separate them. The range of *spinipes* seems to extend farther north than does that of *sanguisuga*, the latter species generally occurring only in the extreme southern states. The distinct black band across the abdomen especially in the females, will usually serve to separate it from its allies, though this is sometimes seen, to a lesser extent in *sanguisuga* and especially in *defecta*. The long anteocular spines at once separated it from the latter species.

Sinea rileyi *Montandon.*

Sinea rileyi MONTANDON, Proc. U. S. Nat. Mus., XVI, 1893, p. 51; UHLER, N. A. Fauna, No. 7, 1895, p. 250; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 199; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 295.

Length, 9.5–12 mm. Head with large tubercles or short blunt spines before the eyes instead of well developed spines. Anterior prothoracic lobe armed with tubercles, posterior lobe unarmed, convex on the disk. A pale fascia at the lateral extremity of each segment of the abdomen, which is entire and with the margins well rounded, not at all angulated at the sides in either sex. Membrane of the hemelytra with a longitudinal dusky mark extending to the tip, rarely obsolete or not easily seen.

Habitat: United States. Type, Coll. Montandon.

This species is somewhat allied to *sanguisuga* and related forms, but the short anteocular spines will serve to distinguish it from all except *defecta*, in which case the characters given in the table will serve to distinguish it. It was described from California and there are specimens in the National Museum from Texas and Arizona. There is also a single specimen labelled "North Carolina." This seems quite out of its ordinary range and the specimen may be wrongly labelled.

The antennæ of this species are obscurely ringed with pale bands on the first segment, in some cases scarcely visible.

Sinea defecta *Stal.*

(Plate I, Fig. 9.)

Sinea defecta STAL, Stett. Ent. Zeit., XXIII, 1862, p. 445; Enum. Hemip., II, 1872, p. 71; WALKER, Cat. Hemip. Heter. Brit. Mus., VIII, 1873, pp. 139, 140; UHLER, Check List Hemip., 1886, p. 23; LETH. & SEVERIN, Cat. Hemip., III, 1896, p. 198; CHAMPION, Biol. Cent. Amer. Rhync., II, 1899, p. 295.

Length, 11–13.5 mm. Head and thorax as in *rileyi*. Abdomen entire, segment four without a pale fascia. The fourth and basal half of segments five and six of the abdomen usually darker than the rest of the body, generally more constant in the females. Abdomen of the male with the apical angle of the fourth segment slightly prominent or subangulate. Membrane of the hemelytra without a longitudinal dusky mark.

Habitat: Mexico and Central America. Type, Museum Holm.

This species resembles *spinipes* in coloration, size and form but is at once distinguished from it, as well as from all others, by having only very short blunt spines or tubercles on the anterior part of the head. This character is shown at figure 9 on plate I.

EXPLANATION OF PLATE I.

Fig. 1. *Sinea diadema* FAB.
Fig. 2. " *coronata* STAL.
Fig. 3. " *complexa* CAUD.
Fig. 4. " *integra* STÅL.
Fig. 5. " *caudata* CHAMP.
Fig. 6. *Sinea raptoria* STAL.
Fig. 7. " *sanguisuga* STÅL.
Fig. 8. " *sanguisuga* STÅL.
Fig. 9. " *defecta* STÅL.

EXPLANATION OF PLATE II.

Fig. 1. *Acholla multispinosa* DEG. ♀. (Tip of abdomen, ventral view.)
Fig. 2. " " " ♀. (Tip of abdomen, apical view.)
Fig. 3. *Sinea diadema* FAB. (Hemielytron.)
Fig. 4. " " " (Wing.)
Fig. 5. " " " (Fore leg.)
Fig. 6. " " " (Claw.)
Fig. 7. *Acholla multispinosa* DEG. ♂. (Tip of abdomen, ventral view.)
Fig. 8. " " " ♂. (Tip of abdomen, apical view.)

LIFE-HISTORY OF PLATYSENTA VIDENS *GUEN.*

BY OTTO SEIFERT.

Southward from Astoria, New York to the railroad and eastward to the little village of Woodside, spreads a pasture-like tract of land, interrupted by sand pits and boggy depressions, the latter being covered a few months in the year by rank vegetation. Every tree and bush of this once wooded region has been removed and almost nothing is left but the sandy soil, covered with a low growth of frugal grasses. Mortified nature, to relieve the monotonous landscape, has compassionately ornamented this desert with some of its hardiest plants. *Euthamia graminifolia*, *E. caroliniana*, different species of *Aster* and *Linaria linaria*, in small fields and patches, cover the ground. Most abundant are the two species of *Euthamia* and, as these are shunned by cattle, their dense yellow flower clusters and emerald green foliage last until late in October. The smaller one, *E. caroliniana*, reaches an average height of twelve inches. The dry, brown stems of the previous season mostly persist, forming with the young shoots (both *Euthamia* are perennial by rootstocks) low, spreading patches. These spots are the favorite habitat of the *Platysenta* larvæ. Here they find a shelter against the parching rays of the sun, protection against rain and a comparatively safe place for their final transformations. The oval cocoons or earth cells are formed in the sandy soil near or on the surface, supported and screened by the superficial roots of the food-plant. Only in a few cases larvæ were found feeding on species of *Solidago*, while hundreds might have been collected without trouble within these patches of *Euthamia*.

The moth of *Platysenta videns* appears in three generations. The first leaves its cocoon late in May, finishing its course of life early in July, while larvæ of the last brood may be found till the middle of October. The caterpillars are most abundant from August till October. They do not feed on the flower clusters, only on the leaves. During the day time they rest on the stems and leaves of the food plant, stretched closely to their resting places, the small, flat head, extended forward and the well-developed anal legs spreading and projecting posteriorly. The normal color of the fully grown larva is the rather pale, dull green of the *Euthamia* leaf, with fine dor-

sal, subdorsal and lateral white lines and a broad white stigmatal band. It would be difficult to detect them were it not for this white band. When disturbed they emit, like many other caterpillars, a yellowish brown or greenish juice. At least 75 per cent. of the larvæ follow this type. Another form is chocolate brown with the same lines. Between these two forms a variety of lighter brown shades to olive green are found. The variety in color has nothing to do with the sex or coloration of the imago, neither does the color protect the larvæ from the attacks of their parasites, as the dark forms are infested in the same proportion as the normal green form.

Of the parasites, *Protomicroplitis calliptera* Say, is most abundant. This and a dipteron, *Winthemia quadripustulata* Fab., may be seen hovering over the blossoms of the food-plant. As the grubs of the parasites leave the caterpillars before the latter form their cells, the little whitish oval cocoons of the *Protomicroplitis* may often be found fastened to the leaves and twigs, though as a rule the grubs bury themselves in the ground deeper than their hosts. *Tanisçus geminatus* Say, is a larger, but far rarer parasite infesting them.

The larvæ and pupæ of the moth are hardy and develop easily even when forced by heat, the pupæ of the parasites being more sensitive. The caterpillars do not appear to be much subject to contagious larval diseases—muscardine and flaccidencia—though both diseases are usually most infectious and many larvæ of *Arctia arge*, *Arctia naïs*, *Leucarctia acræa*, *Arsilonche albovenosa*, etc., are killed by the first named disease and found as stiff, whitish corpses on top of grass blades and stems within and around the habitat of the *Platysenta*, while the pretty, adaptive larva of *Cucullia asteroides* feeding frequently on the blossoms of *Solidago* and *Euthamia* are often found affected or destroyed by the latter disease.

The summer-heat quickly develops the moth, the copulation is of short duration and the female at once deposits her eggs singly or not more than six on a leaf. They are not fastened very tightly and may be shaken off by beating.

The larvæ were plentiful in the district alluded to above. Several places in Westchester Co., where *E. graminifolia* grows plentifully (*E. caroliniana* is far more local), were carefully searched for the larvæ, but none were found. Even virgin females exposed there did not find mates. These localities are mostly boggy or rocky. Common as the moth is, it still seems to be confined to certain conditions and

one of these, besides the presence of one of the *Euthamia*, is a light and dry sandy soil, where water can not collect.

May 24th, six females were exposed near Woodside in three different places. Earlier trials with prematurely appearing females had been unsuccessful. A heavy rain set in that night lasting until the following noon: nevertheless early in the morning two of the females were found fertilized, they deposited eggs by degrees until May 27th, when they died.

Egg.—Almost spherical, slightly higher than the widest diameter of 0.5 mm., pale yellowish green. Around the sunken, circular, shallow vertex arise eight equidistant prominent ribs, eight to ten more arise above the middle of the egg, so that at the base sixteen to twenty vertical equally well defined, rather robust ribs pass across the base, eighteen to twenty equidistant striæ cross horizontally, giving the empty eggshell the appearance of being covered with a fine regular network.

The yellowish green color of the egg changes after 36 to 48 hours to a paler green; a purplish brown stripe encircling the middle and a spot of the same color spreading gradually from the vertex; soon the whole upper half is pale purplish brown, the vertical ribs, especially those near the summit, turning transparent and colorless. By June 2d all the eggs had hatched, the young larvæ eating an opening sideways, leave the colorless membrane intact.

Stage I.—Soon after hatching the young larvæ become active, collecting in numbers on the branchlets and at the slightest touch suspend themselves by silken threads. They are slender, about 2.5–3.0 mm. long when resting, slightly widening from the third thoracic segment towards head. Head perceptibly wider than the body, flat, uniformly very light brownish, clypeus paler, ocelli darker brown. Ground color yellowish green, but being almost transparent the contents of the inner organs changes the color to various tints of darker green. The larvæ are geometrid-like, distinctly hunched on eleventh segment; the first two pairs of abdominal legs undeveloped. Tubercles small, black, the single bristles about half as long as the width of the body, also black. Feet concolorous with body. Thoracic feet spread sideways when walking.

Stage II.—(June 7th.) Length of larva about 4.0 mm., width of middle of body 0.5, of head 0.52 mm. Body slightly tapering towards last segment, 11th segment perceptibly hunched. The varia-

bility of the green ground-color, especially on the first five segments and the two last ones, is due to the transparency of the skin and the momentary condition of the intestines. A clear white dorsal line starts from the anterior edge of first segment and reaches to edge of anal shield. In the middle of the space between dorsal line and stigmata, from anterior edge of first to tenth segments where it becomes untraceable, runs a fine subdorsal white line; equidistant from the subdorsal line and stigmata extends a fine white lateral line to edge of anal shield, also commencing from anterior edge of first segment. A broad, prominent white stigmatal band extends to anal legs. Setæ small, arising from very minute points arranged in the usual noctuid manner. (Dyar, Classific. of Lepidopt. Larvæ.) Head very pale tan-colored, flat, shiny, with a few bristles; from vertex; diverging from the summit, run two olive-brown or olive-green stripes, including the whitish clypeus, ending near the upper lip, another similar stripe (subdorsal) terminates near the mandibles and a 3d (lateral) one, wedge-shaped, reaches the base of the antenna.

Stage III.—The larvæ reach a length of 8–9 mm., width of head 0.75 mm., and width of 5th and 6th segment 1.0 mm., tapering slightly towards head and last segment. The second pair of abdominal legs more developed than the first pair. When resting stretched out the larva uses the second pair, holding them vertically while the other normally developed ones are turned sideways, yet often they rest in geometrid-like manner. The larvæ still suspend themselves when disturbed on silken threads and twist almost in a knot.

Head very pale yellowish brown, striped as before but more pronounced. The lower wedge-shaped stripe, including the bow of blackish ocelli, becomes partly broken up by white mottlings. Buccal region whitish, appearing as a continuation of the white stigmatal band. Ground color, band and lines practically as before, the subdorsal line reaching 11th segment, where it gradually vanishes.

Stage IV.—The larva attains an average length of 15 mm., width of middle of body 2.0 mm., width of head 1.0 mm. The looper-like gait is almost entirely abandoned, and as the two first pairs of abdominal legs are not as well developed as the hinder ones, these latter are spread slightly sideways to give the first two pairs a hold on the leaf. Disturbed they do not drop themselves any more on silken threads or curl up knot-like, but try to get upon their feet again as soon as possible.

Head in general as before, the lateral wedge-shaped, brown streak still more reduced by enlarged white mottlings. The green ground-color more intense. The white dorsal line forms on top of the hump a characteristic small white oval spot, often followed on the plant by a still smaller one. The subdorsal line terminates at edge of anal segment. Very frequently the stigmatal cream-white band contains irregularly rose-colored oval spots and above the legs a yellowish, partly-interrupted pedal line is formed. The green color from pedal line to lateral line appears of a brighter green shade than the regions above; this is caused by an accumulation of very minute yellowish white confluent dots and streaks most profuse in the middle of the green spaces between dorsal, subdorsal and lateral lines spreading sideways. Tubercles appear as minute black dots surrounded by small disc-like white spots; setæ small, black and soft. Ventrally uniformly green but of a fainter and duller shade. Stigmata oval, clay-colored with black wing. On first segment the spiracle is only partly enclosed within the white band, on eleventh segment it is situated above the band. Segmental incisures appear as yellow rings when the larva is not outstretched.

Stage V.—The larvæ attain an average length of 18–20 mm. Width of head 1.5 mm., width of middle of body 2.5 mm. All sixteen legs equally well developed; all geometrid-like habits are abandoned.

Head rather flat, dull greenish white, with the brown or dark green streaks as before, the lower wedge-shaped patch dissolved into irregular reticulations. Mouth parts scarcely colored. Antennæ pinkish, tipped with black.

Normally the dorsal line is diminished but distinct and uniform. With many specimens it is interrupted posteriorly on the segments, or appears composed of many irregular small whitish dots and often the line is wanting in front of the oval, white spot on the hump. A rather broad dark green shade attenuated in the middle of each segment seems only to be caused by the action of the dorsal vessel; subdorsal and lateral lines as before. The cream white stigmatal band extends from the buccal region to the extremity of the anal legs. This band is variegated more or less with rose color or deep pinkish in irregular spots, wavy double lines or even by a narrow, irregularly edged central band. The yellowish-green color of dorsal and lateral area is still more changed by irrorations formed by innumerable minute, confluent yellowish-white dots; below lateral line to pedal line these dots are far

less profuse and hence the green color more vivid. Legs concolorous with body, thoracic legs almost translucent, abdominal ones tipped with pink near the feet.

During this period, between fourth and fifth moult, the larvæ commence to appear in different variations; from the most abundant (about 75 %) green form through all shades of olive-green to chocolate brown. The lines, stigmatal band, oval spot on hump, confluent dots and white discs around setæ are permanent. The rose-colored markings of stigmatal band are rarer with the brown varieties. The head varies according to the color of the larva, lighter or darker shades—always lighter than the color of the body: the brown streaks are unaltered. June 17th some of the larvæ passed their fifth moult.

Stage VI.—In about six days they attain their maturity, measuring about 35 mm., width of head 2.15 mm., first segment posteriorly 2.75 mm., third segment posteriorly 4.0 mm., width of eighth segment 4.25 mm. The larva tapers towards head from third thoracic segment; abdomen almost cylindrical, eleventh segment moderately hunched. Head pale green, with a black, narrow, lateral band on each side ending, pointed, between base of antenna and upper lip. On both sides of the black band following this in its extension, the green color is changed to opaque greenish white. Mouth parts sordid whitish, semi-transparent. Ocelli black; base of antenna pale, translucent greenish white, tipped above with rose color, with a brown spot at the joint and dark brown at the end. Below ocelli, continuing from stigmatal band, the buccal region opaque greenish white, often with brownish dash above. Head not entirely smooth; clypeus with fine transverse furrows, the other part of head very minutely shagreened. Setæ scanty, but longer than those on body.

The larvæ grow very rapidly during this period and are subject to much change in the ground color, which at the beginning of this instar is rather vivid yellowish-green, but turns towards maturity to a dull, more bluish green. The dorsal vessel modifies this region by a darker green, obscuring the dorsal line more or less; sub-dorsal and lateral lines mostly indistinct but traceable and always very clear and plain on thoracic segments. Segmental incisures narrowly but distinctly ringed with yellow, but this is only visible when the larva leaves its outstretched position, feeding or moving, and contracts the somites, so that the skin becomes folded and compressed at the sutures. Stigmata pale ochre with black rim. From head to anal legs extends a broad

cream white band. On first and eleventh segment the spiracles only touching its upper margin and on eighth and ninth they are situated only partly within the band. Often a narrow brown or purplish line borders the white band above; sometimes this line is interrupted or only indicated by a dash on first segment: in most cases it encloses a narrow rose colored, irrorated band with darker red edges; this red band may be interrupted and often is scarcely indicated or wanting entirely.

The green color above and below is mottled with innumerable more or less distinct, yellowish white dots and streaks, most plentiful between dorsal and lateral lines where they become confluent, forming meandric and tortuous designs. On top of hump on 11th segment an oval, yellowish white spot, often pinkish inside, sometimes a still smaller one below on the slant.

Setæ very small and weak arising from white disk-like tubercles, a still more anterior white disk than: does not bear bristle. Ventrally and subventrally the green color is more intense than above. Forelegs greenish but pale; abdominal legs green with minute whitish dots, feet tipped with rose color or pink.

The dark varieties occur in all shades from olive brown and purplish to paler or darker chocolate brown. Markings the same as in the normal green form. The stigmatal band mostly plain, but specimens banded or variegated with rose color are not scarce. The white lines are shaded more or less above and below with a darker tint of ground color.

The head of the dark varieties has the same color but paler than the body, the black bands are the same, the space below the black band and white buccal region is often marked by dark brown dashes or reticulations. June 14th sixty larvæ, all green with striped heads and as far as possible before 5th moult were separately reared in a roomy glass jar, containing an abundance of the dry last year's stems and branchlets of the food plant and dried-up, brownish leaves, only few fresh plants being added, for food, so that the caterpillars had almost no other resting place but the dry plant; the jar was kept in a light though shady place. June 25th they were examined. Five had formed their cells and hence the color could not be ascertained, thirty-nine were of the brown variety in different shades and sixteen only were of the normal green form.

Before pupating the larva turns purplish and, usually at night, forms

on or near the surface of the pround an oval, brittle cell of sand and earth in which it transforms to a pupa within a few hours.

The moderately stout pupa is of a light chestnut brown; head, thorax, wing and limb cases darker brown, finely rugose; movable segments finely punctured anteriorly with darker brown edge near sutures, spiracles also darker brown. The pupa ends in two spines about 0.7 mm. in length and is not fastened to the cocoon. Thorax slightly compressed sideways. Length of earth-cell 15–17 mm., width in the middle 10 mm. Length of pupa 12–13 mm., width of 3d abdominal segment, where the pupa is widest, 4.0–4.5 mm.

First imagines of these broods appeared July 6th, the majority from July 9th to July 12th.

The plain color and design of *Platyscuta videns* precludes marked variation. The large material obtained by breeding shows fairly the range of variation. The moths from wintering pupæ expand 27–32.5 mm.; those of the early summer brood 25–33 mm. The summer form is throughout of a decidedly darker ground color of primaries than the preceding one, even the fringe being often uniformly blackish. The secondaries, which in the fall brood are in some cases even plain whitish, show a tendency to form a more or less broad, sooty, marginal band, sometimes shading beyond the middle. This tendency to melanism in one brood is caused apparently by the favorable temperature and the excellent physiological condition of the food-plant, which combined produce more vigorous individuals than in the brood growing up in the fall, exposed to a waning food-plant and frequently to the vicissitudes of the weather.

DESCRIPTIONS OF SOME PYRALID LARVÆ FROM SOUTHERN FLORIDA.

By Harrison G. Dyar.

Margaronia bivitralis *Guen.**

Larva. Head rounded, whitish green, ocelli black. Body slender, uniform, segments 2-annulate, setæ moderate. Transparent, the blood green, food dark green.

* I learn from Prof. C. H. Fernald that the synonymy as given in the Smith list and by Hampson is erroneous and that this species should be called *Glyphodes sibillalis* Walk. = *batesi* Feld = *alitalis* Hulst (nec. *bivitralis* Guen.).

Tubercles large colorless, obscure, normal; iv and v united. A black dot before tubercle iib on joint 3, sometimes a smaller one on joint 4 and one behind tubercle iii on joint 12. Head with faint red reticulations; width 1.7 mm.

Food-plant: Mulberry (*Morus rubra*), solitary in a web on the back of a leaf folding over parts of the leaf.

Margaronia infimalis *Guen.*

Larva. Head pale green, clypeus high. Body rather short and thick, cylindrical, tapering at the ends. Leaf green with a subdorsal white line; spiracles small, whitish; setæ short.

Food-plant: Melothria grendula, solitary, webbing up a leaf.

Sylepta gordialis *Guen.*

Larva. Head rounded, full, the antennæ long, whitish, reticulate with faint brown dots in patches each side of the suture, over the lobes centrally and behind the eyes; ocelli black, mouth brown; width 1.6 mm. Body a little flat, the cervical shield invisible, not colored except for a blackish pulverulent line at the edge. Body shining, pale green, translucent, food showing dark green. Tubercles colorless, a black half ring below ii on joint 3 and a fainter one below iii on joint 12. No marks, tracheal line white. Anal plate invisible. Setæ short, white. Tubercles iv and v united; on thorax i, ii and iv + v with black dots, on joint 4 iib only so marked; tubercle iii the whole length sometimes with a small dot and one also at ii on 12.

Food-plant: Pisonia aculeata; also on the cultivated *Bougainvillia*, to which it is often rather injurious, webbing up the leaves and partly defoliating the plants.

Sylepta anormalis *Guen.*

Larva. Head green with brown jaws and black ocelli; width about 2 mm. Body rather thick, the segments irregularly 2-annulate, well incised; not very translucent, shining uniform green, tracheæ faintly white; spiracles a little yellowish; a black dot on joint 3 anteriorly laterally. Tubercles transparent, concolorous, iv and v united, vii of three setæ. Legs slender, bulbous at tip, the row of crochets broken on the outside. Sometimes the apices of head lobes a little reddish.

Food-plant: Morning glory (*Ipomoea* spp.), at first a leaf-stitcher, later curving the leaf from the top side and spinning a tent over the surface.

Dichogama amabilis *Möschl.*

Larva. Head rounded, broad, the apex under joint 2; clypeus high, the paraclypeal pieces reaching vertex; antennæ rather long; whitish with large angular olivaceous blotchy mottlings and tiny black dots, the tubercles black ringed; sutures of clypeus black; two upper ocelli with large black central pigment spots; setæ long, fine white; width 3.4 mm. Body thick, a little flattened, narrowing somewhat pos-

teriorly; cervical shield large, weak, translucent whitish, more translucent centrally and anteriorly, the whitish parts black dotted and a marginal black line. Body whitish, the food giving a green tint. A double yellow dorsal line enclosing the greenish dorsal vessel; a single substigmatal line on joints 3 to 13 anteriorly, wavy edged and a little broken; sides a little whitened, with a broken white lateral line above tubercle iii, obscurely dusky edged above. Tubercles i to iii white, hair tubercles black with a distant white ring, absent on iii which therefore looks smaller; iv + v obscurely white ringed and vi also on the apodal segments. Anal flap greenish marbled with white. Spiracles light red, that of joint 5 lower than the rest. feet short, pale.

Food-plant: Capparis jamaicensis: living between leaves firmly spun together.

Dichogama bergii *Möschl.*

Larva. Head round, apex below joint two, clypeus high, reaching cervical shield in the ordinary position of retraction, whitish with scattered patches of dark brown; width 1.7 mm. Body pale red, scarcely marked; cervical shield transparent, faintly spotted; subdorsal (above i), lateral (between ii and iii) and stigmatal lines distinct, whitish, reaching joints 3 to 13; dorsal vessel reddish; spaces between dorsal and lateral lines and between lateral and stigmatal filled in with black; brownish mottlings on subventral fold, subventer colorless. Body a little flattened; setæ long and pale.

Food-plant: Capparis cynophallophora; living among leaves firmly spun together.

Epicorsia mellinalis *Hübn.*

Larva. Head orange, antennæ whitish, jaws, eyes and ends of antennæ black; setæ rather long, pale. Body tapering somewhat posteriorly; semitransparent shining dull greenish, subdorsal and stigmatal lines yellow orange. Cervical shield nearly white with many irregular black spots. Tubercles black, edged with white, white centrally but the hair tubercle again black; a single dorsal spot in front of the anal plate which is colored like the cervical shield. Thoracic feet black.

Food-plant: Citharexylum villosum; curling a leaf and spinning a web over the top.

Terastia meticulosalis *Guen.*

Larva. Head rounded, paraclypeal pieces reaching vertex; blackish brown, sutures and sides black, labrum pale; width 1.9 mm. Cervical shield moderate, brown, bisected; anal plate large, pale brown. Body large, robust, pale luteous, faintly coarsely mottled with reddish leaving obscure broken pale addorsal, subdorsal, stigmatal and traces of subventral lines; dorsal vessel darker. Skin not shining; minutely granular; segments 2-annulate. Tubercles large, luteous; il arger than ii, iii large, iiia before and above spiracle, iv and v united, one above the other. Spiracle of joint 12 more dorsally placed than the others.

Food-plant: Erythrina herbacea. The larva is an internal feeder,

boring in the younger stems which it completely hollows out, killing them. When the plant is in early flower, the young flower heads are often killed and webbed up into a foul mass by this larva. Spins a large webby cocoon on the ground.

Agathodes designalis *Guen.*

Larva. Head round, clypeus high; brownish orange, bases of antennæ and epistoma white, ocelli and ends of antennæ black; width 1.7 mm. Body normal, tubercles ia + ib, iia + iib and iv + v on thorax, iv + v on abdomen, as in all the Pyralids here described. Sordid greenish dorsally, more ocherous laterally; tubercles large, jet black, polished. A pale yellow subdorsal line on joints 3 to 12 broken in the incisures. Cervical shield transparent, densely black spotted; anal flap sparsely spotted. Thoracic feet black, abdominal ones with hair tubercles of vii only black.

Food-plant: Erythrina herbacea, making a web among the flowers. Bores a hole in soft wood to pupate.

Desmia tages *Cram.*

Larva. Head rather long, shining yellowish luteous, shading to bright red brown on the apices of the lobes; paraclypeal pieces reaching vertex but narrow and obscure; clypeus moderate; four upper ocelli large and black, almost contiguous; width 1.5 mm. Body transparent, black from the food showing; cervical shield nearly black, bisected by a pale line. Tubercles large, sordid blackish at the extremities, colorless centrally. Tracheæ and excretory tubules white; spiracles rimmed with pale testaceous; setæ long, pale. Tubercles iv and v united, nearly in line, iv a trace dorsad.

Food-plant: Psychotria undata. The larva is a leaf roller, rolling up the leaf in spiral to several turns, fastened with stitches on the outside in the manner of a Tortricid. When large, several leaves are involved.

Lineodes integra *Zell.*

Larva. Head with vertex under joint 2, clypeus moderate; translucent greenish tinged with brown, shining; width 1.2 mm. Cervical shield transparent with a black fleck on either side before the edge. Body somewhat robust and hunched up, rounded a little at the ends, not tapering; segments scarcely annulate. Translucent whitish green, dorsal vessel blackish green. Tubercles rather large, elevated but quite transparent; iv + v. Spiracles all colorless; feet colorless, the tips of thoracic ones dark. Setæ short.

Food-plant: Solanum radula, also on the cultivated *S. jasminifolium*, to which it was more injurious than to the wild plant. Webs the leaves, biting them off and resting in the withered foliage.

Lineodes triangulalis *Möschl.*

Larva. Head with the vertex slightly under joint 2, clypeus high; green, red-

dish reticulate over the apices and the lobes, mouth brown; ocelli, a spot behind and the posterior rim of the lobes black; width 1.1 mm. Body shaped as in *L. integra* and colored much the same, but the tubercles, and especially iii, are shaded with black, and the excretory tubules show very distinctly white as long finely waved lines in a recurved loop reaching forward from joint 10 to 8 on each side. Tubercles slightly elevated, iv + v. Segments shining, obscurely 2-annulate.

Food-plant: Capsicum frutescens; the habits as in *L. integra*.

Thyridopyralis, gen. nov.

Median nervure non-pectinate, proboscis absent, veins 7 and 8 of hind wings strongly anastomosing. Palpi porrect, uniformly scaled, projecting about the length of the head in front; maxillary palpi distinct, slender, dilated with scales at the end. Antennæ short, simple, thickened toward base and scaled above. Legs moderate, the hind tibiæ with four spurs. Fore wing with a long branch from the basal loop of vein 1; 1c absent; median 4-branched, veins 2 to 4 equally spaced, 5 very close to 4; cell weakly closed; a small accessory cell; vein 6 from the middle of the accessory cell; 7 and 8 stalked from the end of the accessory cell, 9 absent; 10 from the end of the accessory cell; 11 from the cell, free; 12 from base. Hind wings with two internal veins, 1c absent, scarcely with even a rudiment toward base; median vein as on fore wings; cell closed, the upper part obliquely retracted; veins 6 and 7 stalked, the upper vein of the cell weak; 8 strong, free from base, broadly anastomosing with 7 beyond the cell; ♂ frenulum a long spine.

T. gallærandialis, sp. nov.

Head ashen, palpi, front and basal antennal tuft purple brown; thorax purple brown, tips of patagia and end of thorax pale sordid ashen. Abdominal segments broadly ringed with black at base. Fore wing whitish, sordid tinted except in the disk; a large subbasal quadrate purplish black patch resting on the costa and continued not quite to inner margin, joined to the narrow dark costal edge; a rounded elliptical patch in the disk, oblique, lying between vein 1 and the subcostal and centered nearly by the origin of vein 2, reddish purple, relieved by a patch of orange scales toward costa and toward inner margin and a little tuft of raised metallic scales toward base. A small cluster of purple scales on accessory cell. Subterminal line finely crenulate, gently incurved on the lower third, linear, purple brown, but preceded by a broad purple brown shaded band which is pulverulent and obscure on the upper half, distinct below, diffuse inwardly. Three purple brown patches on the margin, the costal one faint and powdery, those at centre of margin and at anal angle distinct. A terminal row of blackish dots, often obsolete. Fringe pale, interlined with dark opposite the dark spots and black tipped. Hind wing sordid white, a terminal shaded black band, broad at apex; sometimes an outer wavy diffuse band. In one ♀ nearly the whole wing is suffused with brown. Expanse, 27 to 29 mm.

Six specimens, Key West, Florida (E. A. Schwarz), Palm Beach, Florida. U. S. Nat. Museum, type no. 5418.

Prof. Fernald examined a specimen of this interesting moth and said: "Not a micro.; I do not know where it should be placed."

It certainly contradicts the characters of the Pyralidæ, where it would naturally be placed, and falls in the Thyrididæ by Hampson's tables. There is, however, no Thyrid with such a highly specialized venation as this moth, which, therefore, seems an offshoot of the Pyralidæ.

The larvæ are gall makers in the old stems of *Randia aculeata*. The gall is a thick swelling in the hard wood about twice the thickness of the normal stem; fusiform with normal bark and no visible opening. There is, however, a tiny apical opening from which the larva ejects the frass and at once closes with silk. The interior of the gall is a tube of the diameter of the larva, about 25 mm. long, moist, without frass, only a little pulverized pithy wood in the bottom. The galls occur in pairs, adjoining. At maturing the larva eats a hole large enough for the exit of the moth and closes it with web. Pupation within, the pupa practically filling the cavity. Old galls remain on the tree and do not kill the branch.

Head very full and rounded, clypeus not reaching above the middle of the front, not depressed nor elevated; head not bilobed, all the sutures level with the surface. Higher than wide; antennæ moderate; ocelli small; dark brown, the sutures paler; width about 1.5 mm. Body cylindrical, nearly uniform, segments somewhat folded and creased, subventral fold distinct but not prominent. Uniformly light brown, a little darker at the ends. Tubercles corneous, shining brown, mostly without setæ, though there are a few near the head and subventrally. Tubercles small, irregularly shaped; iv and v united, vi present, vii without much cornification. On thorax iv + v normal, ia and ib approximate, iia + iib. Spiracles flesh colored with dark rims. Feet normal, short; abdominal ones with complete circle of crochets around the flat planta and small central dark spot. Skin finely granular, rather opaque. Tubercles shining, iv and v somewhat remote, iv the higher, but both on a common shield. Actual hair tubercles darker than the tubercle shields. Leg shields scarcely cornified. The chin gland consists of two large, remote papillæ, wider apart than the thoracic feet.

The larvæ must feed mainly upon the sap, as they consume hardly more of the interior of the gall than will suffice to give space for their bodies.

AN APPARENTLY NEW TORTRICID FROM FLORIDA.

By HARRISON G. DYAR.

Lophoderus amatana, sp. nov.

Dark cinnamon brown, the thorax tufted with purple brown posteriorly. Fore wings with three oblique shaded purplish brown bands, the first covering the basal

third of the inner margin, reaching only half way to costa; median band crossing wing from basal third of costa to outer third of inner margin, even, somewhat diffused; outer band forming a triangle on costa. Terminal space silky whitish, mixed with purplish, broad above, arcuately narrowed below; fringe dark above, pale at anal angle. Between basal and middle bands, extending half way across wing, a light reddish space, edged or partly replaced by silky whitish, indented above its center by a small, dark tooth projecting from the band on either side of it.

Hind wing light reddish, shaded with smoky black on the apical fringe. Expanse, ♂ 13 mm., ♀ 18 to 19 mm.

Three specimens bred from *Anona laurifolia* and *Nectandra wildenoviana*, Palm Beach, Florida. U. S. Nat. Museum, type, no. 5417.

We sent a specimen to Prof. C. H. Fernald, the well-known authority on North American Tortricidæ, who labelled it "Lophoderus allied to and perhaps identical with the variable *triferana* Walk." The specimens, however, seem so constant and distinct from *triferana* that we venture to describe it.

The larva spins up the leaves with a series of transverse walls of web with a round hole in each near the leaf for the larva to pass through. Slightly shining, green, without marks, the tubercles slightly elevated, normal, concolorous.

NOTE ON THE LARVA OF ARCTIA INTERMEDIA.

BY HARRISON G. DYAR.

This note is supplementary to the remarks on page 89, vol. VIII, of this JOURNAL.

Larva. Head black, epistoma white, a broad quadrate pale space over the median suture and apex of clypeus; width 3 mm. Body black, shading to dull gray subventrally and ventrally. Feet brownish red. A faint, narrow, whitish, dorsal line, distinct on joints 2 to 4. Warts i and ii black, i over half the size of ii, ii with a broad shining base; iii pale yellow, iv orange tinted, v and vi red-brown; all with black hair tubercles. On thorax all the warts pale; cervical shield represented by four warts in two rows. Warts of joint 13 also all pale, the large subdorsal one colored like wart iii. Hair bristly, black dorsally, red-brown on joints 2 to 4 and subventrally (warts iv to vi) on joints 2 to 12. Spiracles pale orange, black rimmed. Both warts i and ii, especially anteriorly are partly pale yellow under the lens, but the base of ii is shining blue-black. Anal flap dark with small pale warts. On joints 3 and 4 there are two warts above the stigmatal wart, ia + ib the larger; iib not seen, but iii a distinct, though small, many-haired wart.

The larva was found May 27 in grass at Washington, D. C. It was nearly full grown and spun in June. The moth emerged September 11th, the same season.

NOTES ON THE HABITS OF THECLA DAMON

By E. DAECKE.

Ascending the mountainous elevation ordinarily called the Orange Mountains a little distance above Montclair about the first part of May, we find quite a different flora from that of the valley. Arriving at the top we find plateau-like stretches sparsely covered with cedar bushes. The fresh verdure of the grass is here and there interrupted by large patches of rose-colored mountain pink. Columbine with its beautiful bell-shaped drooping flowers ornament bare rocks and moss-covered ledges. Dense patches of bluets and mountain cress (*Sisymbrium* and *Arabis*), here and there a little bunch of violets, the little creeping potentilla and the omnipresent *Leontodon taraxacum* scattered throughout the soft and flowery carpet to complete the picture which is one of the homes and haunts of *Thecla damon*.

This little *Thecla* is one of the best judges of fine scenery. The red cedar which is the food-plant of *Thecla damon* is common on many places in the Oranges, but *Thecla damon* will not be found wherever cedar abounds. I searched the Orange Mountains for miles and came across many groves of cedar but found *Thecla damon* only on one spot and I dare say the prettiest and most picturesque spot of the whole mountain range.

When I took this insect first I found it very difficult to capture. It would skip swiftly from flower to flower, and as soon as it found itself persecuted it would suddenly drop with folded wings into the grass, the green underside of its wings being a perfect protection from being discovered. Another time I visited this spot in search of *Thecla damon*. I failed to find a single specimen. It was the right season, a beautiful day and early in the afternoon. So I began to inspect the cedar bushes and found that this insect was hovering quite in abundance about the cedar tops, but out of reach of my net. In order to locate them I knocked against the cedar trees to scare them up, but only secured three or four specimens that day. Another time I came better prepared. I had a 4-feet extension to my net, but there

was no need for it that day, as they were skipping about quite low, partly on cedar, partly on potentilla and mountain cress. Another time I went there and found this little *Thecla* at his old tricks, eluding my net by dropping into the grass.

This habit, however, seems to be common with various *Thecla*. I noticed it especially on *Thecla niphon*, *titus*, *irus* and *augustus* all of which I took specimens on the same place. The only difference being that the latter *Thecla*, having brownish undersides, would select bare ground, rocks or dry twigs to drop thereon, and if not very carefully watched their whereabouts would be quite problematic to the pursuer.

CICINDELIDÆ OF MT. DESERT, MAINE.

By Edw. Doubleday Harris.

A persistent search for Cicindelidæ in the Island of Mt. Desert, on the coast of Maine, was undertaken by the writer in August (8–28) of the past season. The field covered was that portion of the island south of a line drawn from Newport Mt. on the east coast to Seal Cove on the west. But four species were found, *longilabris*, *purpurea limbalis* Klug, *vulgaris*, and a variety of *repanda*. The ground is not favorable for the preservation of the genus. Sea beaches are infrequent and contracted, and generally of a pebbly material, the coast being almost universally rocky, and often of precipitous cliffs. There are but few sand deposits in this part of the island, and the banks of the streams and ponds are heavily wooded.

Longilabris occurs nowhere plentifully, distributed along the roads, generally through woods, but where there is an abundance of sunlight. In a day's outing, it was possible to take from five to eight specimens. Out of fifty, taken during the period, there was but little departure from the type, either in color or markings. Perhaps ten per ct. were of a slightly brownish hue; three or four specimens had abnormally large humeral and apical spots, and in as many all markings were somewhat obscure. The species, as here observed, has a higher and longer flight than is usual with the genus, a distance of fifty to seventy feet being not uncommon. Its large size and dark color render pursuit easy. It is not wary, and once located on the ground can be readily taken with the net.

Purpurea var. *limbalis* Klug, was the common species. It occurred on sunny roads, often in considerable numbers. A field near Bass Harbor, on both sides of the road, sparsely covered with grass, was over-run with them. The markings were quite constant and close to type, but the color varied considerably, with decided inclination towards the duller green tones; specimens of the brilliant reddish hue, so common in the West, were absent. *Purpurea* itself was not seen.

The *repanda* variety was interesting. It was quite sparsely distributed over the open roads, occurring generally with *limbalis*. In one single locality, a bit of hard, bare ground at the edge of a small pond in the woods, it was taken repeatedly, and in some abundance. In size, color and markings it resembles the var. *duodecimguttata*, except that the middle band is somewhat more plainly marked. Save for its slightly larger size and darker tone of color it is hardly distinguishable from specimens taken by the writer on similar ground at Mt. Savage in western Maryland, in June, or from specimens in his cabinet from California, designated "*oregona*." Some fifty individuals of the variety in question were secured at Mt. Desert, and in all the same characteristics prevailed. *Repanda*, for some unaccountable reason, was not encountered, except in one single instance.

Vulgaris was very abundant in a single sandy spot in the woods. Many of the specimens were noticeable for the attenuated and prolonged humeral lunule, approaching var. *obliquata*.

Special search was made in the hope of taking *sexguttata*, *ancocisconensis* and *hentzii*. The summits of several high hills, and that of Pemetic Mt., where large exposed surfaces of granitic rock are frequent, were searched for the two last, but fruitlessly. The genus, so far as observed, seemed altogether absent from the higher localities, as well as from the sea coast. Shady wood paths, where *sexguttata* and its varieties love to dwell, yielded nothing though carefully searched. Even ubiquitous *punctulata* was altogether absent.

NOTES ON SOME DIGGER BEES.—I.

BY JOHN B. SMITH, SC.D.

One of the most interesting collecting regions that I have ever found is in the New Jersey Pines. At first sight there is nothing very attractive about them—mostly sand, covered by oak scrub or briars, fields or opens of Indian grass, stunted pines, then a swamp more or less cedar covered, from which runs a little stream through a lowland which is very apt to be in cranberries. The impression gained from the car windows riding to Atlantic City, Cape May or other shore resorts, from New York or Philadelphia, is of dreary desolation, intense heat in summer, flocks of mosquitoes and general hopelessness. Yet this impression is utterly erroneous. There is more difference in level than first appears and, while there are no high hills, there is fall enough for rapid streams affording water power for numerous mills—many of them now dropping to pieces and disused. There are really many very pretty bits of quiet landscape and here and there a large pond courteously dubbed a "lake" affords fishing and even rowing. Lakewood and Browns Mills are Pine resorts not unknown to the fashionable world, but they are by no means the best points in the region. To the naturalist this area is of never-failing interest. The flora which at first seems so uniform is really very rich and varied; while as to insects the records in my Catalogue of the species found in New Jersey will indicate something of the faunal wealth.

Years ago I became acquainted with Mr. J. Turner Brakeley, of Bordentown, N. J., who spends each season, a large portion of his time in the pines, in Ocean County. There are cranberry bogs there and in the course of my studies on the insects injuring this crop I spent some time at Lahaway, as Mr. Brakeley's place is called. This is well in the pines, several miles from any railroad, and two miles or more from the nearest group of houses dignified by the name of village—Prospertown, in which nobody prospers.

Mr. Brakeley knows the pines and their inhabitants; knows much of botany and something of entomology; but better than all, he has the faculty of close observation. Almost every year for a long time past I have managed to spend a few days with him, alone with nature—he keeps bachelor's hall—and on our tramps we frequently discussed

the numerous indications of underground life. This particular locality is peculiarly adapted to the requirements of burrowing insects and every road, every opening in the woods and almost every sand field showed little heaps of sand; here, there and everywhere. There is first of all from six to eighteen inches of light drift sand, dry as can be in summer and light enough to blow away on the surface; but moist a few inches down and very compact. Below this comes an admixture of fine clay, often colored by iron to a rusty red, and below this there is usually a layer of gravel or sand or both. Strata follow each other in this way eight feet down and more, on the level, none of them more than a foot or two thick and all easy digging except in the gravel which is sometimes very hard and mixed with iron stone. Bees, wasps, spiders and ants we saw disappearing into holes in the ground and there ended our knowledge of them. Of course I wished to know more and talked learnedly of what little the books said on the subject. Mr. Brakeley listened patiently and finally proposed to get plaster casts of the burrows as the easiest way of finding out the truth. When I proved skeptical as to the feasibility of the plan he tried it quietly after I left and succeeded. He is, therefore, entitled to full credit for the method by which the information, here given, was obtained. After many trials he found that a good quality of plaster was essential to the best results, and I obtained dental plaster for the purpose. This was mixed measure for measure with water, *i. e.*, one ounce measure of plaster was dumped into one ounce measure of water, the mixture was rapidly stirred and poured while perfectly liquid into the surface opening of the burrow to be investigated. The water drained rapidly into the moist soil and the cast set rapidly, some holes taking as much as eight ounces of liquid plaster. This was comparatively easy; the wearisome task was digging out these casts which went down way beyond the limits I had supposed possible. The first work was done on burrows made by spiders, which were large and easily filled; but in 1898 almost the entire summer was put into work with bees.

Colletes compacta *Cress.*

The determination of this species, which is one of the earliest of its tribe, I owe to Mr. Wm. J. Fox. It is on the wing early in March and its burrows were first noted by Mr. Brakeley on March 12th. At that time groups of from 10 to 20 little mounds of yellow sand were

noticed, indicating a depth of from six to twelve inches. From appearance some of these mounds had been there from 2 to 4 days. They were about 1½ inches in diameter and half an inch high, with a central opening less than one quarter of an inch in diameter. On the 13th over 200 were seen on the same area and on March 15th the ground was dotted with mounds everywhere in groups of from 5 to 15 or more. On this date one of the burrows was followed down to 18 inches without finding the end and several of the bees were taken making determination possible. Plaster casting was now begun and the casts obtained ran from 10 to 17 inches in length, a little twisted or bent near the surface, then dropping down almost vertically. Some burrows, however, were absolutely vertical from the top to the bottom.

March 17th, at a distance of 20 inches from the surface, one cast showed a lateral, set off at an obtuse angle downward from the main gallery.

March 20th a parchment-like cell was found at the end of a lateral. This cell was about three-fifths of an inch in length, less than one quarter of an inch in diameter, a trifle dilated centrally, though this may have been due to removal from soil, was rounded at the outer or lower closed end and squarely truncate at the upper or open end. In texture it was close and very thin, transparent, not very tough, yet scarcely to be called brittle. It was evidently not intended to be resistant, but to keep clean the pasty mass with which it was to be filled.

March 27th to 31st, bees were engaged in filling these food sacs and on April 1st the first completed brood cell with egg in place and finally sealed was found. Of the casts secured up to this time the longest was 27 inches, the range for the beginning of the lateral being from 20 to 27 inches. The laterals themselves varied from 2 to 4 inches, an extreme of 6 inches being observed in rare instances. Cells not sealed were filled with plaster when cast, the membraneous covering forming a shining surface at the end. When sealed the closed cell hung loosely to the end of the cast.

The food stored in the brood cells is a pasty mixture of honey and pollen, but where the insects secured the material at that season was not ascertained. The cell is less than half filled with food and the egg, which is quite large and crescent-shaped, is attached at one side by one end and so curved that the opposite tip rests on the surface of the food mass. The entire insect is less than 11 mm. in length, of

which the female abdomen is rather more than 5 mm. The egg slightly exceeds 3 mm. in length.

The interval from the beginning of the burrow to the time when the first egg is laid seems, therefore, to be from 18 to 20 days, of which 5 were rainy. Three of the 5 bad days came while the insects were storing food and probably delayed the completion of the work. When the cell is filled and an egg is laid the upper end is closed by a flat disc of the same parchment-like material as that constituting the rest of the cell and set in a little inside the ragged upper edge. When completed one of these cells is not unlike in appearance to a short 32 cartridge, and Mr. Brakeley and myself fell into the habit of referring to them as "cartridges" loaded or empty, as they were or were not filled with food. The material of which the pouch is composed is probably altogether salivary. There is no fibrous structure apparent and no mixture of extraneous materials. In casting these burrows the plaster ran to the disc closing the cell, adhered to it and to the slightly projecting rim, so we obtained the perfect cell whenever there was one in place.

The early days of April were unpleasant, rain and snow closing out insect work and leveling the surface so that the location of burrows was not readily visible. However, on the 7th, two casts made showed one loaded and one empty cartridge.

Field work was discontinued until April 22d and now for the first time we ran against a burrow that seemed to have been filled up. It was assumed that this was due to accident, and no further examination was made. It became probable, in the light of later developments, that this was really a completed burrow in which the bee had made all the brood cells that were considered desirable and which had then filled up normally to the top.

April 23d, a number of holes were filled with plaster in a locality marked in March, and these required an unexpectedly small amount of plaster. When the casts were dug out they were unusually short, and some of them had a heel of variable length below the lateral, as if the bee had decided to continue its perpendicular. This was what we expected would happen from published accounts, hence it attracted no special attention. Continuing to dig, however, a second, loaded cartridge, was found below, though not in line with the first, and the burrow leading to it had become filled with sand, which, from its color, had evidently been derived from an upper level. This led to

further investigations, and from a large number of casts and excavations it was found, by April 30th, that the burrows made in March and early April were gradually filling up, and that the heel of the cast below a lateral, indicated the existence of a loaded cell or cells at lower levels. A reëxamination of the casts showed a heel present as early as April 4th. As it happened, a cast had been made on that day which for some reason was not at once taken up. Dug out on the 24th, a heel was found and below it a loaded cell.

April 23d, one cell was found in which the larva had apparently just hatched, but no others of this character were discovered—all were yet in the egg stage. This larva retained the position of the egg for a long time, the mouth parts just touching the surface of the food mass. Many of these cells taken up in the last days of April were undoubtedly placed in the earliest burrows, hence the egg stage is an unusually long one.

By May 1st Mr. Brakeley felt himself justified in writing as follows: "But several facts I have absolutely settled. She digs a very crooked tube, depending on the soil status; but generally starts in on a crook. She first burrows to the full depth to which she is going, begins to pouch at the bottom and the first egg is laid at the bottom. Then she goes upward to start the second pouch. * * * Varies from three to five pouches and then starts again in a new place." Except that we never found more than four pouches connected with any one burrow, all these conclusions were verified by later experience. Of the cartridges secured at this time a number were placed in vials in the hope of securing larvæ and later stages; but in no case did I succeed in getting any beyond the larval stage.

May 13–16th I spent at Lahaway and, although I dug out quite a number of cartridges, all loaded, I found none in which the larvæ had hatched. Nor did I find any new diggings at this time; the *Colletes* period was evidently over for that year, the females had done their work and the brood for the next year was provided for.

Mr. Brakeley's observations as to the rate of digging is that they go down about 5 inches a day. This is easily ascertainable because of the stratification of the sand and clay previously noted. The character of the fresh soil at the surface from each burrow, tells almost exactly how far down the specimen is, when once one is familiar with the sequence of the layers.

June 4th and 5th were again spent at Lahaway, and on this date no

adult bees were observed. They were not found about flowers, in the woods, on the sand fields or in the burrows. They seemed to have disappeared completely and places where they were abundant in March and April showed, as the only signs of their former presence, nothing but discolored patches showing where a mound had been located: the discoloration being due to the clay that had been brought up from lower levels by the bees.

On this point I may say that in my collection I have specimens dated June 1st, taken at Lahaway in previous years, and it may be that in some seasons they fly later than others. All these late examples are males. Of the specimens sent me by Mr. Brakeley in 1898, more than half were males and all were taken late in March or early April going into or coming out of a burrow. It seems, therefore, as if the males sought out the females in their own homes and the females may begin to dig even before they have been impregnated. It seems probable too that the males may live for some time, after no more females are to be found. But on this point it needs continuous observation and collection from the first appearance of the species until no more examples are to be seen.

Starting from a group of the discolored patches already mentioned, and digging a trench two feet deep as a starting point the old burrow may be traced down by the difference in color of the sand; so that first the laterals and afterward the cartridges could be found. In no case did I find more than three cartridges in connection with a single tube: usually there are only two and not infrequently a single one only was found. As to direction from the vertical burrow, the insect rarely places one cell directly above another. In one cast that I dug out a cartridge was found nearly six inches from the main tube in one direction and a second was found almost as far away from the tube in the other. That is, there was a distance of fully ten inches between the two cells, and, in this case, not much difference in level.

From the diggings now made, in one case reaching 28 inches, and from the casts already in hand the habit of the species could be clearly made out. Perhaps it may be as well to say that digging for loaded bee cartridges even where they should be abundant is not so easy a task. As the net result of three hours' digging on one day Mr. Brakeley secured only one filled cell! Of course on other days he did better, but there are a number of probable seekers after this honey store so that, the later in the season it gets, the fewer loaded cells can

be found. In one case a lot of red ants were found robbing the store and where ants are as plentiful as they are at Lahaway, no doubt they are responsible for the disappearance of many bee cells.

It seems certain that *Colletes compacta* digs down from the first to the extreme depth of the burrow; it runs off then, to one side, from two to four or rarely six inches, makes and fills a cell and lays an egg in it. Two or three inches higher another lateral is started, running in a different direction, and the sand taken from this lateral is dropped into the main tube whence it washes into the first lateral so that when the second is completed, the first is pretty well filled up. The second lateral is filled with material from the third if a third is run and, finally, the entire tube is filled; whether gradually by a sifting in of sand from the top, or intentionally by the insect, I cannot say. It is certain, at all events, that the burrows do not remain open and that the young bees that hatch two feet more or less below the surface, must dig up through the soil to that point. Whether they follow the line of the parent burrow in doing this, or whether they work out on lines of their own, is not yet known. One finds in digging about after the new cartridges, old ones that are filled with sand and black with decay. Evidently its old larval home serves the new bee by providing a first space to store the sand removed in getting out. Unless the mother bee lays not over three eggs, she must make two or more diggings.

July 1st, spent part of the morning in digging for more cartridges and as the net result found four in which were larvæ so far developed that they came near to filling the entire cell. Nearly all the food store had been devoured and growth must have been nearly completed. Expecting to secure other examples these larvæ were put into alcohol, but no other specimens were found in spite of all digging. Nor could I secure any others later in the season. The date of pupation is thus left undetermined, and it is also uncertain whether or not the insects reach the adult stage in the fall and winter in the ground, or whether they winter as pupæ and change to adults very early in spring. I would be inclined to believe that the change takes place in fall, because so early as these insects appear, the soil does not feel spring warmth sufficient to induce much active cell development, while it is probably enough to induce an already mature individual to start for the surface.

To recapitulate: *Colletes compacta* makes its appearance—both sexes—prior to March 12th and the females begin at once to dig bur-

rows which extend from 18 to 28 inches down. Males may be taken about these burrows, as well as females. Late in March cells are formed and stored with pollen and honey in the form of a pasty mixture filling less than half the cell. Eggs may be first noted at the beginning of April and none hatch before the end of that month—the majority not until the middle of May or later. At least a month may be counted for this stage. Larvæ are nearly full grown July 1st and probably ready to pupate by the middle of that month; which gives a growing period of from six to eight weeks. Beyond this all positive knowledge ends. Adult males have been taken up to June 1st; females have not been observed after the beginning of May. The bee begins making cells from the bottom of the burrow and works up, never making more than four and rarely more than two cell-bearing laterals from one upright. How many such burrows an individual female may make, is yet indetermined; certainly more than one unless most of the eggs in the ovaries were intended to remain undeveloped.

On this point I examined a number of examples that came in early in the season; I found only a small number of ova indicated; but there are four ovarian tubes on each side, with at least two developing eggs in each tube. There is a third egg cell in each tube, but at the slow rate in which these individual eggs can be placed it is not likely that more than sixteen, perhaps not more than eight ova ever come to maturity. From the specimens examined it appears as if a single egg only developed at one time; at any rate it is certain that there always was only one large egg in one of the tubes, while all the rest were very much smaller. It is probable that the scattering of brood cells is a measure of protection as is also the filling up of the burrows. The honey paste must be tempting to many insects, especially ants, and if six or eight or more cells were grouped around each burrow, the discovery of one series by an ant hill would mean the rifling of every cell in it and the consequent destruction of the entire progeny of a single bee at one time. So the filling up of the burrow makes the discovery of the cells more difficult, the one first planted being protected by the time the lateral for the second is completed.

In the course of the observations on *Colletes* which began earlier than any other form was seen to be on the wing, a few other species were noted incidentally and a few plaster casts of their borings were made. None were followed out as was the *Colletes*, but as the results are additions, though small, to positive knowledge, it is deemed not unnecessary to record them here.

Andrena vicina *Smith.*

Specimens of this species were collected about flowers early in May and examples came to hand from time to time during that month. May 28th the insects were noticed at work and plaster casts were made on that and next day, May 29th. In the first cast there was only a perpendicular less than a foot in length, without lateral, indicating that the specimen had but recently begun digging operations. In the second there was an empty cell 14 inches below the surface and no filled cartridge could be found lower down. It was evidently the first lateral from the burrow. Another cast was deeper and very crooked, but was no further advanced. Here also there was no appearance of a loaded cartridge below the lateral.

May 31st received five specimens of bees, all females, taken two days before. The ovaries were examined in each case and were found to be undeveloped. They were yet covered or encased in one common sheath and none of the tubes showed either developing or missing ova.

June 4th a number of burrows made by this species were cast. They proved to be very much like *Colletes* in type, but somewhat larger in diameter and decidedly more twisted. They go down a little deeper, also, on the average. *A. vicina* is really a much larger and more bulky insect than *C. compacta*, yet the diameter of the burrow is very little greater.

The cell-making habit seems to be like that of *compacta*; there is the same membranous pouch, filled with the same honey paste, less than half full, with the same sort of egg. What was not noted was whether there were more cells than one from a single main burrow. This species made its burrows on higher ground, more among trees where the soil is filled with roots. This makes their borings more irregular and adds to the difficulty of digging them out.

I have the species from Newark, Jamesburg and somewhere in Burlington County, dated May and June. The Newark locality is indefinite, the specimen was given me and I have no information as to the kind of locality inhabited there. The other specimens were taken by myself in locations generally similar to that at Lahaway.

Andrena viola *Robt.*

This is a small species resembling *C. compacta* and at first mistaken for it. It was first seen coming out of a hole May 28th and

captured. Plaster cast made of the burrow showed a perpendicular drop of over 15 inches without indication of any lateral. Another, similar burrow, was cast on the same day and the bee inclosed in the plaster. This was shorter than the other, but had a lateral in which was a filled honey pouch, and a heel which indicated a cartridge below. The cartridge was accordingly sought for and found. The conclusion is a fair one that the bee first caught was not digging its first burrow. If my belief that most of these bees change to adults in fall is correct, there should not be much difference in the date at which they issue and begin to dig.

This species was determined for me by Mr. Ashmead and I have specimens from various parts of the State taken May and June, most of them on the latter month pollen-loaded. Unfortunately the day of the month is not indicated, hence cannot say how late in June the species flies.

Andrena bicolor *Fabr.*

This is nearer to *vicina* in size but readily distinguishable by the rusty thoracic vestiture which made it easy to recognize the bee in the cast. The bee was first seen June 7th, entering a hole larger than usual, and 3½ ounces of liquid plaster were required to fill it. It was nearly perpendicular for 23 inches, then began to twist irregularly, without apparent need, until it measured 38½ inches in length at 30 inches from the surface. There was a cell of the usual composition at the end, loaded with the honey and pollen paste. The lateral at the bottom was not so evident, the tube twisting so irregularly that it seemed like a mere continuation of the twist. That this is not a rule was shown by a second cast made the same day, of the same species. Here there was an almost straight drop of 32 inches then a marked six-inch lateral to the honey pouch.

June 8th, a cast was taken out which dropped down forty inches before forming a short oblique lateral. The loaded cell in this case was fully 41 inches below the surface of the ground and at probably a nearly uniform temperature the year around.

June 11th, two other burrows of this same species were cast. The first included the bee so that no mistake was possible and the cast measured to the honey pouch 37¾ inches. There was no heel and no indication that the gallery or burrow had extended below that point. The second cast was twisted so as to measure 34 inches at 30

inches below the surface, where a loaded cartridge was found on a bed of hard gravel. A heel extended from the end of the cast into this gravel, and below it, almost four feet below the surface, another loaded cartridge was found. To this species then, belongs the distinction of making the deepest digging of any species of the genus, and also the boring of the greatest diameter. It is puzzling why this should be so, but so it is.

I have specimens taken at Newark and in Burlington County in May, and a specimen dated Lahaway, June 20th. This is, therefore, one of the later of the species, though *A. hilaris* I have from Lahaway July 17th.

So far I have six species of *Andrena* from Lahaway: *A. hilaris* Sm., April 20–July 17th; *A. vicina* Sm., May and June; *A. bicolor* Fabr., June; *A. nuda* Robt., May and June; *A. salicis* Robt., without date; *A. viola* Robt., April to June.

Notes are here given on the digging habits of three of these, and they are found to be essentially alike, though each has some little peculiarities of its own that would probably show out more markedly on closer observation and more frequent casting.

Halictus, sp.

June 4th our attention was attracted by occasional small burrows, not exceeding an eighth of an inch in diameter. The maker was a small bee, determined by Mr. Ashmead as *Halictus* sp., and only two or three examples were taken.

The galleries drop down vertically about 15 inches, then a little lateral runs off about an inch and a half, at right angles. At the end of this is a drop of about half an inch and then a very pretty little cell, carefully smoothed inside and soaked with saliva or some other secretion. This turns black, the color penetrating quite deeply and cementing the soil particles as far as it extends. At the bottom of this cell is a very handsome ball of dry pollen, shaped like an apple and quite regular.

The desire to complete the history of *Augochlora* made it impossible to devote further time to this species.

There are, it will be noted when the history of *Augochlora* is written, two types of storing diggers; one which makes a paste with honey and pollen stored in a thin membrane-like sac; the other which lines or hardens the inside of the cell and stores the pollen dry in a loaf of definite form. I have little doubt that this difference in habit

will be found to be accompanied by some structural difference that, when once correlated, will serve to determine what the storing habit of the species is.

Though all the species heretofore mentioned were interesting objects of study, all paled before the little blue and green *Augochlora humeralis* which was followed through all its stages.

The life history of that species, with figures illustrating also some of the matters hereinbefore referred to, will form a second part of this essay.

NEW SPECIES OF HETEROCERA FROM TROPICAL AMERICA.—I.

BY WILLIAM SCHAUS.

SYNTOMIDÆ.

Pseudosphex noverca.

Head grayish. Collar black, fringed posteriorly with gray. Thorax black; a transverse gray line posteriorly. Abdomen black; a gray streak laterally at base; ventral valve fringed with white. Wings hyaline, the veins black. Primaries: costal margin broadly, inner margin narrowly on basal half, suffused with dark brown; fringe dark brown. Secondaries: the basal half of costa narrowly suffused with dark brown. Expanse, 27 mm.

Habitat: Castro, Parana.

Bombiliodes jamaicensis.

Palpi and head black. Collar and thorax black; collar and patagiæ with a crimson streak, mottled with white scales, and inwardly shaded with metallic blue scales. Abdomen crimson; a dorsal black band; the segments posteriorly black; underneath pale brown. Thorax below and legs black, the latter streaked with blue; tarsi circled with white. Wings transparent. Primaries: the margins black; the apex broadly black; a large black spot at end of cell touching costa, and a smaller spot about center of cell resting on costa, and not reaching the median vein. Secondaries: apex broadly, outer and inner margin narrowly black. Antennæ black, tips yellow. Expanse, 39 mm.

Habitat: Jamaica.

Bombiliodes xanthogastroides.

Antennæ black, streaked with white at apex. Head black; vertex dark blue. Collar black with two dark blue spots. Thorax black. Abdomen black basally, shaded with blue laterally; the last four segments orange; underneath the last three

orange, otherwise black. Thorax below and legs black. Wings transparent, the veins black. Primaries: margins narrowly black; a black streak at end of cell, a transparent streak at base of costa. Secondaries somewhat opalescent; the margins narrowly black, more broadly so between anal angle and vein 2. Expanse, 38 mm.

Habitat: Castro, Parana. Looks very much like *Gymnelia xanthogastra* Perty.

Mesothen albifrons.

Head black; frons white. Collar and thorax above black; patagiæ streaked with yellow; underneath yellow. Legs yellow; tarsi and joints black. Abdomen yellow; last three segments black. Wings hyaline, veins black Primaries: some yellow hairs at base; margins black, thickened at inner angle; apex broadly black; discocellular slightly more heavily marked than veins. Secondaries: margins narrowly black; some yellow at base. Underneath costal margin and veins streaked with yellow; fringe terminally yellow at anal angle. Expanse, 25 mm.

Habitat: Colombia.

Cosmosoma flavita.

Head black. Collar yellow. Thorax yellow; two black spots anteriorly; patagiæ outwardly streaked with blue black. Legs black; fore coxæ yellow. Abdomen yellow; last two segments black. Wings hyaline, veins black; base of wings black; margins narrowly black, more widely so at apices, especially on primaries; base of costa with vitreous streak. Expanse, 38 mm.

Habitat: Colombia.

Eurota minerva.

Head black. Collar black; two large yellow spots. Thorax black; a yellow spot anteriorly on patagiæ. Abdomen black; lateral crimson spots on first three segments; a yellow spot on the fourth and fifth. Primaries black; a yellow streak at base; some crimson hairs at base of inner margin; median semitransparent white spots, two in cell, superposed, one below cell somewhat larger, and a much smaller spot below it; four similar spots beyond the cell between veins 3–7. Secondaries black; two whitish spots beyond the cell; the inner margin broadly crimson. Underneath the same. Hind wing with veins 2 and 4 from cell. Expanse, 27 mm.

Habitat: Castro, Parana.

Macrocneme nordina.

Antennæ black, tipped with white. Palpi black outwardly suffused with blue. Legs black; hind tarsi black; fore coxæ metallic green. Head black; frons and vertex blue. Collar black, irrorated with blue scales. Thorax black; two subdorsal metallic spots. Abdomen black; a broad lateral metallic green band, suffused with blue at base; underneath some metallic spots. Wings black; at base of primaries some metallic blue scales on inner margin. Underneath: wings black; on primaries some blue irrorations on costal margin and below cell; on secondaries some blue irrorations on costal margin, at base of cell, and inner margin. Expanse, 35 mm.

Habitat: Guadalajara, Mexico.

Macrocneme sura.

Palpi and legs black, suffused with metallic blue scales. Hind tarsi tipped with white. Head black; frons with two large white spots, and two smaller under antennæ. Collar black with two small blue and white spots. Thorax black; patagiæ with a small blue and white spot anteriorly. Abdomen metallic green above, black underneath; the ventral valve green and followed by two ventral rows of white spots. Primaries: a basal band, and the outer margin broadly black, otherwise shot with dull metallic blue green. Secondaries black. Underneath wings black, shot with dull green to beyond cell. Expanse, 35 mm.

Habitat: Petropolis, Brazil.

Æthria analis.

Antennæ black, petinated, and thickly tufted above on median third. Head, thorax, and legs black; some blue shadings on femoræ, collar, and patagiæ. Abdomen black; the last three segments orange red. Wings transparent, the veins black. Primaries: the margins black; the outer margin inwardly dentate; a broad black discocellular streak, touching costa; some violaceous hairs at base of inner margin. Secondaries: the outer margin broadly black. Expanse, 29 mm.

Habitat: Peru.

Argyroeides vespina.

Palpi yellow. Frons black, edged with yellow. Vertex black with a transverse yellow line, collar black edged with yellow. Thorax black: yellow lines posteriorly; the patagiæ edged with yellow. Legs pale brown; fore coxæ yellow. Abdomen black, spotted with yellow at base; four terminal transverse yellow lines. Wings yellowish hyaline; the veins pale brown; fringe black. Costa of primaries with a darker yellow hyaline streak. Expanse, 24 mm.

Habitat: Castro, Parana. Belongs to section with vein 6 below angle of cell on secondaries.

Diptilon aterea.

Head black; frons yellow. Collar and thorax black, the former, and patagiæ finely edged with yellow. Legs black; tarsi below yellow. Abdomen black; a yellow lateral streak on basal half; underneath yellow on basal half. Primaries yellowish hyaline; the margins black, widest at apex; median vein yellow, other veins black; a black discocellular streak; a hyaline streak on basal half of costa; base of subcostal vein yellow; fringe black. Secondaries yellow; the outer margin black; fringe yellow. Expanse, 23 mm.

Habitat: Casa Branca.

Ceramidia cuprea.

Palpi and head black; frons with metallic green spot; a white spot at base of antennæ. Collar black, irrorated with dark green. Thorax black; a bronze green spot anteriorly. Legs black; tarsi gray; fore coxæ whitish. Abdomen: first seg-

ment metallic green, otherwise metallic bronze with two dorsal black stripes; underneath first segment white, otherwise dull bronze color; a sublateral white spot on second segment. Primaries dark brown, becoming paler at apex; some green scales at base of costa. Secondaries brown; the costa broadly whitish; two hyaline streaks on inner area. Expanse, 33 mm.

Habitat: Coatepec, Mexico.

Marecidia, gen. nov.

Antennæ shortly pectinated; tips serrate. Palpi long, ascending. Hind tibia with a very large gland filled with long hairs above. Primaries long and narrow; vein 2 far removed from 3; 3, 4 and 5 from lower angle of cell; 6 from upper angle; 7–10 stalked; 7 remote from apex. Secondaries narrow; costal margin slightly convex; veins 3 and 4 from lower angle of cell; 5 from just above lower angle; 6 and 7 on short stalk.

Marecidia sanguipuncta.

Head black; frons and vertex irrorated with metallic green. Collar metallic green, edged with black. Thorax black, patagiæ streaked with bronze green. Legs black, shot with metallic green and blue; fore coxæ white; joint of hind tibia white. Abdomen above metallic green; a subdorsal black line, and transverse lines on segments anteriorly; underneath green, with a basal white patch. Primaries black; the median space below subcostal, and above inner margin shot with brilliant green-blue; a bright crimson spot at the base. Secondaries black; a roseate spot in cell; a whitish streak on inner area. Underneath primaries with the crimson spot smaller, secondaries with a crimson spot in cell. Expanse, 33 mm.

Habitat: St. Catharina, Brazil.

Eucereon marcata.

Palpi black; the end of second joint white. Head white; a black spot on vertex. Collar white with two black spots. Thorax white; a black central streak; the patagiæ outwardly black. Abdomen roseate; the basal segment brown; anus black; a short brown subdorsal streak; a lateral row of black spots; underneath buff, shaded with roseate. Primaries white, the markings black; inner margin: a basal irregular spot; at middle two upright streaks connected by a cross line; a small spot towards inner angle. Costal margin: basal, inner, and outer black patches hardly extending below cell, and formed of contiguous spots; the outer patch suffusing with a large irregular spot between veins 2 and 3, which reaches the outer margin above the angle; three small spots obliquely between veins 4–7; before apex two rows of spots, the inner one from vein 5 to costa, the outer row from vein 6 to costa; a terminal black spot above vein 4, and a smaller one below it; fringe white spotted with black at ends of veins. Secondaries white, the veins gray; a slight grayish shade at apex and anal angle, a terminal gray line; fringe partly white. Expanse, 33 mm.

Habitat: Paraguay. Allied to *E. quadricolor* Wlk.

Eucereon mathani.

Palpi, head and thorax brown; two small yellow tufts behind vertex. Body blackish brown above, yellow banded with brown underneath; the anal hairs yellow. Primaries brownish gray, with dark brown markings; a basal spot; an inner curved wavy band; a quadrate spot in the cell, followed by a transverse paler brown spot, and then a large spot partly in the cell and partly beyond, cut by the veins into six parts; an outer curved row of elongated spots; a subterminal row of smaller spots; fringe brown, tipped with gray above vein 3, below it buff tipped with white. Secondaries somewhat transparent on basal half, brownish gray; the outer half dark brown narrowing towards anal angle. Underneath brown. Primaries with a whitish discal spot, and a large white spot beyond the cell. Secondaries with the inner area whitish. Expanse, 33 mm.

Habitat: Balzapamba, Ecuador.

Eucereon trinita.

Palpi, head and thorax gray; a black spot on vertex; two on collar, one anteriorly on patagiæ, which are also inwardly black. Abdomen roseate tipped with black; Underneath buff; a lateral black streak. Legs gray; midtarsi banded with black; fore coxæ roseate. Primaries gray, markings black; two basal spots above submedian; a large spot below submedian; three antemedial spots followed by a larger spot in cell; six median spots, the upper three suffusing somewhat; an outer row, curved around end of cell, consisting of three large spots below costa, three shades close to cell, between veins 2–5, the shade between 2 and 3 followed by another spot; a large spot above submedian, and below submedian a long spot reaching inner angle; a terminal row of spots; fringe spotted with black. Secondaries black, grayish at base. Expanse, 25 mm.

Habitat: Trinidad.

Eucereon lerioides.

Head, thorax and wings as in *E. leria* Druce. The abdomen pale yellow, instead of roseate, the anal segment black. Expanse, 35 mm.

Habitat: Jalapa, Mexico.

Ctenucha mortia.

Head posteriorly, underneath, and basal half of palpi orange; head and palpi otherwise black. Thorax black, finely streaked with yellow. Abdomen blue black; anal hairs orange. Primaries black, the veins grayish; a large white spot beyond the cell from vein 4–7; fringe black, white at apex. Secondaries blue black; the fringe white. Underneath the veins on secondaries are also grayish. Expanse, 37 mm.

Habitat: Castro, Parana.

Hyaleucereon lugubris.

Head and thorax brown. Abdomen brownish black; some terminal transverse violaceous shades. Primaries uniform dull brown. Secondaries brownish black. Expanse, 40 mm.

Habitat: Colombia.

PSYCHIDÆ.

Oiketicus orizavæ.

Primaries smoky gray, almost black on inner margin; a blackish spot occupying outer half of cell, followed by a white oblique mark, less dentate than in *O. kirbyi*: the outer margin semi-transparent. Secondaries smoky gray, the inner margin broadly blackish; the outer margin from vein 2 to apex semi-transparent. Expanse, 39 mm.

Habitat: Orizava, Mexico.

Chalia vigasi.

Wings gray, semi-transparent, thinly scaled with darker hairs. Costal margin of primaries finely black, fringe darker gray. Expanse, 16 mm.

Habitat: Las Vigas, Mexico.

Chalia tristis.

Wings grayish brown, thickly scaled. Primaries 4 and 5 from a point, 7 from near upper angle of cell, 8 and 9 on short stalk from upper angle. 1b angled, anostomosing with 1c, to outer margin. Secondaries: veins 4 and 5 close together, 8 far diverging from 7. Expanse, 17 mm.

Habitat: Jalapa, Mexico.

COSSIDÆ.

Duomitus pyracmonides.

Head and collar brown. Thorax grayish white. Abdomen brown, whitish subdorsally. Primaries white with transverse dark brown striæ; basal third of costa dark brown; from below cell from before vein 2 an irregular broad brown shade to outer margin below apex. Secondaries gray on inner margin, otherwise whitish thickly irrorated with grayish striæ, especially in median space. Fringe white. Expanse, 54 mm.

Habitat: Orizaba, Mexico. Can be easily distinguished from *pyracmon* Cramer by the absence of the terminal dark spots.

Duomitus mathani.

♂ palpi, frons, thorax, and abdomen below brownish black, legs black; tarsi circled with white. Vertex yellowish. Collar black. Thorax white with a central dark brown line. Abdomen dorsally white, with a subdorsal black streak on last five segments; laterally blackish. Primaries white, markings dark brown; a large spot at base of inner margin; a broad space from near base of costal margin extending to one third from base; a small dark spot on costal margin at two thirds, preceded by four small spots and followed by three a little larger; from below cells before vein 2 to outer margin at vein 7, an irregular broad band, nearly straight to along vein 5 then ascending obliquely to vein 7; a row of small spots along inner margin and above vein 1b; a few spots beyond cell; terminal blackish spots at veins partly extending on to white fringe. Secondaries white; the inner margin broadly shaded with brown; a median broad brown shade, posteriorly curved between the veins, and terminating towards costa in diffuse striæ; terminal dark points as on primaries.

♀ paler below, the legs tufts with whitish hairs. Vertex yellowish. Thorax pale yellowish, thickly mottled with black scales. Abdomen dorsally yellowish with a subdorsal dark streak. Primaries white, thickly irrorated with brown, and also with black on inner margin; the base yellowish; the markings not distinct, more like shadings of brown irrorated with white scales; the longitudinal band most distinct between veins 4 and 7; on costa a median black streak preceded and followed by small black spots; a brown spot below the next to last costal spot; terminal black spots on outer margin. Secondaries brown, somewhat irrorated with gray on outer margin and towards base below the cell; terminal dark spots on outer margin; a large dark spot on costal margin before apex. Expanse ♂, 100 mm.; ♀, 125 mm.

Habitat: Huambo, Peru.

Dumitus jamaicensis.

Primaries: basal third almost black on costa, shading to gray on inner margin; this space limited by a dark line not extending below the submedian; a median whitish space, wider on costa than on submedian, irrorated with darker scales and striæ, but not thickly; below the submedian the inner margin is grayer; a velvety black discal point; outer space dull gray; an outer pale gray row of spots between the veins, and terminal pale gray shadings, especially about and above inner angle; all the terminal space slightly irrorated with darker striæ; fringe buff, spotted with brown at tips of veins. Secondaries pale grayish brown; fringe with indistinct darker spots. Female paler, the outer space with the paler space more extended, reducing the darker gray to an irregular band beyond the discal streak; a subterminal darker gray band, interrupted by the veins. Expanse ♂, 48 mm.; ♀, 55 mm.

Habitat: Jamaica.

Costria, gen. nov.

Differs from *Cossula* Bailey, in having veins 9 and 10 on primaries from a point, and 6 and 7 on secondaries well apart.

Type of genus, *C. abnoba* Schaus. (P. Z. S. Lond., 1892, p. 327.)

Costria corita.

Body gray; a median dark brown band on thorax. Primaries light gray; transverse brownish striæ; a median, velvety brown line from cell, obliquely to vein 1b, where it is thickest; before the apex an inwardly curved, semilunar dark brown streak; a terminal brown, wavy, thick line, interrupted by the veins; fringe basally brown, outwardly mottled with gray. Secondaries white, some terminal gray shadings interrupted between the veins; fringe basally grayish brown, outwardly white. On secondaries below a brown discal spot. Expanse, 39 mm.

Habitat: Colombia.

Costria maruga.

Head gray, posteriorly dark brown. Thorax olivaceous; patagiæ gray. Abdomen yellowish white. Primaries pale silvery white tinged with gray; Median space of costa finely dark gray; a large round velvety brown spot in the cell; a smaller one below the median vein, and a still smaller one below vein 1b; these spots obliquely approaching the base of inner margin, and preceded by three dark points a little above them; beyond the spots eight transverse wavy lines; the first three gray,

broken; the first two shaded with brown below the median vein; the third shaded with brown below vein 1c; the fourth not extended below vein 3, geminate towards costa, and yellow posteriorly; the fifth dark gray from below costa to vein 2; the sixth dark brown from costa to vein 3; the seventh dark brown shaded with gray above vein 3, below vein 3 yellow; the eighth very dark brown partly shaded with yellow; fringe yellow at base, white outwardly. Secondaries whitish with traces of subterminal grayish lines; base of fringe pale yellow. Expanse, 33 mm.

Habitat: Castro, Parana.

Costria striolata.

Head and thorax white mottled with a few buff scales. Abdomen buff; white subdorsally at base. Primaries white, shaded with pale brown on the costa, in the cell, and below vein 1b; the fringe on inner margin white; beyond the cell long fine brownish lines not reaching apex or outer margin; basal half of costal margin finely dark gray; an outwardly oblique brownish shade from before the middle of costal margin, terminating in two dark brown spots and below margin vein 1c; a brown spot on outer margin at vein 3; some subapical brown shadings; terminal brown and gray shadings. Secondaries pale reddish brown; the costa and inner margin whitish. Expanse, 30 mm.

Habitat: São Paulo, Brazil.

Costria arpi.

Head and thorax white irrorated with a few black scales. Primaries gray shaded with brown along costa, and on outer third of wing; some irregular transverse black striæ, chiefly on outer half of wing; a thicker transverse black streak in the cell; a velvety black spot between veins 1b and 1c at a third from base; and a smaller spot below it nearer the base; a subterminal outwardly curved black line from veins 2–8 connected with fringe at vein 4 by a black bar, above which it is outwardly shaded with dark brown; the marginal space above vein 4 to costa before apex is otherwise pale brown; a dark costal spot before apex; fringe reddish brown. Secondaries dull grayish brown. Expanse, 46 mm.

Habitat: Rio Janeiro. In this species veins 6 and 7 on secondaries are from a point.

Costria elegans.

Palpi brown. Head whitish; vertex dark brown. Thorax dark brown; patagiæ buff. Abdomen light brown. Primaries whitish buff, shaded with light brown; black and brown striæ evenly distributed over the surface; costa, except at base and outer third, dark brown; the outer margin occupied by a large dark space, inwardly curved and limited by a dark velvety brown shade; the space contiguous to this toward the base is without striæ and appears like a pale line; the space within the curved brown line and a terminal dark brown line is dark olivaceous above vein 5, and lilacine white below it; a small dark brown spot on the lilacine portion; fringe pale brown. Secondaries and base of fringe pale brown; the fringe terminally white. Expanse, 25 mm.

Habitat: Castro, Parana.

Costria discopuncta.

Body yellowish white. Primaries white; a large velvety black spot in the cell; a very small spot on vein 1c, and another below vein 1b; the spots oblique, the lowest being nearest the base; the costal margin narrowly dark gray; the outer margin and posterior outer half of wing striated with brown and gray; fringe light brown. Secondaries white; a fine terminal shade, and base of fringe yellowish; a small brownish shade near anal angle. Expanse, 33 mm.

Habitat: São Paulo, Brazil. *Praeclara* (*Cossula*) Schs. also belongs to this genus. (P. Z. S. Lond., 1892, p. 328). *Arbela norax*, Druce, differs from *Cossula* and *Costria* in having veins 7 and 8 on primaries stalked. The other species described by Druce under *Arbela*, I have not been able to examine.

Givira *Walk.*

Antennæ pectinated. Palpi extending beyond frons. Primaries: veins 1b and 1c connected by a bar; 2 and 3 far apart; 5 near 4; 6 from upper angle of cell, 7 and 8 stalked from areole; 9 from areole, 10 and 11 from cell. Secondaries 6 and 7 from cell. Type *Givira tristis* Walk.

Group I. Vein 8 connected with 7 by a bar:

tristis Walk.
macrochir Schs. (*Dolecta*).
subvenusta Sch. (*Dolecta*).
polybioides Schs., sp. nov.
platea Schs., sp. nov.
watsoni Schs., sp. nov.

Group II. Vein 8 free:

polybia Schs. (*Langsdorfia*).

Group III. Veins 7 and 8 on primaries from areole.

Secondaries: 8 connected to 7 by a bar:

Dukinfieldia Schs. (*Langsdorfia*).

Givira polybioides.

Body dark brownish gray. Primaries white; the costa, inner margin, cell, and median space below cell, brownish; costa spotted with black; some thick, black strie on inner margin, and in cell; dark basal, and inner black line crossing the inner white space below cell; an outer broken, brown line; a subterminal black line, preceded by a brown spot between veins 5–8, and broken at veins 3 and 5, also connected to fringe at tips of veins by dark lines; a fine terminal brownish line, and intervenal terminal light brown spots. Secondaries white with irregular marginal brown marks. Fringe on both wings whitish, spotted with dark brown. Expanse, 34 mm.

Habitat: Castro, Parana. Veins 6 and 7 on secondaries apart. This species is allied to *G. polybia* Schs. (*Langsdarfia*), which has dark secondaries and veins 6 and 7 from a point.

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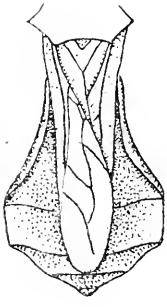

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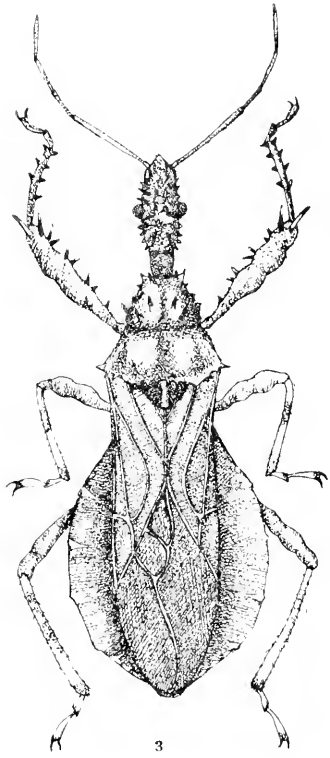

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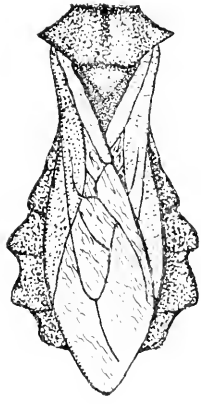

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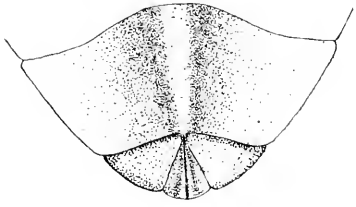
The Genus Sinea.



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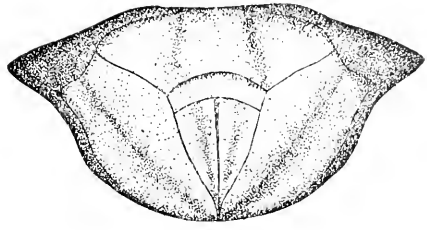

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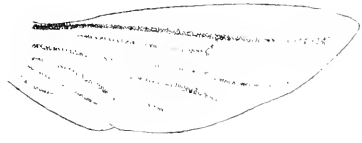

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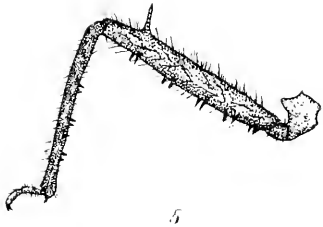

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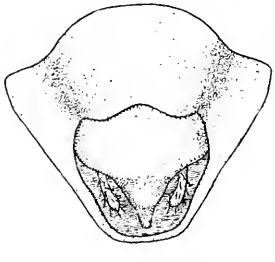

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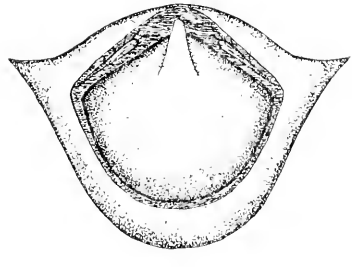

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The Genus Sinea.

JOURNAL

OF THE

New York Entomological Society.

Vol. IX. JUNE, 1901. No. 2.

NEW PYRALIDÆ AND TORTRICIDÆ FROM PALM BEACH, FLORIDA.

By C. H. Fernald.

Marasmia floridalis, sp. nov.

Head, thorax, fore and hind wings white with brown markings as follows: the outside of the palpi, a spot on each side of the collar above, a similar but more indistinct pair on the middle of the thorax, the tips of the tegulæ, a stripe from the eye back to the wing and continued along the costa, the outer margin of all the wings narrower behind, a large costal spot concave on each side, sending one line obliquely down and in to join two parallel cross lines with pale yellow between them, and a second line down and out to similar parallel but curved lines across the outer part of the wing, a line between this and the brown outer margin with an inward bend in the middle and connected by lines to the outer margin and the line within, a few irregular lines near the base of the wing, a median band on the hind wing not reaching the costa, two cross lines between this band and the outer margin each with an inward angle in the middle connected together below where a line extends to the median band, and a series of venular dashes in the subterminal space. Expanse of wings, 12–14 mm.

Described from three examples from Florida, two in the National Museum one of which is from Palm Beach and one from Key West, and one in my own collection. One was bred from *Vincetoxicum palustre* by Dr. H. G. Dyar. Type no. 5411 U. S. National Museum.

Evergestis dyaralis, sp. nov.

Head, thorax, abdomen and fore wings smoky yellow or yellowish fuscous with a silky luster, the latter with greenish reflections. First and second segments of the labial palpi tipped with white. Upper side of antennæ, a line on each side of the face as far as the base of the antennæ, a line across the collar on each side, one on the inner edge of the tegulæ, one on the edge of the costa from the base to the end of the cell, one or two oblique streaks on the outer part of the costa, an oblique streak

at the apex with a black dot below it, and a series of terminal dashes forming a broken line, white. The ordinary lines darker but inconspicuous. The inner one forming a very obtuse outward angle at the origin of vein 2, and an equally obtuse inward angle on vein 1. The outer line is somewhat arcuate but bends inward somewhat on vein 2. The discal spot is a nearly straight oblique streak at the end of the cell. Hind wings with a silky luster, light at the base, dark fuscous outwardly. All the wings are lighter beneath than above. Expanse of wings, 21–23 mm.

Described from one specimen in the National Museum, bred from *Drypetis crocea* at Palm Beach, Florida, and two in my own collection given me by Dr. Dyar, from the same locality as the first.

I have named this beautiful species in honor of Dr. H. G. Dyar whose interesting and valuable investigations on Lepidopterous larvæ have attracted such general attention. Type no. 5410, U. S. National Museum.

Pyrausta costimaculalis, sp. nov.

Head, thorax, fore wings and upper side of abdomen, dark purplish red with a costal spot extending down to the end of the cell and in along the costa to the basal fourth, light orange yellow. Two indistinct dark lines extend nearly parallel, one from the middle of the hind margin, the other from the basal fourth up to the median vein. Hind wings fuscous. All the fringes pale yellow. Under side of the fore wings fuscous, somewhat purplish along the costa and with the costal spot much lighter beneath than above. Legs and underside of the body cream white, the outer end of the fore tibiæ dark purplish. Expanse of wings, 12–13 mm.

Described from one female specimen in the National Museum in Washington and one in my collection, bred from *Psychotria undata* by Dr. H. G. Dyar. Type no. 5412 U. S. National Museum.

Eucosma lineana, sp. nov.

Head and front of thorax dark gray, the remaining part of thorax and the hind part of the fore wings as far as the oblique band, dark fuscous. Fore wings sordid white with numerous dark longitudinal lines; costa with a series of about ten short, oblique dark brown streaks alternating with much finer ones, an oblique wood brown band marked more or less with dark brown and broken above and below the cell arises from the middle of the costa and extends to the anal angle, the costal part of this band sends out a sharp angle from its lower part, the middle part sends out an extension from below forming a v-shaped mark, the third part forms a semicircle on the upper side; a wood brown patch on the outer part of the wing with a line extending from it to near the anal angle. Fringes whitish, cut in the middle by dark brown. Hind wings fuscous with paler fringes. Expanse of wings, 16 mm.

Described from one female specimen in the National Museum, from Palm Beach, Florida, bred on *Anona laurifolia* by Dr. H. G. Dyar. Type no. 5414 U. S. National Museum.

Epiblema perplexana, sp. nov.

Head and palpi clay yellow; thorax a little darker. Fore wings dark fuscous in males, much lighter in females, with a series of about five geminate, sordid white, oblique costal streaks beyond the end of the costal fold; a small dark brown spot rests on the apex; a dark brown irregularly curved streak beyond the end of the cell curves down around the outer part of the ocelloid patch which contains a few horizontal dark streaks; a median dorsal sordid yellowish white spot rests on the hind border, extends up and out terminating a little above the fold; several irregular dark streaks rest upon this spot. The remaining part of the wing is crossed by very fine streaklets. Hind wings fuscous. Expanse of wings, 13–15 mm.

Described from seven examples taken at Palm Beach, Florida, by Dr. H. G. Dyar. Type no. 5432 U. S. National Museum.

Epiblema ochraceana, sp. nov.

Head, thorax and fore wings pale ochreous with darker oblique streaks along the costa and darker dots scattered over the surface of the wing except in the large anal patch in which there are only two such dots. Fringes concolorous with grayish scales along the base. Hind wings yellowish fuscous. Expanse of wings, 12 mm.

Described from one male specimen in rather poor condition in the National Museum collection from Palm Beach, Florida. Type no. 5415 U. S. National Museum.

Lipoptycha maculana, sp. nov.

Head, thorax and fore wings dark fuscous, the latter with a large white spot a little beyond the middle of the hind margin and extending a little above the fold. This spot has numerous fine irregular dark streaks in it. The costa is cut by oblique black streaks followed beyond the middle by white and there are numerous oblique and horizontal yellowish streaks over the surface of the wing except at the base; terminal line around the apex black, which is represented by two or three black dots below the middle, when viewed in certain lights there are oblique bluish streaks visible, two arising near the middle of the wing and extending down to the end of the cell and one or two beyond. Hind wings fuscous, not so dark as the fore wings. Expanse of wings, 7½ mm.

Described from one male specimen from Florida in the National Museum and one in my collection bred from *Schœpfia arborescens* collected by Dr. H. G. Dyar. Type no. 5413 U. S. National Museum.

Tortrix ivana, sp. nov.

Head and thorax dull ochre yellow, the latter with a dark line across the middle terminating at the tegulæ. Fore wings pale ochre yellow with a shining luster; a dark brown spot on the extreme base of the costa a little beyond which an oblique dark band extends about half way across the wing where it ends in several scattered black dots; an oblique dark band arising near the middle of the costa extends nearly to the fold beyond which it is faintly indicated by yellowish streaks, the middle of

this band across the cell is nearly of the ground color of the wing; a subapical dark patch rests on the costa in four equidistant dark brown dots; a dark spot between the end of the cell and the outer border very dark at the beginning extends obliquely down to the outer border a little above the anal angle. Ground color of fore wing with numerous cross streaks of a brighter yellowish color. Fringes concolorous with the ground color of the wing. Hind wings light gray with darker reticularions. Underside of all the wings lighter than above and faintly reproducing the markings of the upper side. Expanse of wings, 12 mm.

Described from one male specimen in the National Museum, from Florida, bred from *Iva imbricata*. Type no. 5416 U. S. National Museum.

NOTES ON SOME DIGGER BEES.—II.

By JOHN B. SMITH, Sc.D.

(PLATES III–V.)

Augochlora humeralis *Patton.*

The first introduction to this species came April 4, 1898, when digging out plaster casts of spider burrows. At that time Mr. Brakeley ran across occasional vertical burrows, filled at the top an inch or so, but open below that and extending down fully three feet. Beyond that they were lost and were looked upon as unusually deep old *Colletes* diggings.

April 17th, an area 18 x 16 x 23 inches was cleared of pine needles, lichens, moss and other surface débris, and about an inch and a half of sand was skived off cleanly, with a large sharp trowel. In this area 13 round holes about one-fourth of an inch in diameter were now exposed. From one of them a bee came up and was captured. It proved to be *Augochlora humeralis*, Mr. Fox and Mr. Ashmead separately determining the species for me.

Plaster was now poured into several of these holes and to Mr. Brakeley's astonishment the first opening required four fluid ounces to fill. The others required yet more, until in one case nine ounces were needed to bring the mixture to the surface.

April 18th, digging began by making a trench before the area of casts, and working down an old burrow, the trench was deepened from time to time until it was fully four feet down. In the first cast a bee was imbedded 23 inches from the top, there was a totally different

arrangement of laterals from what had been noted in *Colletes*, and below the end of the cast, 41 inches from the surface, the hole yet went down: in other words the plaster had set before it reached the bottom. Other casts ran down 47¾ and 50½ inches, respectively, and at the bottom of the holes bees were found.

April 19th it rained, but on the 20th digging was renewed and one burrow was followed down 58 inches. Two bees were found in the bottom of one of these holes. Additional casts were made and were dug out from time to time, until well along in May, and at this time no two casts were alike. There was always the deep vertical extending down from forty-five to sixty inches. Beginning about six or eight inches from the top, lateral burrows might be expected, running at right angles an inch or two and then broadening out into a circular chamber about three-sixteenth inch in height, variable in diameter. From this chamber a variable number of verticals extended down a variable distance—sometimes only half an inch, more generally an inch, and almost always one or two were much deeper. Occasionally one of these verticals was extended down several inches, and it might even run off diagonally; though this was rare. So we found a few cases where the circular chamber was omitted and there was an irregular branching off from the lateral. There seemed neither rhyme nor reason in the differences and we were totally unable to find any traces of bees having developed anywhere in the burrows or the cells connected with them. So the number of laterals and cell clusters varied. Usually there were two; not infrequently there were three and rarely there was a fourth. Below 18 inches we never expected to find cell clusters; but sometimes there were irregular chambers forming little fingers in the casts, which might be found at almost any depth. The longest burrow measured extended 64 inches down; through a layer of sand, through a soft yellow clay into a stratum of hard red clay intermixed with iron, through this clay and through an eight-inch layer of sea sand it went through clay and hard gravel to water-bearing sand beneath. In one case eight bees were found piled one above the other nearly five feet under ground. When brought to the surface they were torpid and did not resent handling; but they became active very quickly in the bright sunlight and started flight when allowed to do so.

Of one thing we were of course certain: all these burrows had been made in 1897; but why were so many bees in one home, and why was there no trace of breeding? All the specimens were females,

and it did not seem reasonable to consider them as the brood that had been born in the system where they were found. There were too many complicated burrows with only a single bee, to make this probable.

May 13th I reached Lahaway to find a "bee mine" well established. It was six feet deep, with three perpendicular faces, the fourth side sloped for convenience in getting out. The process was, first clear a space in front of one of the perpendicular faces, usually about 18 inches square, by cutting off with a large trowel two inches of top surface. So full of holes was the ground here that anywhere from six to a dozen openings would be exposed in this area and of these three or four would be plaster filled. Usually 24 hours were allowed for the plaster to set; but sometimes casts made in the morning were taken out that same afternoon. Though every hole was not plastered, yet every one on the way to the casts was investigated. With a broad trowel the sandy face of the pit was sliced back until a perpendicular was reached: then a small, sharp trowel came into service to follow it carefully down, so as to expose all laterals and cell clusters. These in turn were investigated by a thin palette knife, so that we had clearly before us the whole digging record. Perpendiculars were rarely followed below two feet, because experience had taught us that no laterals or cell clusters were to be expected below that point. Unless we wanted bees, the end of the burrow was neglected.

A notable fact in comparison with the diggings of *Colletes compacta* was that those of the *Augochlora* were perfectly clean and open to the bottom, though covered with sand above. Not a trace of top sand was ever found at the bottom of the tube, where care had been taken to prevent its entrace from our own operations.

When a cast was approached within three inches, the small trowel was carefully used to reach the perpendicular, for we could never tell to which side a cell cluster would be found. From the top down the knife was used to bare the white cast, small slices only being made downward until the direction of the first lateral was discovered. If it ran to either side, matters were easy, for the cluster could be left untouched and the perpendicular followed down until the next cluster was located. When none was discovered at twelve inches from the top we felt very certain that it went off backward, which was also a satisfactory condition. Where a large cluster projected straight out forward matters were more troublesome for a support must be left for

this cluster from the side or below, otherwise it would break by its own weight and fall into the pit. This actually happened more than once. Of course as the pit filled from the sand scraped off its side, it was shovelled out from time to time to afford working room. Finally, when the plaster-filled tube was laid bare for its full length, arrangements could be made to take it out; which was a decidedly ticklish task. As the sand was moist, the cast naturally could not dry out completely nor the plaster set hard. It had a chalky appearance and feeling, and snapped in the most unexpected places in the most disconcerting manner. I have bared a perfect cast, lifted it out carefully and held it safe upright; but attempting to incline it so as to rest against a sunny slope, the whole thing collapsed, breaking into many pieces—to the great damage of my soul's weal, unless the recording angel kindly closed his or her ears temporarily. After a number of similar mishaps we decided to take the matter into our own hands, make no attempt to get perfect casts, but break them where we judged most desirable. Usually, therefore, the perpendicular was broken about six inches below the lower cluster and this left us anywhere from 20 to 30 inches of one-fourth inch pipe stem which could be laid down on the warm sand to dry out. The second break was usually made below the first cell cluster and after that it depended on circumstances. A reference to Plate IV, Figs. 16 and 17, will show the general appearance of the casts secured at this time and also the difficulty of securing a structure like this in one piece. Of course all the parts of one cast were carefully kept together and usually notes were made at the time, detailing the number of clusters, etc.

All the work done by Mr. Brakeley was elaborately noted. Every cast had a stick bearing a number and the quantity in ounces of plaster that had been poured in. This was useful as indicating a simple or a complicated system and was to some extent a guide in the digging operations. After an hour in the hot sun or dry sand, the casts were much more safely handled and much lighter. They were then laid carefully into a box especially made for that purpose and carried to the house.

Incidentally, it may be noted that the bee mines were from one-fourth to one-half miles away from the house and that everything, including the water, had to be carried out and back again. What with graduates, plaster, jars and other paraphernalia for digging, this made quite a load.

Arrived at the house the casts were laid out on boards, each series by itself, with its stick and head mark, and in the evening they were dry enough and hard enough to clean. Of course the round, simple perpendiculars could be easily cleared of the adherent sand by a stiff brush; but the cell clusters were usually a mass of sand and clay, and it was utterly impossible to tell what would come forth out of the lump. Dissecting needles and small brushes came into play here, and it was sometimes close to midnight before a day's field work would be finally laid out so as to show a proper record. When working alone, Mr. Brakeley made full notes of all that was done and seen and these notes, which gave as clear a picture as personal observation could have done, were sent me with the casts.

The first blue bee was noticed by Mr. Brakeley, May 1st, on flowers and thereafter an occasional specimen was seen. After a day or two of pleasant weather, May 14th proved one of those hot, sunny spring days that seem to have an electric power to start into activity all living creatures. This day terminated the hibernating period of *Augochlora* and sent them out among the flowers with a rush. The air was full of life, and bees were hovering over the sand in every direction.

Now it might be supposed that, having spent several months underground, the insects would enjoy themselves a trifle in the sunshine, and would assume family cares only after due deliberation, first clearing up and restoring their winter quarters into summer freshness; but being ladies, they did nothing of the kind. Hardly taking time for a full meal, each individual began at once to dig a new burrow, disappearing beneath the surface in a moment and indicating progress by the gradual forcing up of a little heap of sand. It is a fact that not one of the bees returned to the hibernating burrow and, despite the fact that the ground was fairly riddled with available perpendiculars from which new laterals could be driven, not one was so used. For every bee there was a new burrow. Their method was to fly restlessly here and there over the sand, hover for a few moments at one point, then at another and, finally as by a sudden resolve, drop to the surface and disappear. It was all done in a moment and a brilliant metallic greenish or bluish bee, seemed changed into a little heaving mound of sand. Then even this motion stopped for a few moments until a sudden heave forced out a little lump of sand, and the new burrow was fairly begun. At this time the digging is done chiefly with the fore-legs which loosen the sand and force it back a little.

Then the bee pushes forward, turns a complete sumersault at the extreme end of the burrow and with its head forces the sand to the surface.

The front leg of *Augochlora humeralis* is shown at Plate III, Fig. 1, and, as compared with the middle and hind legs (Figs. 3 and 5), differs by the lack of hair or other apparent vestiture. There is no distinctive digging structure; but the sand in which they work is generally soft and when obstacles are encountered the mandibles (Fig. 10) are brought in to assist. Femur and tibia are of almost equal size and very powerful. Before the end of the tibia is an articulated spur or process, toothed and forming a cover to a notch in the first tarsal joint. This is, of course, the antenna cleaner, and it is shown, more enlarged, at Fig. 2. The claws at the end of the fore tarsus are different from those on the other feet in that they are longer, more flattened, and inclosed for more than half their length in a membraneous sheath, leaving only the teeth projecting. Whether the claws can be completely withdrawn within this sheath, I do not know.

May 15th was an unpleasant, rainy day on which no bees were flying; but the 16th was again pleasant and on this day the first cast was made by Mr. Brakeley of one of the new burrows on a field where the bees were seen earliest. It was observed, first of all, before the casts were made, that the mounds were never open on the surface as in *Colletes*. That active work was going on could be seen by the increase in the size of the mound and the difference in the color of the sand and clay brought up; but all the work seemed to be done at night. During the day everything remained undisturbed; but next morning every mound showed fresh, moist, colored sand or clay, showing just where the insect had reached in its digging. As a matter of fact the mounds never increased very much in size. The hot sun of midday day dried them to a powder and any little breeze over the surface carried off a portion to be spread evenly over the surrounding surface; a rain levelled the whole to the surface.

The first cast was only 12 inches deep, but developed a new feature: the insects do not start at the top and go straight down! To make the cast the sand was cleared out of the center of the mound until a clean opening was obtained. The resulting cast was like Fig. 18 above the first cell cluster. It proved from this and other casts and diggings, that at first the bee digs diagonally a distance of three or four inches, to get about an inch and a half below the surface; then

she digs down vertically and runs the vertical up to the surface. But the opening to this vertical she keeps carefully closed so that not a sign of it appears to casual view. Furthermore, in almost every case the perpendicular comes up under some bit of natural protection—lichen, moss, grass tuft or anything else in fact. The object of the hovering search by the bees is now apparent; they are seeking some place that affords a natural protection to the real entrance to the nest and the surface mound does not indicate this entrance within four inches in any direction. Plate IV, Fig. 19, shows a diagrammatic section of the entrance to the burrow. It is obvious that the perpendicular might be fully eight inches from its present location by removal to the exactly opposite side of the mound; therefore the surface mound does not indicate within 6 or 8 inches the real entrance to the burrow. At first the casts were made through the oblique entrance; but when it was found that the habit was uniform and that obstructions in the oblique arm often interfered with casting, it was decided to hunt up the perpendicular and cast into that. This was not so difficult after a time, for as soon as a little careful dissecting with the palette knife showed the direction of the perpendicular, one could be sure of finding it under the nearest natural shelter. There was always a plug closing this opening except when the bee was out seeking stock for its cells. Therefore it became easy in time to ascertain whether the owner was or was not at home. If we found everything tightly closed, we could take it for granted that the bee was at home; but was not at all disposed so receive company. Frequently we dropped a little pebble or a pinch of surface sand into the opening and awaited events. In a very few moments the owner appeared at the surface, rarely bringing out more than half her body, looked wildly around in every direction, tried the edges of the burrow with her antennæ and then disappeared from view—only for a few seconds however. In an incredibly short time she re-appeared bearing a load of clay which she slapped into place at one edge and dived down for more. In two or three loads she had enough to completely shut the door. At first the discolored fresh clay was rather prominent; but in a short time the sun or drying wind had lessened the contrast so that it did not attract attention.

Sometimes we found the door open, but not widely. That is, though the gallery was fully one-fourth inch in diameter, the opening through which the bee came out was not much if any more than half that, just large enough for the insect to get in and out.

The method of digging is interesting and was studied on a number of examples confined in glass tubes. The fore legs were used to scrape up material which was made into a lump clasped between the abdomen, breast and middle and hind femora. Then the insect crawled up actively but awkwardly, moving middle and hind legs as little as possible and confining the motion to the tibiæ and tarsi. Arrived at the surface or dumping ground the load was deposited in place by turning a complete sumersault and then diving down into the burrow head first. When it was a matter of closing the opening, the upper surface of the abdomen was used to press each load into place, but everything was done so rapidly that it all seemed part of one motion.

The bee is intensely and nervously active at all times when observed. It is never quiet a moment, but bustles about as if every second counted for much. Antennæ, legs and palpi are always in motion, whether in the burrow or on a flower, gathering pollen. It gives the impression of nervous haste, yet the haste seems well directed and effective, no false moves or motions being apparent.

The antennæ of the female are rather short and a little stouter than those of the male, being represented at Fig. 9 of Plate III. The scape is about one-half as long as the funicle, or one-third of the entire antenna. Joint 2 is longer and more slender than the two next following, and these—2, 3 and 4—are smooth, sparsely punctured and only thinly pubescent. Joints 5–12 are stouter and gradually increase in length, 12 being almost as long as 10 and 11 combined, and longer than any other two joints in the antenna. These joints—5 to 12—are densely punctured and pubescent, the surface sensitive and opaque, especially toward tip.

It has been stated that, after making sure that the oblique entrance was an invariable habit, casts were made directly into the perpendicular because the former was often obstructed. We found this especially in the afternoon and finally concluded that the insect used this gallery as a storehouse for sand mined during the day. It had been noted before this that the sand-heaps were all fresh each morning, new material still damp being found on every active hill. No such fresh material was seen at any time during the day, nor were the bees ever seen forcing out sand—everything of that kind was done at night. We concluded, therefore, that what the bee brought up during the day, was stored until night and then forced out through the false mouth. At times digging will cease altogether. For instance, on one occasion a

heavy rain beat all the mounds over a noted area, perfectly flat. For five days thereafter there was no external sign of work done, but after that everything went on in the usual way. The ordinary rate of progress is about five inches each day.

For several days after May 16th bees began digging in increasing numbers, and May 24th, Mr. Brakeley wrote "As for old Cock-Robin Park mine it is a sight—a horrible upheaving of the underneath—and for 20 or 30 feet all around the hole the ground looks as if it had a bad case of hives."

When the perpendicular is from 20 to 24 inches down, laterals are made and cell clusters are begun. May 22d, two casts were made. No. 1 showed a depth of 21½ inches and one cell cluster. The second was down 24 inches and had two cell clusters. This cast is fairly represented by Fig. 18 on Plate IV and it also illustrates the average system of a breeding burrow. There are rarely more than two cell clusters; but the number of cells in the clusters varies.

A section of a cell cluster containing only a single brood cell is shown at Fig. 22 (Plate IV), and many of the earliest clusters were of this type. After driving a round lateral back about an inch and a half, the insect expands it into a circular chamber, varying in diameter and in the center of this she digs a single cell somewhat barrel shaped and about three-fourth inch in depth. This cell is clay-lined on the inside and carefully smoothed down. Usually there is clay in the tube which she is digging; but if not, the bee digs out a little pocket as shown near the bottom of Fig. 18 (Plate IV), and thus obtains the material for finishing up her cradle. After this central cell is completed she digs a series of four or five around it, and of the same depth. These are not at first clay-lined but are left while the insect secures pollen to store the central cell. The pollen is formed into a round loaf, plano-convex in section, dry and firmly compacted. Upon this an egg is laid as shown in the figure. The cell is closed with a capping of clay, and the mother's work on this is done. Now the insect may either make brood cells of two or of all of the surrounding cavities or she may leave them open and unfilled. If she does the latter she deepens and curves them under the central cell until they nearly meet. In this way there is an almost continuous space all around the brood cell, only enough material being left to support the structure. If, on the other hand, she decides to turn others of these into brood cells, she enlarges the chamber accordingly

and digs other cells until the two or the five as the case may be are completely surrounded by empty cells. At Fig. 21 (Plate IV), we have a 5-cell cluster drawn from photograph which shows how such a series is arranged. The five brood cells were capped and of course the plaster could not get into them; but it did get into the surrounding air spaces, and when the cast was dug out the plaster practically inclosed the brood cells and their contents. The photograph shows that the plaster broke down and distorted the narrow partitions between the cells, two being run into one near the lateral running to the main burrow. These marginal cells had been continued beneath the brood cells, and the plaster has been trimmed away with a pen knife to expose the cells. It will be readily seen that in this way the casts preserved safely all the contents of the capped cells and we could examine the clusters at our leisure and trim out the insides whenever we wished; usually this was part of the evening's work.

The first pollen-loaded bee was seen May 24, by Mr. Brakeley. Bees were yet coming out of winter quarters and beginning new burrows on May 26th, though on the 28th some of the casts showed three cell clusters. This shows the enormous activity of the insects, the older series of which was now down from 28 to 33 inches only ten days after the real beginning of the season.

Specimens of bees taken from the new burrows May 25th, 26th and 27th reached me May 31st, and all of these were dissected. All were females and in all the ovaries showed developing ova. Usually there was a tolerably equal increase of size on both sides; but in some cases the ovary on one side was much larger than that on the other, due always to the fact that one egg was reaching maturity. The greatest development was four on one side, a single one on the other, all of about equal size. In this species there are 4 ovarian tubes, and in each tube 2 cells or eggs that seem likely to develop. It seems thus as if the insect might lay 16 eggs; but I doubt if any of them ever do place so many. The greatest number of brood cells that we ever found connected with any one cast, apparently placed by a single individual, was 15 and I much doubt whether any bee ever fills more than that. Six or seven filled cells to a single burrow is about an average, quite a number containing only two. This was not due to interference or incomplete work: such cases occurred constantly, of course: but we never counted them in our estimate. A cluster was complete when the cells surrounding the brood cell or cells were continued be-

low the latter as shown in Fig. 22, Plate IV. In such cases these surrounding spaces could never be made over into brood cells and of course the work was ended.

So far as my dissection of the bees could tell us there had been no egg-laying up to May 28th. Incidentally this examination developed uniformly, an empty alimentary tract. Apparently these insects do not feed at all after they have once begun digging and until they begin to store the cells. The mouth parts themselves are small, except for the mandibles which are shown at Fig. 10, Plate IV. The maxilla is reduced to a single-jointed, scoop-shaped galea, below which is attached a well-developed, 6-jointed palpus. The tip of this maxillary structure and the appearance of the palpus, is shown at Fig. 13, Plate III. The labium is slender and has at the tip a small pointed ligula or tongue set with rather long, fine hair along transverse ridgings or markings. The paraglossæ are small, membraneous lateral processes which do not reach the middle of the ligula and seem to be scarcely functional. The labial palpi are also small, four-jointed, the segments decreasing in size toward the tip and not set with sensory structures save a few, irregularly placed, pitted hairs. This structure is shown at Fig. 12, Plate III.

June 2d, clay-lined cells were found for the first time and now in some cases the reduced number of cell casts pointed to capped cells. But none of these were observed and it is perhaps a question whether some other causes did not interfere with the perfection of the casts.

June 4th and 5th I spent at Lahaway in the bee mines, for there were now two of them operated by Mr. Brakeley. No loaded cells were found, though quite a number were now clay-lined, apparently ready for stocking. Very few bees were observed on the wing and none of these were pollen-laden. Search among the flowers in the vicinity failed to show even a single *Augochlora humeralis*. Thousands of the insects about, yet not one feeding and not one to be obtained by ordinary collecting.

June 7th, pollen-carrying was in full swing and the bees were as active as they had been at digging shortly before. June 10th they were still hard at work, and now the direct opening to the perpendicular was in constant use, as often open as closed. Yet invariably, as soon as a pollen-laden bee entered her burrow, she reappeared in a few moments with a load of clay and closed the door. No attempt to close was made by the bee on leaving home though, theoretically,

the danger should be much greater during the mother's absence than when she is present. Practically there is nothing to prevent a parasite or predaceous species from walking right into the burrow and cleaning out the whole nest contents. No casts were made between June 5th and 11th, and there came thus an unfortunate blank.

June 11th, cast 1, poured into an open perpendicular ran down 27½ inches and had 2 cell clusters, one of six and one of five brood cells. In one of these was a pollen cake. Cast 2 had only one cell cluster. In this was one empty, clay-lined cell, and one containing a pollen cake with an egg on it. This was the first completed brood cell met with. Cast 3 had a perpendicular running down 30¾ inches. There was one cluster of three brood cells: the first was clay-lined, empty; the second had a fully completed pollen cake; the third had also an egg and was capped.

Cast 4 ran down 28 inches and had one claw cluster with three brood cells. One of these was empty, the other two were completed and with caps.

Cast 5 had two cell clusters, upper with three, lower with two brood cells and all completed with pollen, egg and cover.

June 13th, cut back along the face of one of the walls of the bee mine until a new burrow was reached and this was followed down carefully to observe the normal condition of affairs. There were two cell clusters, one at 7½, one at 8½ inches. The first contained one completed cell with pollen and egg. The second had three brood cells, one empty, one fully loaded and sealed, the third with a recently hatched larva. The empty cell had been recently clay-lined and indicated that the bee moistened the material with saliva or some other secretion. At all events the moisture penetrated to a little distance into the sand and seemed to harden it. Probably, when working in clay or a soil containing clay, this hardening mixture is all that is needed. In fact in some cases observed I feel certain that just this was done and no more.

June 15th, a number of hatched larvæ were found and then comes a break, due to the death of Mr. Brakeley's father, until June 30th, when I took up the observations myself. This makes a break during the period of development of the larva and, as pupæ were found on the 30th, there is no certainty as to the shortest period between the beginning of the larval and the pupal stage. It is certainly not over 15 days.

The pollen used to store the cells is gathered upon the middle and hind legs and upon the entire breast and base of abdomen of the insect. The middle leg is seen at Fig. 3, Plate III, and is only a little larger than the anterior: the coxa however is much more developed and the entire member is covered with hair, forming a fringe at the sides, with points inward. The femur is grooved inferiorly for the reception of the tibia. The tibia is quite a little dilated below the middle, and at the tip is a single spur with toothed edges, shown at Fig. 4 on Plate III. The claws are large and strongly toothed. The posterior leg, shown at Fig. 5, Plate III, is much longer and stronger than either of the others and also hairy throughout. In a general way the tendency is to a fringing of long, stout compound hairs directed inward to form a support to the pollen mass when gathered. There is no specialized basket as in the case of the honey bee, and this species makes no attempt to gather the collected pollen into one mass: when it flies into its burrow it is yellow where there is a hair to hold the load. The tibia has two dissimilar spurs at the tip, shown at Fig. 6, Plate III. One of these is really pectinated or comb-toothed, forming four four long dents, while the other has the edges narrowly serrated.

The first tarsal joint is longer than all the others combined, is also clothed with compound hairs and has the tip prolonged at the outer angle into a soft, curved process.

The general structure of the claws of the middle and posterior tarsi is shown at Fig. 8, Plate III. In general the claws are longer and more slender, the teeth less prominent than on the middle pair. Otherwise, and in the central structure between the claws the two pairs are alike.

Reference has been made to compound hairs. Of these there are two types in the clothing of the insect. The general covering of the functional parts of the insect is made up of palmate hairs: hairs with a flat shank, divided into from three to ten flagellæ or whips, shown at Fig. 11, Plate III. In my Annual Report for 1895, to the New Jersey Agricultural College Experiment Station, I gave on a half-tone plate, Fig. 47, a reproduction from a micro-photograph showing the compound hair of *Agapostemon* and *Augochlora*; both being of the same general type. Not all the hair is of this kind: the longer hair at the edge of the tibiæ has a straight shank with many shorter or longer branches: but it is not palmate. I have already stated that there is no specialized pollen basket and when gathering pollen the

insect simply rolls itself in the flower that the pollen may adhere to the mesh of interlacing branches of hair. This habit would seem to make it an effective pollenizer for fruits; but unfortunately no observations were made as to the kinds of flowers visited: therefore, I am unable to say at present whether the insect is of economic importance or not. I do know that the contrast between the yellow pollen and the metallic color of the insect is very striking and identifies the storing specimen at a glance.

June 30th, I made seven casts in bee mine No. 2, of which two were accidentally spoiled. All of these were made close to the point where the digging was done on the previous visit, and all were taken out the same day. In addition, I also took out a number of larvæ, pupæ, pollen cakes and eggs from the pit next to where the casts were made. The main object of this digging was to obtain specimens; but incidentally it was noted that always, in the upper cluster, there were two or three well-developed larvæ, while in the lower clusters either very young larvæ or eggs only were found. In other words, the bees, while they first complete the upper cluster before starting the lower series of cells, do not fill more than three of the upper, before they start on the lower series. The greatest number of filled cells found in any one cluster was five, and in that case three of the lower cells were also stocked.

In cast 1, I had three clusters and two branches which seemed to represent random digging. In the upper series I found one pupa and three full-grown larvæ. Neither of the lower series contained any larvæ, but the filling of some of the cells had been begun.

Cast 2 contained only an imperfect cluster and, as there was no bee in the cast, it is probable that the owner met with an accident.

Cast 3 had one partly completed cluster and one just started; but here the bee was in the cast, imbedded in one of the cells, none of which were filled. This would seem to represent a very late start or some accident that prevented work for a time.

Cast 4, extended more than four feet down. Four clusters were in whole or in part completed and three of them contained cells, either filled or in progress of being filled. All stages from the pollen cake without an egg, to the pupa were represented in this cast, but none of the outside cells had material of any kind. It was the study of this series that made the relation of the outer or air cells to the inner, brood cells, entirely clear. The bee in this instance was in the cast.

Cast 5 had three normal cell clusters and two sets of imperfect processes, one almost at the extreme bottom, nearly four feet under ground. In this cast pupæ and full-grown larvæ were found in the upper two series of cells. In the lower series pollen masses and eggs were found.

Cast 6 was a complicated affair with four cell clusters. Two bees were found in the cast and a third was taken from the mouth of the burrow before the cast was made. When cleaning out the opening preparatory to casting, a bee came up with a load of clay to close it. I removed the material, but on turning found that another load had been deposited. I waited for the next supply and captured the bee with the forceps; immediately thereafter a second bee came up; but before she could return with another load the plaster was poured in. Two bees were in the cast, a third had been captured at the entrance: what relation was there between these examples? There were four large cell clusters, one of them quite a distance from the upright, and in three of these clusters larvæ and pupæ were found. In the fourth were pollen loaves and eggs.

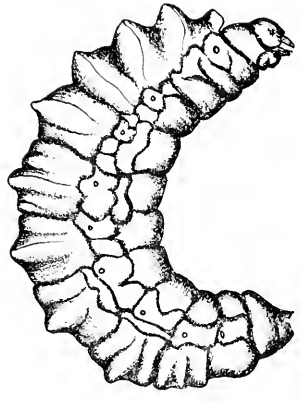

FIG. 1. Larva of *Augochlora humeralis*.

Cast 7 was the most complicated of the series, carrying four entire and two partial clusters. Four bees were imbedded in it. Larvæ and pupæ were taken out of all the clusters. One bee was imbedded in a cell cast, as if she had been engaged in filling it with pollen. The others were imbedded in different portions of the upright.

The result of the castings and diggings made it evident that on June 30, all stages from eggs to pupæ occurred in the burrows. In no pupa was there any tendency to color up, even in the eyes. The inference was that the pupa was a recent formation and that the change to the adult was at some distance off.

As to the sex of the pupæ—all of them seemed to be males. This was easily determinable by the slender form and by the prominent claspers of the genitalia which in the adult are almost completely withdrawn. I made no effort to discover sexual differences in the larvæ.

In appearance the larvæ were not in any way remarkable; they were fat, white grubs, the segments well marked, the head small, horny and yellowish. Figure 1 gives a fair representation of it. The pupa was, of course, the bundled-up adult with the sexual pieces much more prominent.

I was unable to find any reason for the presence of more than one bee in a cast unless, in some instances, two or more work in common, indicating the partial development of a social tendency. It seems reasonable to believe that those burrows that contain only two clusters with a few filled cells are made by one bee only; but it is perhaps a question whether a boring with three or more clusters is the product of a single individual in any case. Cast number 7, was evidently compound and the clusters are arranged in two series. The perpendicular extended down simply from the surface for 7 inches and was there divided into two series, each of which had cell clusters. Had there been two bees only it would have been easier to refer the matter to a common use of an entrance; but four bees require an agreement to use in common the entire perpendicular.

FIG. 2. Pupa of *Augochlora humeralis*.

There is a gap between July 1st, and July 12th–13th, when I spent another two days at Lahaway with Mr. Brakeley. On the morning of the 12th I put down twelve and Mr. Brakeley put down four casts in bee mine No. 2. In working back to these casts we found, in uncast borings, a number of cell clusters with anywhere from one to eight closed cells. All stages from the eggs to the fully colored pupæ were found, and 40 of the latter were put into closed vials for complete development; both sexes being obviously represented. A greater number of larvæ and pupæ were placed in alcohol. In general the insects were in the pupa stage. The eggs were very few and most of the larvæ were full grown.

It became increasingly evident that two or even three bees may work from the same perpendicular. Three bees were found in one cast in which there were five cell clusters. The relation of outer empty to inner filled cells, was now conclusively established by care-

ful dissection of uncast burrows. At first the insect makes one brood cell with three empties around it; rarely there are two cells in a line and four or five around it. Very occasionally there are three brood cells in a line with seven or eight empties around them. The usual form is one central with three around it, and then in order as already described. In one cast I found 10 filled cells and eleven open chambers around it.

July 13th we abandoned the regular bee mine for a study of another, higher field, which was less shaded and much hotter. Here we started another pit and, as it was a question only of cell clusters, a trench only thirty inches deep was needed. Here also we found a cluster of ten cells, all containing pupæ. A three-cell cluster was found in which was a perfectly-developed bee, capable of flight and which actually did fly a short distance in the attempt to escape. The second specimen from the same cluster was fully colored; but the wings were not yet expanded; the third was a white pupa with eyes beginning to color. This shows approximately the difference in time between the ovipositions of one bee and, from what I saw in the examples confined in the vials, there was a period of five days at least between each of these specimens. No bees of the new brood were yet about and, indeed, none of the old ones were seen above ground.

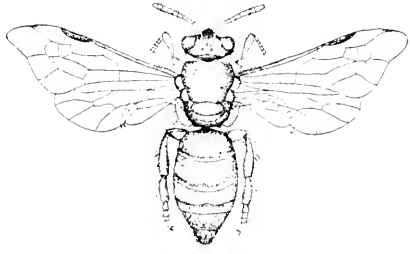

FIG. 3. Adult of *Augochlora humeralis*.

Some old bees were yet found in the burrows; but they seemed dispirited and were not at work. Many burrows had been abandoned by their makers and there was no appearance of new digging anywhere. The work of the hibernating examples was done, just about two months from the time they first began to make their appearance above ground.

Roughly then, the bees began work May 14th, the first completed cell with pollen loaf and egg was found June 11th, and the first larvæ were observed June 13th and 15th. The egg stage, then, is very brief. June 30th there were many pupæ, and a period of about fifteen days is indicated as the length of the larval life. The pupal stage is unexpectedly long, no actually emerged individuals being found on July

13th, though some were completed in the cells. This gives a full month for the pupal stage.

July 14th, Mr. Brakeley's notes are resumed, and as the result of his observations, he thinks temperature and relative maturity of the bee determine the size of the cell clusters and the number of eggs laid. Early in the season when ova are developing slowly, the bee makes only a single cell cluster, because she feels there will be plenty of time to build another series before she needs them: that series will contain from four to eight cells and form the bulk of the deposit. Late bees, coming out in hot weather, feel the ova developing too rapidly to allow of much delay and they build as many cells in one cluster as there may be need for. In case, after the main clusters are provided for, there be some late ovarian developments, a small cluster, lower down than usual is provided.

July 15th, bees were seen on the wing, and in the field where the adult was taken out of the cell July 13th, new diggers are already beginning to be notable. Whether males ever go down into these new burrows was not observed. On the 17th there were many new sand heaps, and on the 21st there was a general hatching and a general going down. Mr. Brakeley, in the course of some notes, writes: "About this time, happened to glance over the bee-bed and saw 100 blue bees or more, hovering low to the ground. Can't say where they come from, but I suspect that while I was working the upper clusters the lower series were unloading their adult bees." A sample of the conditions is shown in the following:

Case 1: Top cluster, 2 cells: 1 bee out, 1 cell yet closed, bee ready to emerge. Case 2; same status.

Case 3: Top, 2 cell cluster bees out of both; but 1 captured; lower cell cluster with larvæ.

Case 4: Top cluster, 2 bees out; lower, 1 bee out, one mature and ready to come out.

Case 5: 4 cell clusters: 1st of 10 cells, several empty, others with mature bees; 2d of 6 cells, some empty, others with bees nearly mature; 3d or 4 cells all with pupæ; 4th of one cell with larva.

July 22d, the last observation was made, and it was concluded from the fact, that digging began just as it did in May, that there would be another brood ready September 15th to 30th. So on September 17th Mr. Brakeley and myself were again on hand, making an observation trip through the blue bee territory. We saw no signs

of adults flying nor of any new burrows; but we did see signs of very recent digging from what seemed to be old sand hills. It looked as if new earth had been pushed out of the old burrows, and on investigation it proved that the oblique sand arm was being used and that bees were working in the borings. A number of the active hills were marked.

On the morning of the 18th four casts were put down, and on the afternoon three others. In digging to these casts a number of closed burrows were found and traced down with knife and trowel. An unexpected result was that not a single brood cell was found in any of the burrows; nothing but irregular fingers. The bees seem to have spent themselves in digging; first a very deep perpendicular and from that all sorts of irregular lateral galleries; but in not a single case was there a cluster of brood cells such as we found everywhere in June and July. The casts showed exactly the same features; there were a great lot of irregular processes; but there was not one single cluster, not a solitary brood cell, not a larva nor any other early stage found. And these were all burrows made by July bees! Mr. Brakeley and I saw the bees coming out of their summer burrows; and Mr. Brakeley saw them beginning to dig between July 14th and 22d. Thoughout that same territory where this digging was most active, we now find mostly flattened sand hills: a few from which fresh sand is being forced. In one case the sand was being carted directly out of the perpendicular. In the others it was forced through an oblique lateral which was not the same as that made in July: in fact, in one case we found traces of no less than three separate oblique laterals, all sand filled.

The interesting and unexpected feature was that not one of these midsummer burrows—and we traced at least twenty—showed any appearance of breeding cells. There is indeed not a particle of evidence that there has been any second brood; on the contrary, everything goes to prove that there has been none, and that the insects simply dig down to get beneath the surface: for despite their bright, metallic color they are strictly subterranean. One of the casts went down 52, another 55 inches and two of them we did not follow to the end; but where we did we usually found bees at the bottom. In other words we found practically the same condition of affairs that we found in Spring in Cock Robin Park where we first began work. Hibernation had really begun for some of them. In one case we found three bees, in another two bees, apparently working in laterals from the

same burrow: several bees then may be working in the same general system, all more or less independent of each other.

The conclusion was irresistible that there is no second brood: that the bees dig to get out of the sun and keep on digging in a sort of blind, instinctive way. They make all sorts of laterals and sometimes make processes that resemble cell clusters, in isolated instances going so far as to line individual cells with clay. But these clusters are never complete; there is never an enveloping or air space and the drop cells or fingers are of all sorts of lengths. In short the structures are not breeding cells at all. All the bees found were females, and the inference seems to be that after copulation they do more or less work all summer in a hap hazard sort of fashion; then late in the season they deepen the main burrow to between four and five feet. There from one to eight bees will pile on top of each other to go into hibernation. Some of the bees that we dug out more than four feet down, from burrows closed on top, were already almost dormant and could be freely handled without their making effort to sting; very different from the bustling activity of the newly hatched individuals or of those working on the brood cells.

The really remarkable fact is that these bees that have been digging such long burrows during the summer, abandon them in the spring and start all over again with new diggings for breeding purposes. A single bee may, in the course of its life, dig two quarter-inch tubes, which combined will equal between seven and eight feet in depth; and if the laterals and fingers can be added it would amount to at least two feet more—one of the most remarkable instances of apparently useless digging on record. Mr. Brakeley, as a matter of curiosity, weighed two bees taken in one of the winter burrows, and found them 1½ grains together; the larger of the two weighed less than one grain, and he put the problem thus: If a blue bee, weight less than one grain, will dig a hole double its own diameter, 64 inches deep, how deep ought a Princeton graduate, weight 185 pounds (or thereabouts), diameter two feet (more or less), to burrow to equal blue bee, weight for weight?

And he answers in this wise: One grain bee, 5 feet; one pound, bee, 7,000 grains—35,000 feet or, roughly, 7 miles. This would make for the Princeton graduate (or the Rutgers professor) 1,295 miles of tubing four feet in diameter! But this does not tell the whole story, for the calculation was made when we did not know that each bee digs two burrows of approximately equal depth.

Another interesting fact is this: the life of an individual female bee is eleven months at least, and of this entire period not more than ten days at the outside is passed above ground—probably much less, for only when gathering pollen does the insect come out of its den. How long an individual male lives I do not know, for circumstances prevented the continuation of observations. If it does nothing else, this note proves that an entire season may be not unprofitably spent in studying the habits of even a single species.

EXPLANATION OF PLATE III.

Structural details of *Augochlora humeralis* Patt., 1, anterior leg; antenna cleaner at *a*, at 2, yet further enlarged; 3, middle leg; 4, the single tibial spur yet further enlarged; 5, posterior leg; 6, spurs of posterior tibia, more enlarged; 7, claws of anterior tarsus; 8, claws of posterior tarsus; 9, antenna; 10, mandible; 11, palmate body hair; 12, tip of labium showing ligula, paraglossa and palpi; 13, tip of maxilla: all much enlarged. Original.

EXPLANATION OF PLATE IV.

Digging and breeding habits of *Colletes* and *Augochlora*. 14, burrow of *Colletes compacta*, the well-defined upper shaded portion representing the cast which runs to the end of the upper lateral; a "heel" extends below this lateral from the main burrow, below which the evenly shaded area represents the sand-filled portion of the digging; 15, brood cell of *C. compacta*, enlarged about two diameters, showing attachment of egg at sides, its tip resting on the food surface; 16, 17, casts made from hibernating burrows of *Augochlora humeralis*, actual length about 50 inches; 18, cast of breeding burrow of *Augochlora*, with two small cell clusters of brood cells; the oblique lateral at top, from which cast was made; lower part of cast broken off; actual length of portion shown 22 inches; 19, diagrammatic section, about $\frac{1}{3}$ natural size, showing oblique entrance to the perpendicular burrow; sand heap at surface, the entrance to the upright closed by a plug; 20, perpendicular from which lateral extends backward, natural size; 21, cast of a cell cluster with five brood cells: 22, section through a single cell cluster about twice natural size, showing pollen loaf and egg at bottom, the outside cells continued until they almost meet below the loaded cell; 23, egg of *A. humeralis*, very greatly enlarged. Original.

EXPLANATION OF PLATE V.

Plaster cast in position in the bee mine, ready to take out: has two brood cells.

In the bee mine, showing tools and method of digging out casts and investigating burrows: each notch or angle indicates a cast taken out.

NEW SPECIES OF HETEROCERA FROM TROPICAL AMERICA.—II.

BY WILLIAM SCHAUS.

Givira platea.

Head, collar, thorax, and subdorsal tufts on abdomen mottled black and brown; abdomen otherwise light brown. Primaries brown, irrorated with black; veins yellowish except the subcostal; the black irrorations forming indistinct spots on costa, in cell, and on inner margin; a large outer dark spot between 3 and 5 cut by vein 4; just beyond cell a fine whitish line, cut by veins, a subterminal wavy black line partly edged with white; terminal white spots between the veins; on basal third between veins 1b and 1c, an oval silvery spot, preceded and followed by smaller silvery white spots. Secondaries brown; the costal margin buff; veins 6 and 7 on secondaries from a point. Expanse, 26 mm.

Habitat: São Paulo, Brazil.

Givira watsoni.

Head and thorax brown, mottled with gray and white hairs; abdomen brown, tinged with olivaceous on last segment. Primaries: base brown, followed by a broad darker brown band, outwardly curved below the cell from costa to vein 1b, enclosing above vein 1b a small white spot; median space whitish, irrorated with brown, crossed by a fine dark broken line; close to end of cell a narrow brown shade, widening towards inner margin; beyond the cell a dark streak on veins 5 and 6; a dark subterminal brown line, widening before apex, slightly lunular between the veins, and shaded with white on either side; the outer margin brown. Secondaries brown with traces of darker spots near apex. Expanse, 25 mm.

Habitat: Pernambuco, Brazil.

Eugivira.

Antennæ rectinated. Primaries: neuration as in *Givira* Walk. Secondaries: veins 6 and 7 stalked.

GROUP I. VEIN 8 CONNECTED WITH 7 BY A BAR.

Juturna Schs. (*Dolecta*).
Aroa Schs. (*Langsdorffia*).
Teemessa Schs. (*Givira*).
Philomela Schs. (*Givira*).
Cestroides H. S. (*Hypopta*) 7 & 8 on primaries on very short stalk.
Arheloides Dyar (*Inguromorpha*).
Sabulosa Schs. sp. nov.
Quadra Schs. sp. nov.

GROUP II. VEIN 8 FREE.

Durangona Schs. sp. nov.
Carisca Schs. sp. nov.
Pallidicosta Schs. sp. nov.
Nudaria Schs. sp. nov.
Plagiata Schs. sp. nov.
Pardana Schs. sp. nov.
Pulverosa Hamps. (*Givira*).

Eugivira sabulosa.

Body light brown. Primaries light brown, irrorated with darker brown, and blackish lines, forming indistinct shades and strix; blackish spots on costa; an interrupted blackish inner line; a dark spot at the end of the cell; an outer irregular dark line, connected with the submarginal irregular shadings, and the terminal dark blotches, by dark lines from vein 3 to inner angle, and along vein 4, also about veins 7 and 8; fringe mottled, light and dark brown. Secondaries brown with irregular darker transverse strix on outer half. Expanse, 37 mm.

Habitat: São Paulo, Brazil.

Eugivira quadra.

Body gray; darker transverse shadings on abdomen. Primaries: costa whitish with four black spots, a long black streak and then a shorter black streak; cell whitish, irrorated with light brown; a dark spot at end of the cell; basal half of wing below medium vein reddish brown, this space ending at origin of vein 2 above, and below on inner margin at 1b; beyond this to vein 3 is a whitish space slightly irrorated with brown at inner angle; above vein 3 and beyond cell the wing is thickly irrorated with brown, shading to buff at apex and extreme outer margin. Secondaries whitish, irrorated with brown above vein 3, and with traces of broken lines towards apex; an indistinct grayish spot at end of cell. Expanse, 37 mm.

Habitat: São Paulo, Brazil.

This species has vein 1c as in *E. arbeloides* Dyar.

Eugivira durangona.

Head and thorax pale buff. Abdomen white with a subdorsal blackish tuft. Primaries white; some dark points along costa; on middle of inner margin a cluster of reddish brown and black scales; an indistinct reddish brown shade beyond cell; three outer rows of minute and indistinct grayish spots between the veins. Secondaries white, covered with small indistinct grayish spots except on inner margin. Both wings with an interrupted dark terminal line; fringe white, mottled with light reddish brown. Expanse, 26 mm.

Habitat: Durango, Colorado?.

Eugivira carisca.

Head, collar and thorax buff, laterally shaded with brown; posteriorly on thorax a tuft of reddish brown scales, and subdorsally on second segment of abdomen a similar tuft. Primaries whitish; at base a cluster of large dark brown spots separated by veins, and not below vein 1b; a similar space below origin of vein 2 to inner margin, where it is widest, and merely divided by vein 1b and 1c; a round brown spot in cell before its end; just beyond the cell a bright brownish red spot; the outer space above vein 1 irrorated with brown, forming large spots subterminally from veins 3–8; costal margin spotted with brown; apex and outer margin thickly irrorated with brown. Secondaries grayish white. Expanse, 23 mm.

Habitat: Jalapa, Mexico.

Eugivira pallidicosta.

Body dark gray. Primaries: costa to near apex broadly white, shaded below through cell and to apex with dark brown; the basal half of wing and inner margin is shaded with reddish brown, otherwise the wing is pale gray with about seven very broken transverse brownish lines, consisting chiefly of clusters of scales at the veins. Secondaries white. Both wings with dark geminate spots terminally at veins; fringe whitish, divided by a dark gray line. Expanse, 24 mm.

Habitat: Castro, Parana.

Eugivira nudaria.

Body mottled gray and pale brown, the former color predominating. Primaries light gray, irrorated with white specks and striated with darker gray, forming indistinct bands, especially on outer portion; the inner margin with some black strie; costal margin spotted with black, the second from base large, and prolonged as a black streak to vein 1b, the fourth also large and crossing cell. Secondaries whitish, striated with gray on outer half. Both wings with terminal grayish spots at veins, fringe mottled gray and white. Expanse, 35 mm.

Habitat: Aroa, Venezuela.

Eugivira plagiata.

Body brown. Primaries gray, shaded with light brown at base and on inner margin; the outer portion mottled with white and brownish gray striæ; a dark brown spot on costa near base; a larger brown spot below cell a little more remote from base; a spot at end of cell, and another below vein 2; a subterminal brown spot between 4 and 5, larger ones between 6 and 8, and a minute one on costa before apex; terminal grayish brown spots at veins; fringe mottled gray, buff, and pale brown. Secondaries dark grayish brown, paler terminally with dark spots at the veins, and a dark subterminal shade below costa; fringe mottled buff and brown. Expanse, 38 mm.

Habitat: Aroa, Venezuela.

Eugivira pardana.

Thorax light brown with darker markings. Primaries light brown; a basal, inner, outer and subterminal row of round, dark brown spots, edged with whitish; the basal and inner row nearly straight, the outer curved beyond cell and geminate above vein 5; the submarginal spots very large between veins 4 to 7, the one between 5 and 6 nearer the outer margin; some dark spots in cell between the median and outer rows; two spots above inner margin between outer and subterminal rows; terminal dark spots at veins, those above veins 2–4 elongated obliquely to vein above; the terminal spots extending on to fringe. Secondaries with traces of darker, transverse, irregular and broken lines. Expanse, 30 mm.

Habitat: São Paulo, Brazil. Antennæ serrate fasciculate.

ARBELIDÆ.

Langsdorfia coresa.

Body dark brown. Primaries grayish brown, with dark brown markings; small

spots on costa, in cell, and below it; inner margin with transverse streak; a reddish brown shade at end of cell; marginal space with reticulations; below costa a large subterminal spot, and smaller spots below it to vein 3, these spots partly edged with white. Secondaries dark brown, with still darker streaks and reticulations. Expanse, 27 mm.

Habitat: Colombia.

HEPIALIDÆ.

Phassus trojesa.

Head and thorax black. Abdomen black; transverse pale buff lines posteriorly. Primaries gray, covered with minute black striæ edged with light brown; basal third of vein 1b broadly white; below this vein, at base, a long black spot: at end of cell a white spot close to vein 6; a medium brownish shade from end of cell to vein 1b, between which and median vein, it is very dark; a broad subterminal brown band, outwardly curved between 5 and 8; outer margin and fringe dark brown with triangular paler spots; some white shades before apex; costal margin with dark spots. Secondaries grayish brown; light brown hairs at the base; some of the veins on outer margin light brown; fringe light brown; two dark spots on costa before apex; fringe spotted with brown towards apex. Expanse, 70 mm.

Habitat: Trojes, Mexico.

Dalaca tesselloides.

Body pale brown. Primaries pale brown; the cell and spaces between the veins evenly filled with geminate darker streaks, somewhat curved towards each other and surrounded by a buff shade, but not forming complete circles; beyond the cell from vein 4 to 7 is a line, inwardly shaded with buff. Secondaries light reddish brown. Expanse, 62 mm.

Habitat: Paraguay.

Dalaca basirubra.

Head and thorax dark brown, the later somewhat paler posteriorly. Abdomen brown; the base dorsally with long red hairs. Primaries dark gray; the space between the subcostal and median shaded with dark ochreous brown; near base of cell a small golden yellow spot; three similar spots at origin of vein 6; some simila, scales above cross vein connecting 2 and 3; an outer, subterminal and marginal row of dark ochreous brown spots, the outer row shaded with brighter ochreous between veins 4–7; above vein 1b two dark velvety brown spots, partly edged with light gray. Secondaries light brown, with long reddish hairs at base. Expanse, 80 mm.

Habitat: Peru.

Cibyra dorita.

Head and thorax dark brown. Abdomen fawn color. Primaries: costal and inner margins violaceous brown; the space between veins 2–7 dull golden, crossed by the reddish veins, and dull lilacine brown blotches, edged with reddish; a silver spot at base of cell, and another towards vein 2; a large silver spot at end of cell, and a series of silver spots between veins 5 and 7. Secondaries buff at the base, shading

to reddish on the outer margin; fringe dark at the base, terminally pale. Expanse, 33 mm.

Habitat: Castro Parana.

Cibyra poltrona.

Head and thorax ochreous brown. Abdomen buff. Primaries ochreous brown on costa and inner margin, the intermediate space more ochreous; on terminal half some indistinct transverse lines, darker than the ground color, inwardly edged with a paler shade; these lines do not form spots. Secondaries reddish brown, somewhat roseate in the cell. Expanse, 40 mm.

Habitat: Castro. Parana.

Cibyra dormita.

Head and thorax dark brown. Abdomen light brown. Primaries reddish brown shaded with gray on basal half of inner margin, and within the outer line, especially towards costa; an oblique darker shade from base of subcostal to middle of inner margin; the outer line fine, dark gray, shaded with lighter gray, and followed by a broad reddish brown shade; subterminal grayish spots between the veins; some silvery white spots outlined with black, one at base of cell, a larger oblique spot at end of cell, some minute spots on veins 5 and 6 beyond the outer line, a minute spot at vein 2. Secondaries blackish brown; the outer margin and fringe light brown. The female has a terminal white spot between veins 7 and 8, and 8 and 9. Expanse, ♂ 40 mm., ♀ 68 mm.

Habitat: Petropolis.

Cibyra brunnea.

Body brown. Primaries light brown; the costa spotted with black; a basal, and a geminate inner oblique row of dark brown spots; a median row of large brown spots, elongated below costa, and above inner margin shaded on either side with fawn color; three silvery spots at origin of vein 6; a broad outer brown shade, forming spots below vein 5, these spots edged on either side with dark brown and then fawn color; a subterminal row of dark lunular spots outwardly edged with fawn color; the fringe light brown with darker blotches. Secondaries dull blackish brown. Expanse, 31 mm.

Habitat: Aroa, Venezuela.

NOTES ON LEPIDOPTEROUS LARVÆ FROM JAMAICA, B. W. I.

By MRS. E. M. SWAINSON.

Papilio homerus *Fabr.*

The caterpillar is most peculiar, and differs from the rest of the larvæ of the Papilionidæ in not having the two fleshy retractile ten-

tacles on the back of the segment next the head. In color it is green and brown; across the neck is a band of white, on which are spots of light blue; in shape this band is something like a half moon. There is also a band of brown in front of this with a spot at each end, in the center of which is a tiny dot of brown and above it a line of pale blue. Length about two and a half inches.

I have always found the larvæ resting on the top side of a broad green leaf (named for me as *Thespesia populnea*). The first time I found several together and thought them most uncanny looking creatures. The butterfly is very rare, being found, so far as I know, in and near Bath in S. Thomas of East and near Moneaque and Union Hill in S. Anns.

Papilio pelaus *Fabr.*

The larva is brown; a pair of short subdorsal tubercles on each of the first four body segments; a dash of creamy white on the side of the body.

Aganisthos odius *Fabr.*

The caterpillar feeds on the leaves of the trumpet tree. When fully grown is it very pretty and measures two and three-fourths inches in length. Its colors are light green and brown in alternate bands, with rows of branching spines, the middle ones black, those on the sides white. The face is cream colored with black marks. Two days before changing to chrysalis the whole larva turns a bright yellow color with orange marks. The pupa is suspended by the tail; pale yellow at first, changing afterwards to a red-brown with darker markings.

Heterochroa iphicla *Linn.*

This most curious caterpillar is about one inch long, of a dull dark brown, the head a darker color with sharp short spines of reddish brown around it. On first segments are two brown horns with sharp points bending over the head; from this to the end of the third segment is silvery gray; then two tiny horns bending backward. On the ninth and tenth segments on the back are two branching stellate spines; on the other segments tiny spines at the sides. The whole larva is a mixture of brown and gray; it rolls itself up on the outside of a leaf and looks so much like dirt that I have passed it for such.

The chrysalis is attached by the tail to a leaf. It is of a pretty fawn color; the under side is reddish and glitters like gold. The

shape is very curious, resembling the pictures of "Punch," long nose and all.

Euptoieta hegesia *Cram.*

The caterpillar when young is bright red with a line of white down the back and on each side; six rows of spines of a metallic blue-black color; face red; two black horns on the head. When fully grown it is an inch and a half long, body very dull red; spines jet black, the whole larva shiny.

The pupa is attached by the tail and very pretty. It is dark brown in color with white marks which turn to silvery gilt.

Lives on the wild yellow primrose.

Junonia genoveva *Cram.*

A beautiful velvety black caterpillar about two inches long; the body is covered with tiny yellow dots. Six rows of black branching spines with dark blue metallic spot at base of each spine. Face black with a spot of buff, a ring of bright buff around the neck. Legs black and brown with buff marks above them, two rows in some larvæ while in others these marks hardly show.

The chrysalis is gray brown with pale-pinkish markings and attached by the tail. Food plant blue vervine; the stem of the plant near the ground is purplish black, and on this the larvæ rest, so closely resembling it in color that it is hard to detect them.

Victorina steneles *Linn.*

The larva is deep velvety black and nearly two inches long. Seven rows of very finely branched spines: when young these spines are bright red, in the adult form the bases of the spines are creamy red; the middle and lower rows are very fine, while the rows each side of the middle are much thicker and enlarged at the base; the points of the spines are slender. Face shining black; two long dull red horns on the head bending backward.

The chrysalis is pale green without markings and attached by the tail.

Gymnæcia dirce *Linn.*

These caterpillars are velvety black with pale yellow marks on the sides; the first body segment bears dorsally two white painted spines of moderate length, the other segments bear stellate spines. The spines on the first four segments are white; on the fifth to eleventh,

yellow; on the last white. When very young the larva is black with tiny white spines; as it grows older all the spines turn yellow. The chrysalis is attached by the tail, is gray at first, changing to brown. Food plant, the leaves of the trumpet tree. The young larvæ eat the ribs of the leaf near the stem so that it hangs down as if dead; beneath this the larvæ remain concealed, several together.

Eresia frisia *Poey.*

A small gray caterpillar with an almost black line along the sides: eight rows of tiny spines covered with fine hairs; those around the head bright buff. Face shining, two shades of gray. The larva curls itself up and falls to the ground when touched. Length nearly one inch.

Chrysalis very small, attached by the tail: dark brown in color.

Danaus gilippus var. **jamaicensis** *Bates.*

The pretty smooth caterpillar is a little over one inch long, with alternate stripes of black and white and a short band of bright yellow on each segment on the back and spots of yellow at the ends of the white stripes just above the legs. On the second, fifth and eleventh segments are a pair of tentacles, crimson at the base and merging into dark red at the tips. The first pair of tentacles are much longer than the others. Face black and white; legs all deep velvety black. The whole caterpillar looks like enamel. Some of the larvæ are much more white than others. The pupa is very pretty, being light green with tiny black dots and gold spots. It is attached by the tail. I have had the chrysalis pale pink instead of green. Although Mr. Stuart Panton gives the food plant as *Asclepias curassavica*, I found it to be the wild wat plant [probably *Vincetoxicum palustre**—Harrison G. Dyar]. This butterfly has been described by Mr. E. S. Panton in the Journal of the Jamaica Institute, I, pages 311–314 (1893).

Pyrgus syrichtus *Fabr.*

The larva is about one inch long covered with tiny white dots and short white hairs which give it the appearance of being powdered; a dark green mark down the middle of the back, neck reddish brown. It puts one leaf over the other and lives between them. The chrysalis is enclosed in a leaf. Head and wing cases a dark green, the lower part greenish white; all looking as if powdered.

* This is the food plant of *D. gilippus* var. *berenice* in Florida—H. G. D.

Cydosia submutata *Walk.*

A pretty half looper larva, soft velvety black with orange marks down the back and sides; between these are tiny yellow marks. On the third, fourth and fifth segments are only tiny orange marks and on the third segment four shining black spines; the fourth and fifth segments have two spines each; on the rest of the body are very fine black hairs. Face and legs black with orange marks. When quite young the pale yellow marks are white. When touched the larvæ curl themselves and drop to the ground. Turned to a chrysalis in the earth, chestnut brown, short and fat.

Euthisanotia timais *Cram.*

Larva black, about two inches long; the body is covered with small pale yellow spots; face, legs and tail dull buff with black marks, front legs black. There are very fine black hairs on the body. Pupa dark brown, formed in the earth. Food plant lilies. They seem to eat most kinds and are quite a pest, eating off every leaf down to the ground. Lent lilies they are very fond of.

[This description does not agree at all with Guenée's figure, Sp. gen. Noct. vi, plate 2, Fig. 6, but there is no reason to doubt the accuracy of Mrs. Swainson's notes. Her bred moth is before me—Harrison G. Dyar.]

Gonodonta incurva *Sepp.*

A beautiful jet black velvety [semi-]looper nearly two inches long; face black with small cream colored spots on top of head. On each segment at the sides are bright red spots: on the second and third segments is a band of bright red across the middle of the back: the band on the second segment has tiny cream colored marks around it; on the fourth segment are cream marks with a red one across them. All the other segments have two red spots each side of the middle of the back. When young these spots are orange and in some pale yellow.

Pupa smooth, red brown, enclosed in a nest of cut up leaves. They have a curious way of attaching this nest to the side of a stem.

Plusia eriosoma *Doubl.*

A small green [semi-]looper. When quite young the back is dark green with a whitish line on each side, below which on each segment is a black dot. Front legs black, face yellowish. When fully grown the caterpillar is over one inch long, the body, legs, face and all are

uniform light green. Chrysalis light green with brown marks, enclosed in a white web.

[These notes were sent me by Mr. T. D. A. Cockerell with others on certain well-known species which it did not seem worth while to publish. I have seen the bred imagos of all except the first three and last two; the last two were determined by Sir G. F. Hampson. It has been impossible to get the names of the food plants—Harrison G. Dyar.]

AN ABERRATION OF PAPILIO PHILENOR.

By Archibald C. Weeks.

(Plate VI.)

Papilio philenor *Linn.*, aberr. **wasmuthii** aberr. nov.

This form, the type of which was exhibited by Mr. William Wasmuth at a meeting of the Brooklyn Entomological Society, held December 6, 1900, and a figure of which is shown herewith, was produced from one of two nearly matured philenor larvæ taken by him in the latter part of August, 1900, upon the Dutchman's Pipe plant (*Aristolochia sipho*) growing in front of his residence. Neither larva displayed any characteristic, either in size or general appearance, to distinguish one from the other nor from other larvæ of the same species. Shortly after their capture they pupated and together on the same day, about the middle of September, emerged. One proved to be an orthodox *philenor*, and the other so unusual a deviation from the type as to warrant a special designation. Broadly stated, the aberration consists, upon the upper side, of the extension inward between the veins of the white marginal lunules to such a distance as in the primaries to comprehend the entire submarginal row of white spots, and in the secondaries to leave only a more or less faint line of separation, increasing in fullness in the direction of the inner angle. In the primaries the white indentations assume a sagittate form, the first at the apex being narrower than, and half as long again as, any of the others. In the secondaries the indentations are more nearly subquadrate. All indentations are separated by the veins, heavily bordered with the ground color of the base and discal area, and the majority of them are cleft by a narrow line paralleling the veins. The portion

of darkened border of the median nervules extending into the tails is so widened as to nearly include the entire area of the latter. The whitened areas are, in many instances, somewhat suffused, particularly at the apex. The aberration is repeated upon the under side, except that in the secondaries the white indentations are more extended laterally, the heavy border of the intersecting veins being proportionately decreased except toward and at the edges. The right tail also is deeply invaded by white, while the left retains the original hue.

It is extremely difficult to convey by means of a photograph or description a clear conception of the odd and striking appearance of the butterfly. Had it been taken in free flight in a remote locality without previous knowledge of its origin, it could not but have occasioned much curiosity and discussion. The accompanying figures were drawn by Mr. Charles J. Martin, of Brooklyn. The type is in the collection of Mr. Wasmuth.

TWO NEW BEMBICINE WASPS.

BY WILLIAM J. FOX.

Bembex beutenmulleri, sp. nov.

♂. Deep black throughout without pale marks on thorax or abdomen; pubescence of head and thorax rather conspicuous, cinereous; clypeus except a crescentic basal black spot, labrum, mandibles except base, line on scape beneath, flagellum beneath entirely, or with each joint spotted (or again entirely black) inner orbits, tips of all femora, a line on anterior and middle tibiæ, and a spot at apex with no hind ones, yellow; wings hyaline, veins testaceous. Front narrow, distinctly more so than *B. amœna*, to which this species is related; clypeus convex, quite short medially, owing to the strongly incurved fore-margin; eighth antennal joint bidentate; medial femora smooth, not serrated, the lower margin rather sharp, their tarsi much longer than their tibiæ; second ventral segment finely carinated down middle; sixth ventral with two elongate, parallel tubercles, varying in strength; seventh produced into an acute spine. Length, 17–18 mm.

Habitat: Fresno County, California. Four specimens collected by the late Henry Edwards, and now in the collections of the American Museum of Natural History. It comes closest to *Bembex amœna*, though it is related to *primosa* and *occidentalis* in spined seventh ventral segment.

It has a strong superficial resemblance to *Bembex cinerea* which is quite distinct from it, and has so far been recorded from Georgia

only. It is quite probable that the notes of M. Coquillett* really apply to this species, and not to *B. cinerea*, which does not occur in California.

Steniolia sulfurea, sp. nov.

♂. With the exception of the entirely black thorax, front, vertex, cheeks (except orbits), small spots on the coxæ and trochanters, first segment of abdomen on its fore surface and a triangular mark above (which is sometimes merged into the black anterior), the insect is bright sulphur yellow; the flagellum dark above, yellowish on basal half beneath, wings hyaline; pubescence of head and thorax dense and grayish.

Flagellum slender, acuminate, though shorter than in *S. duplicata*; front long and narrow, much more so than in the species mentioned; legs robust; second ventral segment carinated on apical third, the carina extending to apical margin where it projects in the form of a slight tooth; seventh ventral segment medially at apex with an emargination, in which rests a large bifurcated process forming part of the genitalia and having one furcation much longer than the other. Length, 19–20 mm.

Habitat: Shasta County, California. Two specimens collected by the late Henry Edwards and forming part of the collection containing the preceding specimens. It is not closely related to any described species of *Steniolia*, and is quite remarkable in its coloration.

NOTE ON THE LARVA OF PSAPHIDIA THAXTERIANUS.

By Harrison G. Dyar.

Head luteous brown, dotted with whitish, a black patch on each side of the clypeus with a brown shade on the angle of the lobe and one extending upward on the posterior edge of the lobe, widening above to suggest an elliptical pale enclosure on the side; width 3.3 mm. Body vinous brown, a little greenish tinted; a series of large subdorsal creamy white patches on joints 2 to 14, on the thorax covering the sides of the cervical shield setæ ia to iib, on the abdomen setæ i to iii (the patch somewhat trilobate) and whole of anal plate. Tubercles and spiracles white; setæ normal, single, distinct, but fine, pale; thoracic ones well separated and all present.

The handsome larva of this rare Noctuid occurred to me on the white oak at Brookhaven, N. Y., in June. It was fully grown and

* *Proceedings Entomological Society of Washington*, V. III, p. 236.

pupated immediately in the earth. The moth emerged the following May.

DIAGNOSIS OF A NEW ARCTIAN.

By HARRISON G. DYAR.

Dodia albertæ, gen. nov. et sp.

Head moderately prominent, tongue weak, palpi short, not reaching front, eyes naked, ocelli large; ♂ antennæ simple with bristles and cilia; body slender, geometriform, vestiture hairy but short; hind tibiæ with four spurs, fore tibiæ with terminal spine; primaries broad, trigonate; secondaries large and ample. Vein 1 free, scarcely forked at base; 2 from middle of cell; 3–5 rather approximate, 5 nearer 4 than 6; 6 from end of cell, free or shortly stalked; 7–10 stalked, 8–9 nearly at apex; 11 and 12 free; on hind wings 3–4 approximate; 5 strong, arising near 4; 6–7 stalked; 8 anastomosing with cell to near middle. Frenulum present. Gray, wings diaphanous with only a faint whitish waved subterminal line or considerably washed with whitish over the basal half of the wing, leaving a gray subbasal curved band and a slightly waved, oblique, median one, between which and the subterminal line are whitish powderings. Hind wings subhyaline. Expanse, 34–35 mm.

Three ♂ ♂, Calgary, Alberta, Canada (F. H. Wolley Dod). One, taken June 11 is fresh and washed with white; a second, July 3, is diaphonous gray with only traces of markings, while the third, July 10, is rubbed and nearly hyaline.

U. S. National Museum, type No. 5747.

DESCRIPTIONS OF THREE LEPIDOPTEROUS LARVÆ.

By D. W. COQUILLETT.

Homœosoma mucidellum *Ragonot.*

Body green, minutely granulated, a brown dorsal and subdorsal stripe, first thoracic segment brownish, darkest laterally, cervical shield yellow, bordered posteriorly with black piliferous spots, minute, black, spiracles circular, wholly black, anal plate unmarked, head brown, an ocellar black dot and above it a large black spot; 16 legs; length, 8 mm.

Found two February 12, 1893, in thin, white cocoons beneath a piece of paper in the grass near Los Angeles, Cal. One pupated February 15, and the moth issued March 28.

Ephestiodes gilvescentella *Ragonot.*

Body dull olive brown, in the younger ones marked with a dorsal, subdorsal and stigmatal whitish stripe, which are sometimes so dilated as to almost cover the whole body, but in the older ones they are narrower, sometimes being entirely wanting; piliferous spots quite distinct, blackish brown; spiracles ringed with black; head dark, reddish brown; cervical shield yellowish brown, bordered posteriorly with black; on each side of the first thoracic segment is a rather large, polished, blackish, stigmatal spot; thoracic legs whitish, marked with black; no anal plate; length, 11 mm.

Found many on trunks of orange trees at Los Angeles, Cal., Jan. 5 and 7, 1889. Some were in masses of dry leaves, in the crotches of the trees, and the leaves bore evidence of having been fed upon by them. Others were in silk-lined channels in the bark of the tree, beneath débris of various kinds adhering to the bark. They refused to feed upon the green orange leaves. The moths issued from February 21 to March 8.

Setiostoma fernaldella *Riley.*

Body greenish white, a dorsal row of large pinkish spots, a rather wide subdorsal and narrower stigmatal interrupted pinkish line; the three thoracic segments wholly pinkish; piliferous spots and spiracles black or dark brown; cervical shield blackish brown, head yellowish brown; length, 12 mm. Lives on *Quercus agrifolia* between two leaves fastened together with silk threads. Found many larvæ June 13, 1886, near Los Angeles, Cal. The moths issued during the following month. Young larvæ also were found in the same locality, Feb. 12, 1888.

NOTE ON A SPECIES OF PSILOPYGA.

BY CHARLES SCHAEFFER.

Specimens collected by Dr. R. E. Kunze, in Arizona, agree very well with the description of the Mexican *P. fasciata* Sharp, except in the extent of the red markings, which are said to occupy two-thirds of the elytra in the Mexican species, while in the specimens from Arizona the red occupies only one-third of the elytra. According to Dr. Sharp the generic name *Psilopyga* must be restored for our species of *Oxycnemus*.

THE EARLIER STAGES OF SPHINX GORDIUS.

By WILLIAM BEUTENMÜLLER.

Egg.—Globular, smooth, shining, pale green. Width, 1 mm. Height, .75 mm. The egg is similar to that of *Sphinx lucitiosa*, but is smaller and more globular. Emerged July 6th.

Stage I.—Pale whitish green, caudal horn jet black, with two hair-like bristles at the tip. Length, 3.5 mm. As the larva becomes older there appears at the sides five white oblique bands and a subdorsal stripe of the same color. Length, 7 mm. Getting ready to moult July 10th and 11th. Moulted July 11th and 12th.

Stage II.—Pale green with pale yellow granulations, and pale yellowish oblique bands at the sides and a subdorsal stripe, broken by the bands. Caudal horn reddish brown, cherry red at base. Feet, legs and head, pale green. Getting ready to moult July 14th and 15th. Moulted July 15th and 16th. Length, 12 mm.

Stage III.—Pale green, thickly beset with yellowish granulations, and a short subdorsal stripe on each side composed of yellow granulations. The oblique bands yellow behind, red in front and slightly white in the middle. Head green with a yellow stripe on each side in front. Caudal horn red with short spines. Thoracic feet red. Abdominal and anal legs green. Getting ready to moult July 18th and 19th. Moulted July 19th and 20th. Length, 18 mm.

Stage IV.—Head light green with a broad yellow stripe on each side in front. Body bright whitish green with the oblique bands broad, bright crimson in front, yellowish behind and white in the middle. Caudal horn crimson. Thoracic feet crimson. Sometimes the caudal horn is crimson above, orange beneath or blackish above, yellow beneath and red at the sides. Moulted July 23d and 24th. Length, 24 mm.

Stage V.—Same as in the previous stage. Moulted July 29th and 30th. Length 35 mm.

Stage VI.—Body bright apple green with numerous small yellowish or whitish dots, some of which are encircled with black. Along each side are seven oblique, bright carmine stripes, which are white posteriorly, the carmine shading into the white. Caudal horn black at the sides and tip, green at the middle above and beneath. Spiracles orange. Head with a yellowish and brownish stripe on each side in front. Thoracic feet pink, greenish at the base. Abdominal and anal legs green. Length, 65 mm.

Food-plants: Apple, huckleberry, *Myrica*.

THE EARLIER STAGES OF CERATOMIA AMYNTOR.

By WILLIAM BEUTENMÜLLER.

Stage I.—Body pale green, with a whitish dorsal line and one on each side on the subdorsal, the oblique stripes along the sides running through the subdorsal line and almost touching the stripe on the dorsum. Caudal horn yellowish with two fine fork-like setæ at the tip. On each the second and third segments are two short, blunt, stout tubercles. Thoracic feet and abdominal legs green. Length, 8.50 mm. Getting ready to moult July 13. Moulted July 14th.

Stage II.—Same color as in previous stage. Body and head, granulated, and the line along the dorsum in form of serrations. The tubercles on the second and third segments more prominent. The body is regularly wrinkled and the granulations are placed on these transversely. Length, 15 mm. Moulted July 18th.

Stage III.—Uniform green above and below. The dorsal line is now composed of rather prominent elevated serrations and at the anterior edge of the first segment a transverse row of serrations. The oblique stripes along the side almost touch the dorsal line. Caudal horn yellow. The tubercles on the second and third segments yellow and beset with small yellow protuberances. There is also a serrated, yellow, subdorsal line, beginning at the anterior edge of the first segment and running to the end of the fourth segment; it is broken by the tubercles. Length, 21 mm. Moulted July 22d.

Stage IV.—Head green with a yellow line on each side and covered with yellow, granular dots. Thoracic feet yellow, tip red. The tubercles on the second and third segment are now fleshy and very prominent with canary yellow protuberances. The row of serrations on the anterior edge of the first segment is now also very prominent. The subdorsal line as in the previous stage. The dorsal line prominent and distinctly serrated, pinkish, white. The seven pinkish white oblique stripes along the sides, raised by tubercular dots. Caudal horn yellowish. Anal plates with yellow borders. Body wholly dotted with whitish grandular dots. Length, 25 mm. Moulted July 27th.

Stage V.—Same color and marking as in the preceding stage, except the thoracic feet, pink. Length, 45 mm. Moulted July 31st and August 1st.

Stage VI.—Chocolate brown with the dorsal serrations and lateral oblique stripes somewhat paler. The lateral stripes are now composed of elevated serrations; behind each stripe is a pale brownish-gray hue or shade. Subdorsal serrated line somewhat like in the last stage, but more prominent. The four fleshy tubercles with yellow warts. Anal-plate maroon brown. Head chestnut brown, granulate, with a paler stripe on each side. Mouth-parts yellow; mandibles black. Thoracic feet chestnut red.

Food-plant: Elm.

As is well known the usual color of the fully grown larva is green instead of brown and the species also feeds on linden and white birch.

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THE EARLIER STAGES OF SMERINTHUS GEMINATUS.

By WILLIAM BEUTENMÜLLER.

Stage I.—Wholly green. Caudal horn black. Head globular. Length, 4 mm. Moulted June 5th.

Stage II.—The head is now triangular and slightly furcate on the vertex and covered with minute granulations. Along the sides of the body are seven oblique yellow bands, broken on the subdorsum by a longitudinal, narrow yellow line. The bands and lines are composed of elevated granulations. Over the body are numerous elevated granulations. Caudal horn reddish brown. Tip of thoracic feet pinkish. Length, 7.5 mm. Moulted June 9th.

Stage III.—Very much like the last stage, but the oblique lateral stripes are paler and the subdorsal stripes more conspicuous on the first to the end of the fourth segments. Length, 12 mm. Moulted June 11th.

Stage IV.—Pale green with the subdorsal line only reaching to the end of the fourth segment and composed of serrations, and much deeper yellow. The body is covered with whitish green granules, giving the larva a light appearance. The last oblique stripe on the sides reaches to the tip of the caudal horn, which is black above. Head triangular. Spiracles black. Thoracic feet black, pinkish at the base. Length, 15 mm. Moulted June 16th.

Stage V.—Head more triangular with a yellow vertical stripe on each side in front. Body bluish green with the subdorsal line as before, but more distinct and clear, pale straw yellow. Oblique stripes on the sides less distinct, except the last, bright yellow and reaches the tip of the caudal horn, which is now reddish above and below. Spiracles black. Length, 28 mm. Moulted June 22d.

Stage VI.—Body decidedly bluish green, more so than in the last stage, especially along the dorsal region, granular. Subdorsal line and oblique stripe like before. Caudal horn bluish purple. Thoracic feet purplish. Abdominal legs purplish outside. Spiracles black, center white. Length, 55 mm.

Food-plants: Cherry, wild and cultivated, plum, apple, elm, oak, hazel, willow, poplar, hornbeam, birch, ash, etc.

DESCRIPTIONS OF THREE LEPIDOPTEROUS LARVÆ.

By WILLIAM BEUTENMÜLLER.

Alaria florida.

Head shining green; cervical shield green with a purplish patch on each side; body bright green, covered with numerous, elevated, white granules; dorsal line and indications of a line above the spiracles darker green. There is also a trace of a faint pale line along the spiracles. Junctions of segments with a narrow yellow transverse line above. Underside smooth, bright green with a whitish tinge. Length, 30 mm.

Found on evening primrose, August 17th. The moth emerged the following July.

Hadena devastatrix.

Head very glossy chestnut brown; smooth parts pitchy black; cervical shield rounded at the sides and behind, testaceous; anterior edge blackish, glossy; body dirty brownish white, very glossy, with a dark band on a junction of each segment. A few short hairs are scattered over the body, which arise from minute piliferous spots. Thoracic feet testaceous, tips pitchy black; spiracles black; abdominal legs not prominently developed. Length, 30 mm.

Found under a stone, May 27th, living in a burrow about three inches deep.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF OCTOBER 16, 1900.

Held at the residence of Mr. Chas. Palm, 172 E. 64th St. Vice-President Palm in the chair. Nine members and two visitors present. Mr. Joutel acted as recording secretary *pro tem.* in absence of Mr. Shaeffer.

Mr. E. P. Felt was proposed for corresponding membership by Mr. Joutel.

Mr. Chas. Palm exhibited some rare coleoptera from Arizona, collected by Dr. Kunze, amongst which were *Cychrus snowii*, from the Pima Mountains, *Melanophila mirandi*, *Plusiotis gloriosa*, *P. leontei*, *P. woodii*, *Chalcolepidius smaragdinus*, *C. tartaricus*, *C. behrensii*, *C. webbi*, *Xylorytes faunus*. He also showed an intermediate form of *Dynastes tityus* and *grantii*. After discussion and informal meeting, adjournment.

MEETING OF OCTOBER 20, 1900.

Held at the residence of Mr. S. Beyer, 511 E. 117th St. President Beutenmüller in the chair. Ten members present.

The treasurer was authorized to deposit in the savings bank such money as he deemed advisable to put out on interest. Mr. E. P. Felt was elected a corresponding member of the Society. On motion it was decided to have an outing on December 1st and 2d to the Ramapo Mountains. Mr. Weeks reported the death of Rev. George D. Hulst, and upon motion Messrs. Beutenmüller and Weeks were appointed as a committee to draft resolutions on the death of Dr. Hulst. Mr. Schaeffer exhibited a series of *Callichroma splendida*, from the usual green to the entirely blue forms. Mr. Beyer then showed part of his collection, calling attention to his latest captures from Florida, Montana and North Carolina. His collection contains many fine series of *Cychorus*, viz.: *C. guyotii*, *C. andrewsii*, *C. ridingsii*, *C. stenostomus* var. *bicarinatus*, *C. canadensis*, *C. viduus*, *C. elevatus* var. *heros* and *C. hemphillii*.

MEETING OF DECEMBER 4, 1900.

Held at the American Museum of Natural History. President Beutenmüller in the chair. Eight members present.

Mr. F. D. Watson, was proposed for active membership by Mr. Joutel.

Mr. Beutenmüller showed an example of *Papilio merope* var. *cenea* which mimics the female of *Diadema misippus*.

Mr. Barber spoke on a collection of Coleoptera taken at Cold Spring Harbor, L. I.

Messrs. Beutenmüller and Weeks having been appointed a committee at the last, meeting of the Society, to draft a fitting memorial regarding the death of Rev. Dr. Geo. D. Hulst, presented the following resolutions:

Resolved, That by the death of the Rev. Dr. George D. Hulst, a member of this Society, this community has lost a true educator, a keen and enthusiastic scientist and an estimable and worthy citizen, his congregation a faithful and earnest pastor, the unfortunate a genuine comforter and alleviator, his family a beloved husband and father, and we a valued associate and friend.

Resolved, That we sincerely mourn for the bright and genial companion, the pleasing and sympathetic instructor, the ever-ready and attractive speaker, the industrious and intelligent student, the man, valiant for the right yet modest and unassuming, by foes respected and admired, by friends honored and esteemed.

Resolved, That we deeply regret his sudden and untimely departure in the meridian of his experience and powers, while his master hand was on the key, alert to complete his self-allotted tasks in the solution of those problems of nature to which he had devoted so large a portion of his abounding talents and energies.

Resolved, That these resolutions be inserted in the minutes of the Society and a copy thereof sent to the family of the deceased.

MEETING OF DECEMBER 18, 1900.

Held at the American Museum of Natural History. In absence of the President and Vice-President, Mr. L. H. Joutel was elected as chairman *pro tem.* Twelve members present.

Mr. F. D. Watson was elected an active member of the Society.

Mr. Kearfott and Dr. Love were appointed as a committee to nominate officers for the year 1901.

Mr. Schaeffer exhibited a number of Coleoptera collected in the vicinity of New York: *Melasis pectinicornis*, *Deltometopus rufipes*, *Entomophthalmus rufiolus*, *Microrrhagus subsinuatus*, *M. humeralis*, *M. audax*, *Hypocoelus frontosus*, and *Schizophilus subrufus*. He also spoke on the different way of collecting. The species referred to live in dead branches, generally oak.

After discussion adjournment.

MEETING OF JANUARY 15, 1901.

Held at the American Museum of Natural History. President Beutenmüller in the chair. Nine members present.

The treasurer presented his report on the finances of the Society for the year 1900, which was accepted, and referred to the auditing committee. The following officers were elected for the year 1901: President, Wm. Beutenmüller; Vice-President, Wm. D. Kearfott; Treasurer, L. H. Joutel; Recording Secretary, Chas. Schaeffer; Corresponding Secretary, C. F. Groth; Executive Committee, Chas. Palm, H. Hug, C. F. Groth, R. Ottolengui, O. Seifert; Publication Committee, Wm. Beutenmüller, L. H. Joutel, Chas. Schaeffer and Chas. Palm.

Mr. Kearfott extended an invitation to the members to meet in his house at Montclair, N. J., on January 27th, to examine his large collection of Lepidoptera. After a general discussion, adjournment.

MEETING OF FEBRUARY 5, 1901.

Held at the American Museum of Natural History. President Beutenmüller in the chair. Nine members present.

The resignations of Messrs. E. Shoemaker and Ernest J. Munch were read and accepted.

Mr. L. Krüger, of Stettin, Germany, was proposed for corresponding membership by Mr. Beutenmüller.

Mr. Schaeffer exhibited the species of *Trechus*, among which was a new species collected on Mt. Mitchell, western North Carolina, by Mr. Beutenmüller. The differences between the species were pointed out, also the more salient characters of the new species. Mr. Beutenmüller spoke on the habits of *Trechus hydropicus* and the new species, both of which he stated lived in deep damp moss and were obtained by sifting.

MEETING OF FEBRUARY 18, 1901.

Held at the residence of Mr. C. F. Groth, 139 E. 40th St. President Beutenmüller in the chair. Fourteen members present.

Mr. L. Krüger, proposed at a previous meeting, was elected a corresponding member.

On motion it was decided that the JOURNAL shall not be sent to members in the arrears with their dues for one year.

Mr. Groth exhibited his collection of insect architecture.

The president appointed the following committees: Field Committee, Wm. D. Kearfott, and Dr. E. G. Love. Auditing Committee: H. G. Barber, O. Seifert, and Chas. Palm. Delegates to the Scientific Alliance, Dr. E. G. Love and C. F. Groth and the president by the constitutions of the Alliance.

The death of Mr. Frederick Clarkson, a member of this society was announced by Mr. Groth, and upon motion Mr. A. C. Weeks was asked to draft proper resolutions on the death of our fellow member, whereupon Mr. Weeks presented the following:

Resolved, That we, the members of this Society, sincerely regret the death of our associate and realize that thereby we have lost a worthy member, a genial and courteous companion and a respected and valued friend.

Resolved, That these resolutions be entered in our minutes and a copy thereof transmitted to the family of the deceased.

After a social and informal meeting, adjournment.

MEETING OF MARCH 5, 1900.

Held at the American Museum of Natural History. Dr. Love in the chair, *pro tem*. Eleven members present.

The following motions were made and accepted: (1) That a sum not exceeding three dollars be appropriated to defray the expenses of each social meeting held at a member's house. (2) That this Society shall hold a subscription dinner on April 17th, provided a sufficient number of members and their friends participate, and the arrangements for the dinner be left in the hands of Mr. Chas. Palm. (3) That a certificate of membership be prepared. (4) That a circular soliciting new members and subscribers to the JOURNAL be issued at the expense of the Society.

Mr. Watson showed an interesting aberration of *Pamphila hobomok* taken in Van Courtlandt Park, N. Y. The upper left-hand side of the specimen was the normal dimorphic female, *pocahontas*, while the right-hand side showed the yellow markings of *hobomok*. The under side was entirely abnormal, being a mixture of *hobomok* and var. *pocahontas*: the markings are not symmetrical, the left side being entirely different from the right.

Mr. Schaeffer exhibited the following rare Coleoptera taken in the vicinity of New York. *Sphæridium scarabæoides*, taken in West Farms. He stated that Dr. Horn had omitted this European species from our fauna, in his paper on *Sphæridium*, but that other specimens had been taken in Wisconsin and Canada, and that the species should be included in our lists. *Dicranopselaphus variegatus*, taken by sweeping low plants; *Crosimus obesulus* taken by sifting old leaves at Greenwood Lake, N. J., in June. *Cerophytum pulsator*, from Fort Lee, N. J., *Europs pallipennis*, from buds of hickory in Mosholu, *Phyllobrotica discoidea*, taken in number at Arlington, N. J., by sweeping in meadows; this is the first record of its occurrence in New Jersey. *Cassida nebulosa* was taken by Dr. Love and Mr. Münch at Suffern, N. Y.; as compared with the European form of this species, they are smaller but otherwise seem to agree very well. *Rhinosimus incipennis* was taken in the Highlands, N. J., by beating oak branches and *Stephanocleonus plumbeus* taken in Mosholu under stones.

MEETING OF MARCH 19, 1901.

Held at the residence of Mr. Beutenmüller, 106 W. 133 St. Ten members present.

Mr. Palm proposed that the subscription dinner of the society be held at the Arion Hall, 59th St. and 4th Ave. He stated that a sufficient number of members had subscribed to make the affair a success.

Mr. Beutenmüller showed a large series of lantern slides, illustrating mimicry, protective coloration and life histories of many species of Lepidoptera. He also showed by means of a lantern a series of slides of views taken in the Black Mountains in western North Carolina. After informal meeting, adjournment.

MEETING OF APRIL 2, 1901.

Held at the American Museum of Natural History. President Beutenmüller in the chair. Eleven members present.

Mr. Kearfott reported on the proposed field meetings of the Society, viz.:

April 14th Mountclair, N. J.; May 4–5, Suffern, N. Y.; May 18–19, Greenwood Lake, N. J.; May 30 to June 1, Ramapo, N. Y.; June 15–16, Lake Hopatcong, N. J.; June 21–23, Anglesea, N. J. Members of the Brooklyn and Newark Entomological Societies were cordially invited to attend these meetings. Mr. Schaeffer recorded the occurrence of *Aphodius longulus* taken by Mr. Beutenmüller at Fort Lee, N. J. The specimen was dug out of a decaying chestnut stump where it probably hibernated. He also showed a specimen of *Trechus barbaræ*. Mr. Beutenmüller, spoke on some Pacific coast species of *Catocala*. He stated that a supposed type of *C. mariana* Hy. Edw., in the Strecker collection was identical with *C. californica* and that the true types of *mariana* in the Hy. Edwards collection was an entirely different insect. He also showed a series of *Catocala* from Lake Tahoe, Sierra Nevada, Calif., which he was unable to identify. After discussion, adjournment.

MEETING OF APRIL 16, 1901.

Held at the residence of Mr. Chas. Palm. In the absence of the President and Vice-President, Mr. Palm was elected chairman, *pro tem.* Eight members present.

No business was transacted and the entire evening was devoted to informal discussions, on collecting grounds and inspecting beetles exhibited by Mr. Palm.

MEETING OF MAY 7, 1901.

Held at the American Museum of Natural History. Seven members present.

Mr. Beutenmuller proposed Messrs. Thomas O'Connor and E. Irving Huntington, both of New York, for active membership.

Mr. Beutenmuller recommended that the sum of $25.00 be appropriated for the purpose of soliciting members for the society. On motion this sum was allotted for this purpose. The following amendment to the by-laws was offered: That III, section 4, should read as follows: Any person may, by the payment of fifty dollars in lieu of annual dues, become a life-member, in payment of one hundred dollars become a patron and in payment of five hundred dollars become a patron.

Mr. Beutenmuller spoke on the introduction of the Chinese Mantid, *Tenodera sinensis* at Mt. Airy, Pa. He stated while on a visit to Mr. Laurent at that place, he had picked off a tree an egg-mass of this species, which very much resembles a cocoon of *Tilea polyphemus*. He further stated that Mr. Laurent had subsequently found the egg-masses in abundance. Mr. Beutenmuller also stated that he had liberated over one hundred young *T. sinensis* at Fort Lee, N. J., and that he had failed to raise them in captivity, owing to the want of proper food.

The following Lepidoptera, presented by Mrs. Slosson, and to be sold at auction for the benefit of the JOURNAL, were exhibited. *Anæa portia*, *Eunica tatila*, *Eudamus zestos*, *E. batabano*, *Pamphila ethlius*, *Thecla martialis*, *Pergesia thorates*, *Sphinx canadensis*, *Dilophonota ello*, *Cautethia grotei*, *Alypia wittfeldii*, *Burtia bele*, *Composia fidelissima*, *Syntomia epilais*, *Euchætes abdominalis*, *Scepsis edwardsii*, *Euhalisidota longa*, *Halisidota cinctipes*, *Expantheria scribonia* var. *denudata*, *Lagoa pyxidifera*, *Lagoa opercularis*, *Hyperchiria lilith*, *Hyparpax auristriata*, etc.

On motion of Mr. A. C. Weeks a vote of thanks was extended to Mrs. Slosson for her generous donation.

Mr. A. C. Weeks read the following paper: "Suggestions for Collecting Insects with Least Injury." The true collector studied to preserve his captures as perfectly as possible. The more perfect a specimen the more valuable and attractive was it for cabinet purposes as well as more capable of accurate identification. Lepidoptera by reason of their fragility required more care than insects of other orders. The principal situations of capture were in the field, at light or sugar and when bred. In the field he recommended the use of one jar for killing and any other jar for storing, in which the specimens folded in paper could be packed. Among these papered specimens any of those of the other orders unpapered could be placed after killing. This method seemed on the whole preferable to the use of collecting boxes which were objectionable on account of inaccuracy in pinning, exposure to injury and liability of insect to revive, besides being cumbersome to carry, while on the other hand specimens in stone jars could be pinned with care or relaxed at leisure, were never exposed to light or air currents and could not revive. The storing jar answered a double purpose, not only for storing, but if required, of killing as well—also insects papered and firmly secured in stone jars relieved the collector from any solicitation as to his movements. At light and sugar, where numbers of insects were taken in rapid succession and papering was impossible or inconvenient, it would be found advisable to have large storing jars stationed at short intervals into which the captures could be transferred. Separate jars should be carried for larger specimens and those likely to cause injury by their spiny

legs in struggling to escape. Those bred, if diurnals, should be kept in absolute darkness, if nocturnals, in as much light as possible, but not sunlight glare, to prevent fluttering. Large Lepidoptera such as *A. archippus* could be carrried safely in a jar without paper by wedging, *i. e*, after covering the bottom of the jar with as many as could be placed upright with wings folded, additional specimens with wings likewise folded could be inserted in an upright position between two adjacent wings of different specimens, the insect to be inserted being held by tweezers and the separation effected by a thin blade. To remove the specimens they should be tapped, and not lifted, out. Insects of other orders should not be introduced among lepidoptera thus packed. Coleoptera and Hemiptera should be collected in jars half filled with well-crumpled tissue paper, but not cotton. Beetles with a fine bloom or pubescence should be wrapped in paper to prevent marring. If the collecting be general, the killing jar need have no lining except blotting paper, fitted accurately, and all captures might be transferred to the stone jar containing the papered Lepidoptera and Coleoptera. Neuroptera on account of the fragile character of their bodies and rOthoptera on account of their spiny legs and secretions should be stored separately in jars half-filled with crumpled tissue paper. All captures should be transferred from the storing jars to a relaxing vessel as speedily as possible and no mounting should be done until at least one day's relaxation had been allowed.

MEETING OF MAY 21, 1901.

Held at the American Museum of Natural History. President Beutenmüller in the chair. Seven members present.

Messrs. Thomas D. O'Connor and E. Irving Huntington, proposed at a previous meeting, were elected active members of the Society.

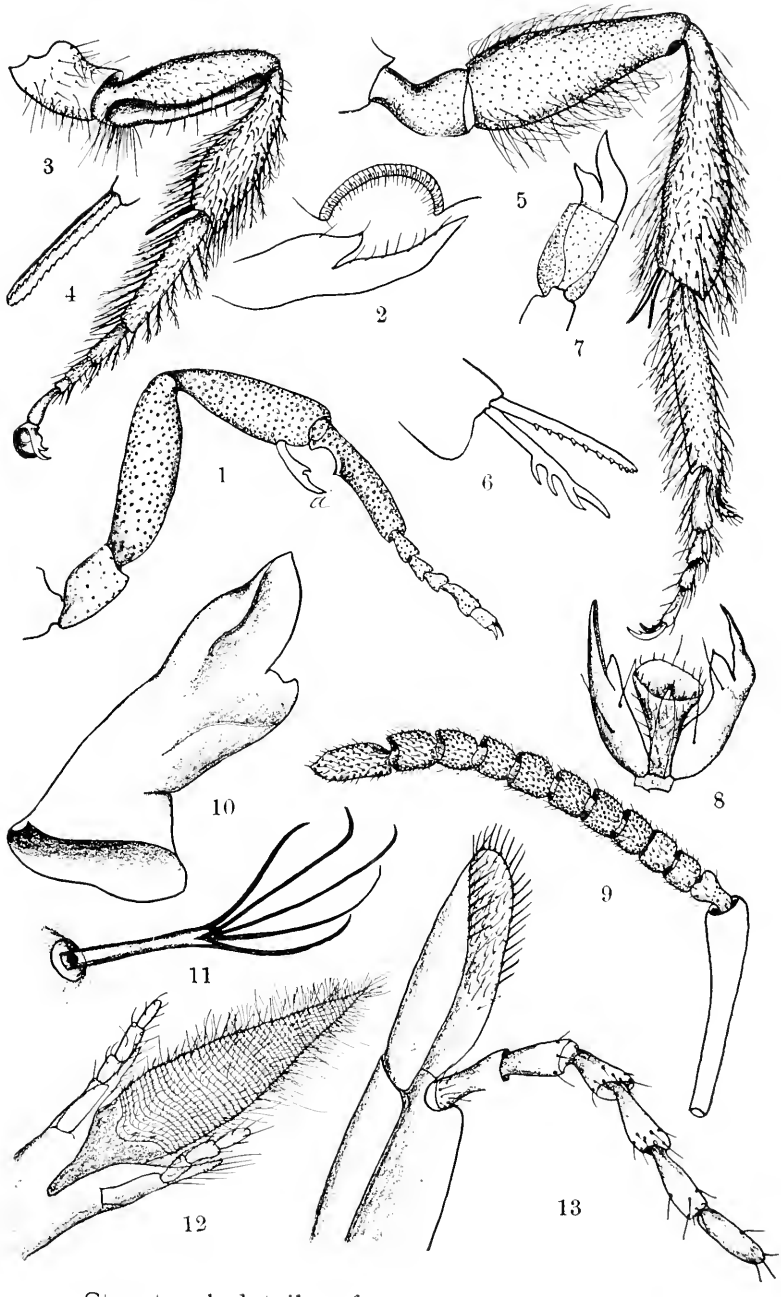
Mr. Palm presented a bill for extra expenses incurred by the dinner held by the Society, April 17th, and upon motion the Treasurer was authorized to pay the same.

Dr. Love reported on the good progress made by the Scientific Alliance towards a building for the societies. He also spoke on the advisability of our Society of holding one meeting a month, but no action was taken.

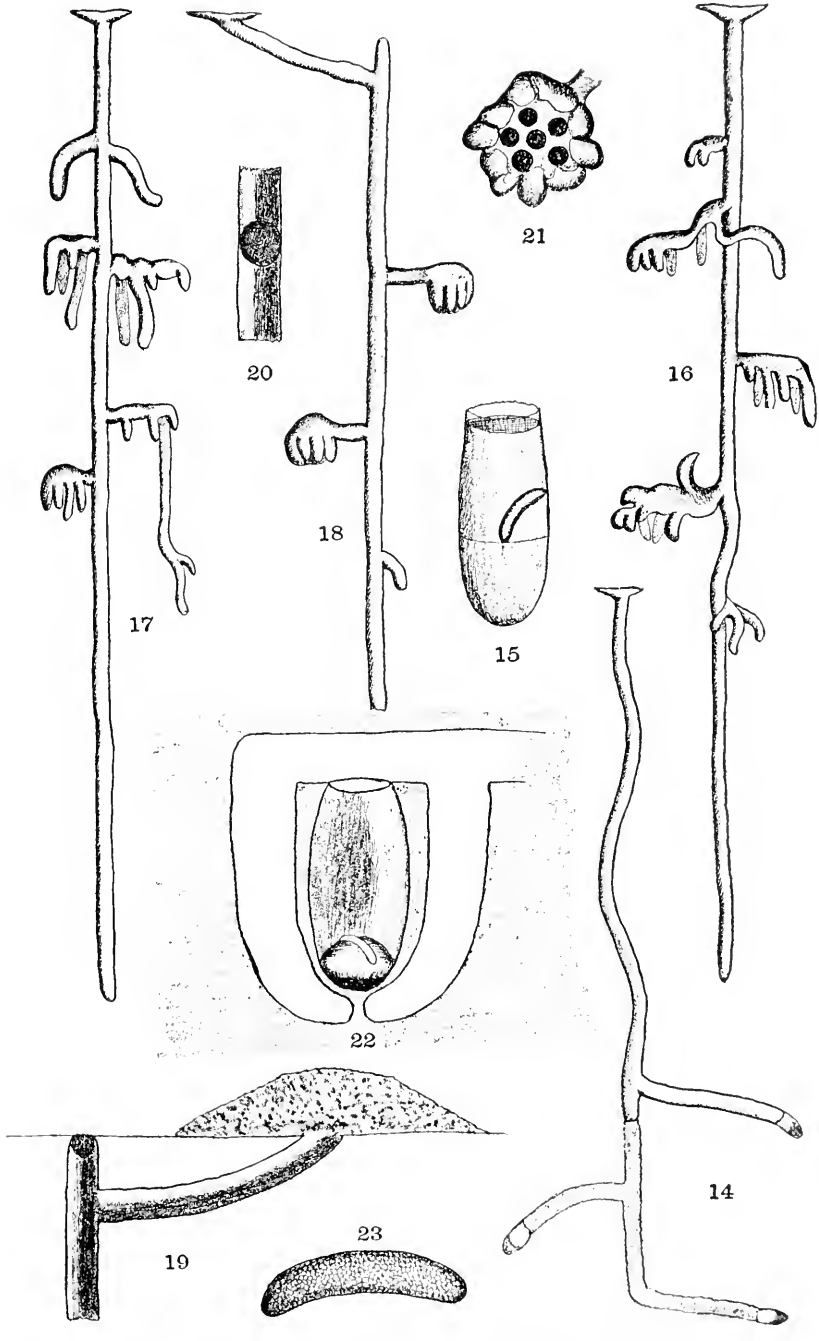
Mr. Schaeffer made some remarks on the species of *Omophron*, illustrated by specimens.

Mr. Beutenmüller exhibited progressive proofs of plates on food-habits of North American Sesiidæ and a copy of the complete work, which he said would be issued in a few days. He also spoke on a monograph of the genus *Catocala* which he was now preparing and exhibited colored drawings of the black-winged species.

Mr. Barber showed some Coleoptera bred from hickory and sumac.

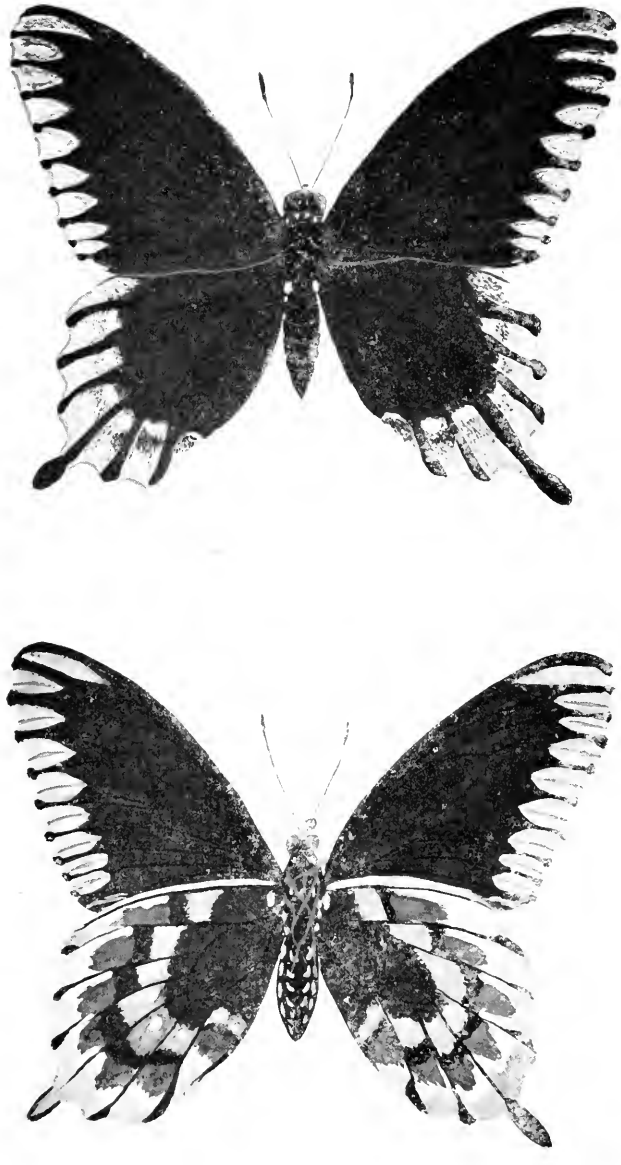


Structural details of Augochlora humeralis.



Architecture of Augochlora and Colletes.

Burrows of Augochlora.



Aberration of Papilio philenor.

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JOURNAL

OF THE

New York Entomological Society.

Vol. IX. SEPTEMBER, 1901. No. 3.

DESCRIPTIONS OF NEW TIPULIDÆ.

By R. W. Doane.

In my first article on North American Tipulidæ (Jour. N. Y. Ent. Soc., Vol. VIII, No. 3) a number of mistakes occurred which were corrected in some of the separates sent out by me. It may be well to note these corrections here. *Dicranoptycha borealis*, should read *Limnobia borealis*: *Cryptolabis bisinuatis* should read *Cryptolabis bisinuata*; *Limnophila flavapila* should read *Limnophila flavipila*; *Phyllolabis obscuris* should read *Phyllolabis obscura*: *Amalopis disphana* should read *Amalopis diaphana*: the reference to the plate after *Polyangæus maculatus* should read Pl. VIII, Fig. 20, instead of Pl. VII, Fig. 20.

I am under obligations to Prof. J. M. Aldrich, Univ. of Idaho; Prof. Trevor Kincaid, Univ. of Wash.; Dr. L. O. Howard, U. S. Entomologist and Curator of Insects for the National Museum, for large series of Tipulidæ from their respective collections; also to Prof. V. L. Kellogg, Stanford University; Prof. Jas. Hines, Univ. of Ohio; Mr. G. Chagnon, Montreal, and to others for smaller valuable series; also to those having charge of the insect collections in the National Museum and in the Museum of Comparative Zoölogy in Cambridge for the privilege of studying the Tipulidæ in these collections.

Tipula illustris, sp. nov.

Brown; head yellowish; front and occiput dark brown or blackish; rostrum short, yellowish below, brown above; nasus darker brown; palpi brown; antennæ rather long, reaching beyond the base of the wing, dark brown or black, first and second joints sometimes lighter especially below, joints beyond the third incrassate below at base; mesonotum dark brown, with a narrower median black line and two very indistinct lateral lighter lines; scutellum and metanotum yellowish, the brown stripe in the middle bordered by a brownish area varying in width; collare light

brown with three darker spots; dorsopleural membrane yellowish; mesopleura and sternopleura very dark grayish; pteropleura and hypopleura light grayish; metapleura yellowish; halteres yellowish at base, infuscated toward tip, knobs brown; legs brownish-yellow, tarsi and tips of femora and tibia brown; abdomen reddish-brown, sometimes with a faint median brownish line; eighth tergite concealed except laterally; hypopygium very small, a little lighter than the rest of the abdomen, upper lamella with a wide crescent-shaped incision, outer lateral appendages of lower lamella about three times as long as wide, incurved, tip rounded; wings uniformly reddish-brown, coloring sometimes a little less dense in the middle of some of the cells and in the region of the stigma which is not darker than the rest of the wing; veins brown, sometimes those in the region of the discal cell in part whitish. Length, male 9–10 mm., wing 12–13 mm.

Habitat: St. Anthony, Idaho, two males. (Type) Aldrich. Olympia, Wash., two males. Kincaid. Yakama, Wash., one male. Battle Creek, Mich., two males. Aldrich. Type no. 147. Wash. Agric. Coll. & S. of S.

Tipula dorsolineata, sp. nov.

Cinereous; head light yellowish, somewhat cinereous above; rostrum short, somewhat darker, with a fuscous lateral line; palpi fuscous to blackish; antennæ of male reaching beyond the base of the wings, first and second joints light yellowish, others fuscous, cylindrical; antennæ of female hardly reaching the base of the wings; mesonotum cinereous with an indistinct narrow median fuscous stripe and two much broader fuscous stripes on each side, the outer pair not reaching the anterior margin; a rather broad yellowish median line running from the suture to the base of the abdomen; collare brown with three yellow spots; scutellum light yellowish, lateral margin more or less fuscous; metanotum whitish yellow with two broad lateral fuscous stripes; pleura mostly brown, pteropleura and a few spots along the sutures much lighter brown; halteres brown, yellowish at the base, knobs brown; legs yellowish-brown, the tarsi and the tips of the femora and the tibia darker; abdomen brownish, the anterior margin of each segment lighter, the posterior and lateral margins much darker brown; hypopygium small, concolorous with abdomen; upper lamella with a deep V-shaped incision; lower lamella with a deep Y-shaped incision, the upper pair of lateral appendages is somewhat spatulate and brownish, the lower pair is smaller and brownish-yellow; eighth and ninth terga of abdomen of female yellowish, shining, with three brown spots; ovipositor yellowish, darker at the base, upper valves rounded at the tip, lower valves reaching a little beyond the base of the upper valves; wings hyaline, with a slight grayish tinge; subcostal cell brownish; very faint lighter streaks in nearly all the other cells; stigma brown, surrounded by an indistinct whitish cloud; a small whitish spot in the base of the discal cell incompletely connected with the one around the stigma; discal cell a little more than twice as long as wide; petiole of second posterior cell nearly equal to the width of the discal cell. Length, male 10 mm., female 14 mm., wing 11 mm.

Habitat: Pullman, Wash., five males, ten females. (Type) Keyport, Wash., one female. Doane. Type no. 148. Wash. Agric. Coll. & S. of S.

Tipula sulphurea, sp. nov.

Brownish; head yellowish, brownish to cinereous above, with a faint fuscous streak; rostrum yellowish, rather short; nasus short, with yellowish hairs; palpi brownish to black, yellowish toward the base; first three joints of antennæ yellowish, second somewhat darker, others brownish black; antennæ of male reaching beyond the base of the wings; antennæ of female lighter and shorter, not reaching to the base of the wings; mesonotum brownish with three indistinct darker brown lines, the median one divided by a faint narrow cinereous line; collare brown, lateral margins grayish; scutellum and metanotum light yellow; the posterior half of the pleura sulphur yellow; mesopleura and stenopleura and the base of the first and second coxæ slate colored; dorsopleural membrane light brownish; halteres brownish, extreme base yellowish; legs brown, the tarsi and the tips of the femora and tibia darker; base of the femora somewhat yellowish; abdomen brownish yellow, the posterior margin of each segment lighter; a rather broad, broken brown stripe on each side of the terga and a similar one the sterna; basal half of eighth segment brown, distal half yellow; hypopygium yellow; upper lamella terminating in two short, blunt, black points; lower lamella with a deep incision from the base of which arises a pair of long membranous upward and inward projecting appendages; the brown stripe on the abdomen of the female broader and more complete; eighth and ninth terga short; ovipositor reddish-brown, acute, lower valves reaching beyond the base of the upper valves; wings immaculate with a slight grayish tinge; stigma and veins brown; the subcostal cell and the anterior margin of the anal cell with a slight yellowish or brownish tinge; discal cell more than three times as long as wide; petiole of the second posterior cell about equal to the length of this cell; fifth posterior cell not in contact with the discal cell. Length, male 13 mm., female 15 mm., wing 11 mm.

Habitat: Battle Creek, Mich., sixteen males six females. Aldrich. Type no. 149. Wash. Agric. Coll. & S. of S.

Tipula fumosa, sp. nov.

Grayish brown; head silvery gray pollinose, dark brown above; rostrum short, thick; nasus inconspicuous, with short yellow hairs; palpi and antennæ dark brown, the latter reaching but little beyond the base of the wings in the male; basal segment grayish, last segment very minute; mesonotum light brown with three very broad darker brown stripes which are darker bordered, the median one divided by a narrow, indistinct darker line; collare grayish-brown with three darker spots; scutellum light grayish-brown with a median darker line; metanotum, pleura and coxæ silvery gray pollinose; dorsopleural membrane light brownish; halteres brownish yellow, knobs brown; tarsi and tips of femora and tibia dark brown, femora yellowish, tibia brownish; abdomen dull brown, posterior and lateral margins of each segment grayish; eighth tergite visible only at the sides; hypopygium small, concolorous with rest of abdomen; upper lamella terminating in two short, black, blunt, tooth-like projections; lower lamella with a deep V-shaped incision; ovipositor short, base blackish; valves reddish-brown; upper valves slender, acute; lower valves shorter and much broader; wings immaculate, with a dark tinge which is a little darker anteriorly; an indistinct whitish space in front of the brown stigma;

discal cell more than twice as long as wide; petiole of second posterior cell short. Length, male 10 mm., female 12 mm., wing 12 mm.

Habitat: Columbus, Ohio, seven males, one female. Hines. Type no. 150. Wash. Agric. Coll. & S. of S.

Tipula rostellata, sp. nov.

Black; head blackish, darker above, grayish beneath the antennæ and eyes; rostrum black, rather short and stout; nasus with black or brownish hair; palpi black; antennæ brownish black, the tips of the basal joints of the flagellum somewhat enlarged and produced below, not furnished with verticillate hairs; last joint much more slender than the preceding joint; mesonotum dark slate-color, with three longitudinal grayish stripes, the median one narrow and indistinct, the lateral ones broader; collare dark grayish-brown with two darker spots; scutellum, metanotum, pleura and coxæ blackish-gray; dorso-pleural membrane reddish-brown; halteres brown, knobs darker; legs very dark brown, femora reddish-brown toward the base; abdomen dull blackish-brown; dorsum with a distinct, broad, reddish-brown stripe; posterior margin of each segment grayish; hypopygium small; upper lamella black, posterior margin with a rather broad yellowish lobe on each side leaving a deep incision between; lower lamella black with a deep narrow incision the edges of which are bordered with yellow, with two pairs of broad, yellowish appendages, the upper pair broadly ovate, the lower inner pair drawn out to an acute inward projecting point; base of ovipositor black, valves reddish-yellow; lower valves very short, reaching but little beyond the base of the upper valves, latter not arcuated; wings rather broad, immaculate; subcostal cell, the anterior margin of the anal cell and the stigma faint brownish yellow; discal cell about three times as long as wide; petiole of second posterior cell short; veins brown. Length, male 13 mm., female 15 mm., wing 14 mm.

Habitat: Colorado, two males, two females. Morrison. Type no. 151. Wash. Agric. Coll. & S. of S.

Tipula cervicula, sp. nov.

Black; head velvety black; rostrum black, rather short; nasus indistinct; palpi black or blackish-brown; antennæ velvety black, joints cylindrical, base verticillate with short black hairs, last joint very short; mesonotum velvety black with four rather broad indistinct grayish lines; scutellum, metanotum, pleura and coxa black; dorso-pleural membrane yellow; halteres brownish, lighter toward the base; legs black, base of femora brownish-yellow; abdomen black, posterior and lateral margins of each segment grayish; hypopygium small but rather long; upper lamella black with a deep incision; lower lamella reddish-brown with a very deep, broad incision; base of ovipositor black, valves reddish-yellow, upper valves straight, tips somewhat obtuse; lower valves shorter, broad, flat; wings immaculate, with a grayish tinge; subcostal cell and the anterior margin of the anal cell with a faint yellowish-brown tinge; stigma brown; discal cell hardly twice as long as broad; petiole of the second posterior cell not longer than the discal cell; veins brown except at the base of the discal and second submarginal cell where they are white; the grayish

tinge is less intense in the region of the stigma and in the base of the discal cell sometimes making these parts appear whitish or hyaline. Length, male 11 mm., female 15 mm., wing 12 mm.

Habitat: Mount Rainier, one male, two females, Piper. Type, 152. Wash. Agric. Coll. & S. of S.

Tipula bituberculata, sp. nov.

Brown; head cinereous with a median brown line above, two small tumid processes just above the base of the antennæ, much larger in the female; rostrum short, stout, yellow, cinereous above; palpi brown; antennæ reaching to base of wings, wholly brown, segments of flagellum cylindrical, the first not longer than the succeeding four or five; mesonotum cinereous, with five brown stripes, the lateral ones somewhat indistinct, the median one fusiform; scutellum light yellowish with a median brown line; metanotum dark gray; dorsopleural membrane yellowish; collare grayish; pleura cinereous with an indistinct yellowish broken line running from the base of the anterior coxæ to the base of the halteres; pterostigma yellow spotted; halteres yellow, knobs brownish; legs yellowish brown; tarsi and tips of femora and tibia darker; abdomen yellowish above with three dark brown stripes; slate colored beneath; posterior margin of each segment yellow; hypopygium small; upper lamella with a U-shaped incision; lower lamella with a narrow deep incision, the ventral aspect lighter than the lateral aspect; ovipositor reddish-brown; upper valves arcuated, acute; wings with a grayish tinge somewhat darker along the veins and in the middle of the cells, a little lighter in the region of the stigma which is brown; præfurca short; discal cell more than twice as long as wide. Length, male 10 mm., female 14 mm., wing 11 mm.

Habitat: Calif., two males, one female. Type No. 153. Wash. Agric. Coll. & S. of S.

Tipula helvocincta, sp. nov.

Black; head light gray with a median dark brown stripe above; rostrum dark gray; palpi brown; antennæ of male reaching nearly to base of abdomen, first two segments and the base of the third reddish yellow, others black, cylindrical; mesonotum gray with four brown stripes; scutellum, metanotum, pleura and coxæ gray; dorsopleural membrane light yellowish; collare dark grayish; halteres yellowish, basal half of knobs brown, distal half yellow; legs brown, base of femora reddish-brown, tarsi and tips of femora and tibia black; abdomen black, posterior margin of each segment yellow; hypopygium small, black, posterior margin of the upper lamella depressed with two median longitudinal shining black ridges; lower lamella with a deep broad incision the margins of which are narrowly bordered with yellow; wings grayish-brown; stigma brown; the rhomboidal, discal and fourth posterior cells almost wholly white; the basal half of the marginal cells, a spot in the first posterior cell, a spot before the stigma, a spot beyond the middle of the second basal cell, two spots near the middle of the anal cell and a spot in the anterior margin of the axillary cell whitish; discal cell four times as long as wide. Length, male 14 mm., wing 14 mm.

Habitat: Mount Rainier, Wash., two males. Piper. Type no. 154. Wash. Agric. Coll. & S. of S.

The antennæ of both the specimens before me are deformed, making them appear only eleven or twelve jointed.

Tipula stalactoides, sp. nov.

Brown; head brownish-gray with a median rather broader, short, brown line above; rostrum short, brownish-yellow, darker above; antennæ reaching to base of halteres, brown, first two segments and the base of the third yellow; joints of flagellum cylindrical, very slightly incrassate at the base; mesonotum brownish-gray with six brown stripes, the lateral pairs narrow and converging anteriorly, the median pair broad, parallel, the grayish stripe dividing them suddenly broadened in the middle; collare grayish with three brownish spots; dorsopleural membrane yellowish; scutellum, metanotum, mesopleura and sternopleura dark gray, rest of pleura yellowish-gray; halteres brown, base yellow, knobs darker; legs brownish yellow, tarsi and tips of femora and tibia brown; abdomen yellowish-brown, with three broad black stripes; eighth segment black; eighth sternite with two deep longitudinal folds or depressions which are abundantly supplied with thick yellowish hair; hypopygium black; posterior margin of upper lamella with two very small reddish brown points; lower lamella with a median whitish streak extending its entire length, posterior lateral angles whitish, each with a long, slender, whitish membranous appendage which hangs over the lower lamella; wings hyaline; costal, subcostal and anterior margin of the anal cells tinged with yellow; stigma brown; one or two indistinct whitish spots in the region of the stigma and a fainter spot in the discal cell; discal cell more than four times as long as wide. Length, male 12 mm., wing 12 mm.

Habitat: Unalaska, three males. Kincaid. Type no. 155. Wash. Agric. Coll. & S. of S.

Tipula tristis, sp. nov.

Brown; head grayish-brown with a brown stripe above; rostrum grayish-brown; antennæ reaching a little beyond the base of the wings, wholly brown; joints four to eight rather short, thick, constricted in the middle, incrassate at the tip; those beyond the eighth somewhat longer, also constricted in the middle; mesonotum light brownish with six brown stripes, the median pair broad, parallel, the lateral pairs narrow, converging; collare grayish-brown with five brown spots; dorsopleural membrane yellow; scutellum and metanotum dark brown; pleura blackish with yellowish pollen; coxæ blackish; halteres yellowish, knobs brown; legs yellowish-brown, tarsi and the tips of the femora and tibia darker; abdomen yellowish-brown, posterior and lateral margins of each segment yellowish to grayish; posterior margin of the eighth sternite with a few short yellow hairs and a median short two-lobed appendage which is narrower at its base; hypopygium small, elongate; upper lamella with a deep, broad, V-shaped incision; lower lamella with a narrow very deep incision which almost divides it into two parts; wings grayish or brownish; variegated with whitish hyaline spaces; a band running from in front of the stigma across the discal, fourth, and fifth posterior cells to the margin of the wing, a space beyond the

stigma, the base of both the submarginal cells, nearly all the first posterior cell, and irregular spaces in the basal, anal, axillary and spurious cells whitish hyaline; the stigma and a spot over the origin of the præfurca darker brown; second and third posterior cells not white spotted; discal cell more than twice as long as wide. Length, male 11 mm., wing 14 mm.

Habitat: Palo Alto, Calif., three males. Doane. Type no. 156. Wash. Agric. Coll. & S. of S.

Tipula simplex, sp. nov.

Brown; head grayish-brown with a median darker line above; rostrum grayish-brown; palpi brown; antennæ of male reaching nearly to the base of the abdomen, brown; joints of flagellum darker brown at the base; mesonotum yellowish-brown with four grayish-brown stripes each with a darker brown margin; collare brown with a median darker spot; scutellum and metanotum grayish-brown each with a median brown stripe; dorsopleural membrane brownish-yellow; pleura and coxæ brownish-gray; halteres yellowish, knobs brown; legs lighter brown, tarsi and tips of femora and tibia slightly darker; abdomen brown with three darker brown stripes, the lateral ones incomplete; hypopygium yellowish-brown; upper lamella with a broad crescent-shaped incision; lower lamella with a very broad, deep, V-shaped incision; wings narrow with a grayish tinge; stigma, a spot on the origin of the præfurca, a spot just back of the first vein opposite the end of the seventh vein, and small spots at the tips of all the veins, brown; basal half of the fifth vein with a rather broad brown border on the anterior side, all the other veins with a whitish or grayish border; a spot beyond the stigma, another in the base of the discal cell and the base of the fourth posterior cell, and one or two spots in the posterior margin of the wing, whitish; discal cell more than four times as long as wide. Length, male 10 mm., wing 12 mm.

Habitat: Palo Alto, Calif., two males. Doane. Type no. 157. Wash. Agric. Coll. and S. of S.

The markings on the wings are somewhat similar to those of *T. pubera* Lw., but the small size, the general color of the body, the structure of the hypopygium, etc., will prevent confusion.

Tipula carinata, sp. nov.

Brown; head brown with a faint narrow darker median stripe above; rostrum brownish, yellowish on the sides; palpi brownish, darker toward the tip; antennæ dark brown, nearly reaching to the base of the abdomen; first three joints brownish yellow, joints four to eleven somewhat constricted in the middle; mesonotum brown with the sides cinereous and with a very faint trace of two cinereous lines; collare brown; dorsopleural membrane reddish brown; scutellum; metanotum, pleura and coxæ cinereous; halteres yellowish-brown lighter toward the base; legs brownish, tarsi and tips of femora and tibia darker, base of femora yellowish; abdomen yellowish-brown, darker posteriorly, with a broad, brown, dorsal stripe; posterior margin of each segment gray; hypopygium small; basal half of upper lamella brown, distal half yellow with a broad crescent-shaped incision; base of lower lamella brown with

a prominent median light yellow carina, posterior margin yellowish with a crescent-shaped incision, appendages yellow; the brown on the abdomen of the female is less intense; ovipositor reddish-yellow, base black, upper valves straight, compressed, lower valves rather broad; wings immaculate with a brownish tinge; subcostal cell and stigma slightly darker brown; discal cell about twice as long as wide; petiole of second posterior cell short. Length, male 11 to 15 mm., female 13 to 16 mm., wing 15 to 20 mm.

Habitat: Pullman, Wash., forty-five males, twelve females. Doane. Type no. 158. Wash. Agric. Coll. & S. of S.

Tipula impudica, sp. nov.

Brownish-yellow; head grayish-brown with a distinct narrow blackish line above; rostrum reddish-brown to yellowish; palpi brownish, darker toward the tips; antennæ very dark brown, the basal portion of the third and all of the first and second segments yellowish; joints of the flagellum cylindrical, slightly incrassate at the base, last joint very small; mesonotum brownish-gray with four rather distinct brown lines; scutellum brownish-yellow with a distinct brown line; metanotum grayish-brown; collare brownish-yellow with three darker spots; dorsopleural membrane yellowish; halteres yellowish, knobs brown; legs yellowish-brown, tarsi and tips of femora and tibia darker, basal portion of femora yellowish; abdomen brownish-yellow with three black stripes, the lateral ones sometimes more or less broken; posterior margin of each segment gray; eighth tergite scarcely or not at all visible; posterior margin of eighth sternite with long yellow hair; hypopygium concolorous with rest of abdomen; upper lamella short, leaving the inner accessory organs unusually exposed, divided by a deep median incision, each half with a small crescent-shaped incision near the inner angle; margin of lower lamella whitish with a broad, deep incision, appendages reddish-brown; ovipositor reddish-brown, upper valves straight, acute; wings with a grayish tinge, with white or hyaline spaces bordering some of the veins in the middle portion of the wings; a whitish hyaline space beginning in front of the stigma and extending through the discal cell into the base of the fourth and fifth posterior cells; the base of the rhomboidal cell, the base of the submarginal cells, and one or two indistinct irregular spaces in the anal and axillary cells likewise whitish hyaline; discal cell more than twice as long as wide. Length, male 15 mm., female 25 mm., wing 17 mm.

Habitat: Wawawi, Wash., two males (type), Doane. Almota, Wash., two males. Pullman, Wash., one male, one female (type 159). Wash. Agric. Coll. & S. of S.

Tipula australis, sp. nov.

Brown; head grayish with a narrow brown stripe above; rostrum brownish-gray; palpi brown, darker toward the tip; antennæ very dark brown, first and second joints and the extreme base of the third brownish-yellow; joints of the flagellum slightly constricted in the middle; mesonotum gray with five rather broad brown lines, the two on each side confluent anteriorly; the median one divided by a narrow gray line; collare light brownish with three darker spots; dorsopleural membrane yellowish;

metanotum pleura and coxæ brownish-gray; halteres brown, lighter toward the base, knobs darker; legs yellowish-brown, tarsi and tips of femora and tibia darker; abdomen brownish-yellow, darker toward the base, with three dark brown stripes; eighth sternite large, posterior margin bearing two pairs of yellowish appendages the inner margins of which are provided with rather long yellowish hairs, the inner pair is short broadly spatulate, the outer pair is somewhat triangular the upper angle being drawn out into a more strongly chitinized blackish point; hypopygium large, concolorous with the rest of the abdomen; upper lamella with a deep median incision; lower lamella with a deep median incision in which hangs a pair of rather long, somewhat curved, tumid, pendulous appendages; ovipositor reddish-brown, upper valves straight, acute; wings with a slight brownish tinge; subcostal cell and stigma darker brown; a whitish broken band beginning on the costa in front of the stigma and extending through the discal cell into the base of the fourth posterior cell; discal cell a little more than twice as long as wide. Length, male 14 mm., female 17 mm., wing 14 mm.

Habitat: Georgia, one male, one female. (Type) Morrison. Texas, one male. Type no. 160. Wash. Agric. Coll. & S. of S.

Tipula barbata, sp. nov.

Brownish; head grayish-brown with a median dark brown stripe above; rostrum short, reddish-yellow; palpi brown; antennæ not reaching the base of the wings, first two joints yellow, third yellowish-brown, others uniformly brown; antennæ of female lighter, first to fourth joints yellowish; mesonotum light brown with three darker brown stripes, the median one divided; collare, scutellum and metanotum light brownish, each with a median brown stripe, the latter darker laterally; mesopleura and sternopleura slate colored and rest of pleura yellowish; dorsopleural membrane yellowish; halteres brown, base yellowish, knobs darker brown; abdomen brownish-yellow, darker posteriorly, with three brown stripes the dorsal one entire, the lateral ones interrupted or subobsolete; posterior margin of each segment grayish or yellowish; posterior margin of eighth sternite with a broad shallow incision which is furnished with a fringe of thick, long, light yellow hair; hypopygium concolorous with the abdomen; upper lamella with a narrow median incision; posterior margin of lower lamella whitish with a broad deep median incision on each side of which are two small, yellowish appendages which are fringed with rather long yellowish hair; ovipositor reddish-yellow, upper valves acute, slightly curved at the tip; wings hyaline, with a faint brownish tinge; stigma brown; the indistinct whitish band beginning in front of the stigma running through the discal cell into the base of the fourth posterior cell; a whitish spot beyond the stigma; discal cell four times as long as wide. Length, male 13 mm., female 16 mm., wing 14 mm.

Habitat: Colorado, one male, two females. Morrison. Type no. 161. Wash. Agric. Coll. & S. of S.

Tipula lamellata, sp. nov.

Yellow; head cinereous, yellowish below; rostrum yellow; palpi brown, yellowish toward the base; antennæ brown, first three joints yellow, joints of flagellum

cylindrical; mesonotum reddish-yellow with three very faint brownish stripes; collare yellowish, darker medianly; scutellum and metanotum brownish-yellow; pleura and coxæ bright yellow; halteres yellow, knobs brown; legs yellow or brownish-yellow, tips of femora, tarsi and tibia brown; abdomen reddish-yellow, with three broken brown stripes which are more indistinct anteriorly, the dorsal one somewhat broader posteriorly; the lateral lines are sometimes so broken that they appear as a series of brown dots on the anterior margin of each segment; posterior margin of each segment gray; eighth sternite large, ventral margin somewhat produced posteriorly, and furnished with a fringe of rather long reddish-yellow hair; upper lamella consisting of two lateral elongated processes the bases of which are broadest and connected by a more membranous portion, the distal halves are narrower with the lateral margins and the extreme tips bent in at right angles to the upper surface; lower lamella long, lateral margins with an irregularly triangular appendage, the posterior margin with two small brown tumid processes each bearing a tuft of yellowish hair; base of ovipositor brownish, shining, valves yellowish, upper pair rounded at the tip, lower pair short, reaching but little beyond the base of the upper pair; wings hyaline; costal and subcostal cells slightly tinged with yellow; stigma brown; a scarcely perceptible whitish band running from in front of the stigma across the discal cell into the base of the fourth posterior cell; discal cell a little more than twice as long as wide. Length, male 12 mm., female 13 mm., wing 13 mm.

Habitat: Pullman, Wash., five males, one female. Doane. Type no. 162. Wash. Agric. Coll. & S. of S.

Tipula subtilis, sp. nov.

Brown; head grayish-brown; rostrum yellowish-brown, grayish above; palpi brownish; antennæ yellowish, long, reaching beyond the base of the abdomen; base of each joint of the flagellum except the first slightly incrassate and brownish at the base; mesonotum grayish-brown with three broad darker brown stripes, the median one divided by a gray line; collare light brownish, with three darker spots; scutellum, metanotum, pleura and coxæ silvery gray; halteres yellowish, base of knob brown, tip whitish; legs light yellowish-brown, tips of femora and tibia scarcely darker; abdomen brown with light yellow hair; posterior and lateral margins of each segment gray; median portion of posterior margin of the eighth sternite slightly depressed, brownish with two short acute processes; on each side of this depression is a small irregularly ovate, light colored process which bears a tuft of yellow hair; posterior margin of upper lamella of hypopygium with a narrow median and two broader crescent-shaped incisions; lower lamella with a broad, deep, U-shaped incision in which hangs two tumid pendulous processes; wings almost hyaline with a slight grayish tinge; subcostal cell and stigma light brownish; a scarcely perceptible broken whitish band running from in front of the stigma through the discal cell but not entering the fourth posterior cell; discal cell about twice as long as wide. Length, male 15 mm., wing 16 mm.

Habitat: Calif., one male. Type no. 163. Wash. Agric. Coll. & S. of S.

Tipula splendens, sp. nov.

Yellow; head yellow, grayish-brown above; rostrum and palpi yellow, latter brownish toward the tip; antennæ reaching the base of abdomen, dark brown, first three segments yellow; joints of the flagellum cylindrical, those beyond the first very slightly incrassate at the base; mesonotum yellow with scarcely perceptible brownish shades in place of the usual three stripes; collare, scutellum, metanotum, pleura and coxæ somewhat lighter yellow, halteres yellow, knobs brown; abdomen brownish-yellow, much lighter toward the base, posterior margin of each segment gray; eighth sternite long, narrowed posteriorly, posterior margin with a border of yellow hair; upper lamella of hypopygium with median V-shaped and lateral crescent-shaped incisions, posterior lateral corners produced inwardly into short, narrow two-pointed processes; posterior ventral margin of lower lamella with two small processes each bearing a tuft of hair, lateral margins with two pairs of appendages the outer lower pair being triangular with the apex drawn out into a slender point, the basal portion of the upper inner pair is somewhat quadrate, shining, the distal portion flattened and with a black edge; wings hyaline; subcostal cell and stigma faintly yellowish; a scarcely perceptible whitish broken band running from in front of the stigma through the discal cell into the base of the fourth posterior cell; discal cell more than twice as long as wide. Length, male 12 mm., wing 13 mm.

Habitat: Olympia, Wash., one male. Kincaid. Type no. 164. Wash. Agric. Coll. & S. of S.

Tipula calcarata, sp. nov.

Brown; head yellowish-brown with a narrower indistinct stripe above; rostrum reddish-brown; palpi dark brown, basal segment reddish-brown; antennæ not reaching beyond the base of the wings, brown, first two segments yellow; mesonotum brown with four darker brown stripes, the two median ones slightly diverging anteriorly; collare light brownish with three darker spots; dorsopleural membrane yellowish; pleura and coxæ brownish-gray; halteres brown, yellowish at the base, knobs brown, tips lighter; legs brownish-yellow, tarsi and tips of the femora and tibia brown; abdomen yellowish-brown with three indistinct yellowish-brown stripes; posterior margin of each segment gray; eighth sternite with a deep U-shaped incision from the base of which arises a broad, blunt process with yellow hairs at the base; lateral margins of the segment ending in a pair of long, slender, reddish, spur-like processes which lie across the base of the incision; upper lamella of hypopygium terminating in two short, median, blunt processes between which is a narrow incision, and two lateral incurving longer, sharper processes; lower lamella with a very deep, U-shaped incision; wings hyaline with a brownish tinge; subcostal cell brownish, stigma darker brown; the distinct whitish band beginning in front of the stigma and running through the discal cell into the base of the fourth posterior cell is interrupted along the præfurca. Length, male 15 mm., wing 17 mm.

Habitat: Mount Rainier, Wash., one male. Piper. Type no. 165. Wash. Agric. Coll. & S. of S.

Tipula clara, sp. nov.

Brown; head yellowish-brown, darker above, with a median brown stripe;

mesonotum light brown with four rather broad darker brown stripes and a very narrow median brown line which ends in a small brown dot on the anterior margin; scutellum and metanotum cinereous with a median brown line; pleura cinereous; dorsopleural membrane light yellow; halteres yellow, knobs brown; legs brown, tips of femora, tibia, and tarsi darker; abdomen yellowish-brown with three darker brown stripes; posterior margin of each segment grayish or yellowish; eighth sternite with a median rather broad projecting process the sides and rounded ends of which are furnished with long light yellow hair; hypopygium similar to that of *T. impudica*, but the upper lamella is not so deeply incised and the crescent-shape incisions are wanting; lower lamella somewhat larger; base of ovipositor black, upper valves reddish-brown, acute; wings hyaline; costal, subcostal and the anterior margin of the anal cells and the stigma brown; the whitish line running from in front of the stigma across the discal cell into the base of the fourth posterior cell scarcely distinguishable; discal cell three times as long as wide; petiole of second posterior cell short. Length, male 16 mm., female 22 mm., wing 15 mm.

Habitat: Wawawi, Wash., two males, one female. (Type) Pullman, Wash., one female. Doane. Type no. 166. Wash. Agric. Coll. & S. of S.

Tipula æqualis, sp. nov.

Brown; head light brownish-yellow; rostrum and palpi yellowish, latter darker toward the tip; antennæ reaching to base of wings, first three segments yellow, others brown, darker at the base; mesonotum yellowish-brown with four brown stripes; collare yellowish, darker laterally; scutellum yellowish with a median brown line; metanotum yellowish-gray with a median darker yellow line; pleura and coxæ light grayish-yellow; mesopleura and sternopleura darker; halteres yellow, knobs brown, tips lighter; abdomen yellowish-brown, darker posteriorly, with three indistinct, interrupted brown lines which are broader and more distinct posteriorly; posterior and lateral margins of each segment gray; posterior margin of eighth sternite with a broad rather deep incision from the middle of which arise two tufts of thick, long hair reddish or yellowish toward the base, whitish toward the tip, lateral angles with two small triangular projections with a few short yellow hairs; hypopygium darker; upper lamella black, posterior margin reddish with a broad, shallow incision; lower lamella dark reddish-brown with a deep median incision, the edges of which are whitish; outer appendages irregularly triangular; ovipositor reddish, upper valves straight, acute; wings with a slight brownish tinge; costal and subcostal cells slightly darker; stigma brown; the whitish band beginning on the costa in front of the stigma running through the discal cell into the base of the fourth posterior cell; discal cell a little more than twice as long as wide. Length, male 15 to 18 mm., female 21 mm., wing 10 to 18 mm.

Habitat: Pullman, Wash., one male, two females. (Type) Doane. Olympia, Wash., six males, two females. Seattle, Wash., one male. Kincaid. Tokeland, Wash., one male. Keyport, Wash., seven males. Doane. San Francisco, Cal., two males. San Diego, Cal., one male. Type no. 167. Wash. Agric. Coll. & S. of S.

Tipula retusa, sp. nov.

Yellow; head dark brown with a somewhat darker line above; rostrum yellow with an indistinct brown stripe on each side; palpi brown, darker toward the tip, yellow at base; antennæ of male reaching beyond the base of the wings, dark brown, first three joints yellow; joints of the flagellum beyond the first constricted in the middle and darker at the tip; mesonotum brownish-yellow with three somewhat darker yellow stripes, the median one divided by a very narrow, dark line; collare yellow; scutellum, metanotum, pleura and coxæ yellowish with a gray pollen; halteres yellow, knobs brown; legs yellow, tarsi and tips of femora and tibia brown; abdomen yellow, darker posteriorly, sixth, seventh and eighth segments mostly black; posterior margin of each segment gray; posterior margin of eighth sternite with a border of very thick long yellow hair which is usually folded back under this segment; hypopygium brown; upper lamella ending in two broad, blunt, black-tipped processes between which is a wide rather deep incision; lower lamella with a deep incision in which hangs a pair of yellow appendages the points of which are curved towards each other and furnished with yellow hair; ovipositor reddish-brown, upper valves of nearly equal width throughout, extreme tips slightly broader with four short points, a rather deep rounded incision between the lower point and the one above it; wings hyaline; costal and subcostal cells, the stigma and a small faint spot on the origin of the prefurca brown; a broad whitish band beginning in front of the stigma back of the first longitudinal vein and extending through the discal cell into the base of the fourth and the side of the fifth posterior cells; discal cell twice as long as wide. Length, male 15 mm., female 20 mm., wing 16 to 19 mm.

Habitat: Wawawi, Wash., six males, two females. (Type) Pullman, Wash., one male, one female. Doane. Olympia, Wash., one male. Seattle, Wash., two males, one female. Kincaid. Type no. 168. Wash. Agric. Coll. & S. of S.

Tipula translucida, sp. nov.

Yellow; head yellow with a narrow dark line above; rostrum yellow; palpi lighter yellow; antennæ reaching but little beyond the base of the wings, yellow, base of each segment beyond the third slightly incrassate and darker at the base; whole thorax somewhat reddish-yellow; pleura somewhat lighter; halteres yellow, knobs brown; legs yellow, tarsi and extreme tips of femora and tibia darker; abdomen yellow, somewhat darker posteriorly; posterior margin of each segment gray; posterior margin of eighth sternite with a fringe of long yellow hairs, lateral angles with a single long curved reddish bristle; hypopygium brownish-red; upper lamella terminating in two sharp black points between which is a rather deep, V-shaped incision; lower lamella with a rounded incision in which lies a pair of brownish, elongated, tumid, pendulous appendages the tips of which are furnished with rather long, yellow hair; wings hyaline; costal, subcostal, anterior margin of anal cells and stigma yellowish; the whitish stripe running from in front of the stigma across the discal cell not entering the fourth posterior cell; discal cell three times as long as wide. Length, male 15 mm., wing 17 mm.

Habitat: Penn., four males. Dietz. Type no. 169. Wash. Agric. Coll. & S. of S.

Tipula cinctocornis, sp. nov.

Yellow; head yellow, more brownish-yellow above; rostrum, palpi and antennæ yellow; joints of the flagellum beyond the first dark at the base; antennæ not reaching beyond the base of the wings; mesonotum light yellow, with three faint brownish stripes; scutellum and metanotum brownish-yellow; pleura and coxæ lighter yellow; halteres yellow, knobs brown, tips lighter; legs brownish-yellow, tarsi darker; abdomen yellow, darker posteriorly; posterior margin of eighth sternite with a fringe of yellow hair, the lateral angles with a tuft of two or three long, curved reddish bristles; hypopygium darker, similar to *T. transbucida* but the outer upper appendages longer and the lower pendulous appendages much shorter and without the blackish tip; wings hyaline; costal, subcostal and the anterior margin of the anal cells with a yellowish tinge; stigma brown; the whitish band running from in front of the stigma not reaching the posterior border of the discal cell; discal cell three times as long as wide. Length, male 16 mm., wing 19 mm.

Habitat: Penn., one male, two females. Dietz. Type no. 170. Wash. Agric. Coll. & S. of S.

Tipula albocincta, sp. nov.

Brownish-yellow; head brownish-yellow with a distinct median stripe above; rostrum and palpi yellow, the latter brownish toward the tips; antennæ hardly reaching base of wings, the first and second joints yellow, third brownish-yellow, others brown, darker at the base; mesonotum brownish-gray with four brown stripes, the median ones broadened anteriorly; collare and scutellum brown, with a median darker brown stripe; metanotum brownish-gray with a narrow median brown line; pleura blackish; pteropleura more yellowish with a silvery grayish bloom; halteres brown, yellowish at the base, knobs darker brown; legs yellowish-brown, tarsi and the tips of the femora and tibia darker brown; abdomen brownish-yellow with three broken brown stripes; posterior margin of segments four to eight white; posterior margin of eighth sternite with a broad tuft of very long yellow hair; hypopygium concolorous with the abdomen; upper lamella with a deep median depression from the end of which projects a rather broad sharp-pointed process which is furnished above with a thin broad keel; on each side of the depression is a small crescent-shaped incision; lower lamella with a deep incision the borders of which are whitish; hanging down into this incision are two reddish-brown pendulous appendages the bases of which are furnished with rather long, reddish-yellow hair; wings hyaline; costal, subcostal and the anterior margin of the anal cells with a yellowish tinge; stigma brown; the whitish band beginning in front of the stigma extends through the discal cell into the base of the fourth and the side of the fifth posterior cells; a whitish spot beyond the stigma and two indistinct whitish streaks just behind the sixth longitudinal vein the first close to the base, the second nearly opposite the origin of the præfurca; discal cell three times as long as wide. Length, male 19 mm., wing 19 mm.

Habitat: Colo., one male. Morrison. Type no. 171. Wash. Agric. Coll. & S. of S.

Tipula cuspidata, sp. nov.

Yellow; head brownish-yellow with a median indistinct darker stripe above; rostrum reddish-yellow; palpi lighter yellow; antennæ of male reaching nearly to base of abdomen, yellow, base of each segment beyond third dark; mesonotum brownish-yellow with three faintly indicated darker stripes; collare, scutellum and metanotum brownish-yellow; pleura and coxæ lighter yellow; halteres yellow, knobs brown, lighter at the tip; legs yellowish, tarsi and tips of femora and tibia darker; abdomen yellow, darker posteriorly, with three faintly indicated interrupted brown bands; posterior margin of eighth sternite with a broad shallow incision from each side of which arises a very long stiff reddish-brown bristle; hypopygium brown; upper lamella darker, produced into two long acute processes between which is a deep, V-shaped incision; lower lamella lighter with a broad deep incision in which lies two rather long whitish tumid pendulous appendages, the tips of which are furnished with rather long yellow hair; sixth, seventh, and eighth abdominal segments of female darker brown above; ovipositor reddish-yellow, upper valves straight, slender, acute; wings hyaline; costal, subcostal, and anterior margin of anal cells tinged with yellow; stigma brown; the whitish band beginning in front of the stigma extending through the discal cell into the base of the fourth posterior cell; a small whitish spot beyond the stigma; discal cell more than twice as long as wide. Length, male 15 mm., female 17 mm., wing 19 mm.

Habitat: Penn., three males, one female. (Type) Dietz. Battle Creek, Mich., one female. Aldrich. Type no. 172. Wash. Agric. Coll. & S. of S.

Tipula bisetosa, sp. nov.

Yellow; head yellow, with a median grayish spot and a narrow brown line above; rostrum and palpi reddish-yellow; antennæ of male not reaching beyond the base of the wings, first and second joint yellow, next two or three yellowish-brown, darker at the base, others brown, darker at the base; mesonotum light yellowish with five brown lines, the median one almost entire, the others interrupted; neck with a brown stripe above; scutellum, metanotum, pleura and coxæ grayish-yellow; mesopleura and sternopleura darker; dorsopleural membrane light yellowish; halteres yellow, knobs brown, lighter at the tip; abdomen yellow, much darker posteriorly with three brown stripes; posterior margin of each segment grayish or yellowish; posterior margin of eighth sternite with a rather broad median depression fringed with yellow hair, lateral margins drawn out into short whitish points from each side of which rise two incurved reddish bristles, the upper one long and stiff, the lower one much smaller; hypopygium concolorous with rest of abdomen; upper lamella with a deep broad crescent-shaped incision; lower lamella with a deep, V-shaped incision below which is a whitish oval tumid process; eighth segment of abdomen of female brown; base of ovipositor reddish-brown, valves reddish-yellow, slightly curved, acute; wings hyaline; costal and subcostal cells slightly tinged with yellow; stigma pale brown; the whitish band beginning in front of the stigma very indistinct but reaching the base of the fourth posterior cell; discal cell a little more than twice as long as wide. Length, male 18 mm., female 20 to 22 mm., wing 20 to 22 mm.

Habitat: Pullman, Wash., nineteen males, fourteen females, Doane. Collins, Idaho, two males, Piper. Type no. 173. Wash. Agric. Coll. & S. of S.

Tipula inermis, sp. nov.

Brown; head light brown with a median brown stripe above; rostrum yellowish-brown; palpi yellow at base, darker toward the tip; antennæ of male reaching to base of wings, yellow, each segment beyond the third dark at the base; mesonotum light brown with three brown stripes, the median one divided by a lighter line; collare brown with a median darker line; scutellum yellowish-brown with a median darker line; metanotum light yellow; pleura and coxæ grayish; halteres yellow, knobs brown; legs brown, femora and tibia yellowish toward the base; abdomen brown, yellowish toward the base, with three darker brown stripes; posterior and lateral margins of each segment gray; posterior margin of eighth sternite with a median reddish-brown, two-pointed process and lateral triangular brownish appendages which terminate in long, stiff, curved, reddish bristles; hypopygium small; upper lamella dark reddish-brown with a deep crescent-shaped incision; lower lamella brownish, lighter toward the margin with a deep U-shaped incision in which hang two long light yellow tumid appendages with yellow hairs toward the tips; ovipositor long, straight, dark reddish-brown; wings hyaline; costal, subcostal and anterior margin of anal cells tinged with yellow; stigma light brown; the whitish band beginning on the costa in front of the stigma reaching only to the extreme base of the fourth posterior cell; discal cell more than twice as long as wide. Length, male 20 mm., female 27 mm., wing 22 m.

Habitat: Battle Creek, Mich., four males, one female. (Type) Aldrich. White Mts., one male. Morrison. N. C., six males. Georgia, one male. Morrison. Type no. 174. Wash. Agric. Coll. & S. of S.

Tipula megaura, sp. nov.

Yellow; head yellow with a dark brown line above; rostrum, palpi and antennæ yellow, the latter reaching a little beyond the base of the wings, base of each segment beyond the third darker; mesonotum yellow with four brownish stripes, the median one divided; collare, scutellum and metanotum yellow; pleura whitish-yellow; halteres yellow, knobs brown, tips lighter; legs brown, femora yellowish toward the base; abdomen yellowish, much darker posteriorly, with three brown stripes, the dorsal one entire and distinct, the lateral ones indistinct, interrupted; posterior margin of eighth sternite with a fringe of yellow hairs and two strong curved reddish bristles; hypopygium reddish-brown; upper lamella tumid, with a short rather broad, two pointed tumid process arising from the dorsal side near the posterior margin; the posterior lateral angles of the process also drawn out into short, blunt points; lower lamella with a median depression in which lie the tips of two short yellow haired appendages; eighth abdominal segment of female and ovipositor reddish-brown, upper valves very short, somewhat quadrate, nearly as broad as long; lower valves broad, leaflike; wings hyaline; costal, subcostal and anterior border of anal cells yellowish;

stigma brown; the whitish band beginning in front of the stigma reaching the posterior border of the discal cell, but not entering the fourth posterior cell; discal cell about twice as long as wide. Length, male 15 mm., female 18 mm., wing 16 mm.

Habitat: Battle Creek, Mich., two males, one female. Aldrich. Type no. 175. Wash. Agric. Coll. & S. of S.

Resembles somewhat *T. bicornis* Lw., but may be easily distinguished by the structure of the tumid processes on the upper lamella of the hypopygium which are black, set much closer together and curved downward instead of upward.

Tipula streptocera, sp. nov.

Brownish-yellow; head brown, darker above; rostrum yellowish; palpi brown; antennæ of male reaching to base of halteres, first two segments and the basal half of the third yellowish-brown; remaining segments wholly brown; mesonotum with three broad dark brown stripes, the median one entire; scutellum light brown; metanotum, pleura and coxæ light yellow; halteres brownish, yellowish at the base, knobs brown; legs yellowish, the tarsi and the tips of the femora and tibia brown; abdomen yellowish, darker posteriorly, with three brown stripes; eighth sternite reddish-brown much produced and narrowed posteriorly, posterior margin truncate; upper lamella of hypopygium very small, posterior margin produced into two blunt processes between which is a small circular incision; lower lamella very large, lateral angles terminating in very long, tapering, twisted, horn-like processes; ovipositor similar to *T. meganura*, but lower lamella not quite as broad; wings hyaline; costal and subcostal cells faintly tinged with yellow; stigma and an inconspicuous spot on the origin of the præfurca brown; the indistinct whitish band fading out before it crosses the discal cell; discal cell more than twice as long as wide. Length, male 13 mm., female 14 mm., wing 15 mm.

Habitat: Collins, Idaho, two males, one female. (Type) Piper. Olympia, Wash., one male. Kincaid. Tokeland, Wash., one male. Doane. Type no. 176. Wash. Agric. Coll. & S. of S.

The specimen from Olympia has the stripes on the mesonotum very faintly indicated.

Tipula hirsuta, sp. nov.

Yellow; head somewhat brownish-yellow; rostrum and palpi yellow; antennæ reaching a little beyond the base of the wings, first three segments yellow, the succeeding four or five yellowish-brown, the remaining segments brown; those beyond the third somewhat incrassate and darker at the base; mesonotum light yellow with three broad somewhat reddish-yellow stripes; scutellum, metanotum, pleura and coxæ light yellow; halteres yellow, knobs brown, lighter at the tips; legs brownish, tarsi and the tips of the femora and tibia darker, femora yellowish toward the base; abdomen yellow, darker posteriorly, with three faintly indicated stripes; eighth sternite somewhat produced and narrowed posteriorly, with a median depression which is abundantly furnished with long yellow hair, lateral angles with a pair of short

rather broad reddish-brown appendages the ends of which are fringed with shorter yellow hairs; hypopygium very dark brown; upper lamella thick, swollen, with a median shallow furrow which is much narrowed anteriorly, posterior margin produced into two short, blunt swollen processes which are widely separated by a deep rounded incision, below these is another pair of flattened, triangular, sharper pointed processes; the posterior half of the suture separating the upper from the lower lamella quite wide, membrane whitish; lower lamella with a rounded incision which is filled with the broad bases of a pair of long triangular upward pointing appendages; outer upper appendages very long and slender; wings hyaline; costal and subcostal cells yellowish; fifth longitudinal vein with a narrow very faint yellowish border; stigma brown; the whitish band beginning in front of the stigma extending through the discal into the base of the fourth posterior cell; a whitish spot beyond the stigma; discal cell hardly twice as long as wide. Length, male 21 mm., wing 22 mm.

Habitat: Battle Creek, Mich., three males. Aldrich. Type no. 177. Wash. Agric. Coll. & S. of S.

Tipula calva, sp. nov.

Yellow; head brownish-yellow with an indistinct darker median stripe; rostrum and palpi yellowish, last joint of latter brownish; antennæ reaching nearly to base of abdomen, first three joints yellow, others light brown, much darker at the base which is somewhat incrassate; mesonotum light yellow with three brown stripes, the median one twice as broad as the lateral ones and indistinctly divided by a faint cinereous line; the portion of the lateral lines extending back of the suture broader and much darker brown; collare light yellow with three faint brownish spots; scutellum and metanotum light yellow, each with a very faint median brown line; pleura whitish; halteres yellowish, knobs brown; legs yellow, tarsi and the tips of the femora and tibia slightly darker; abdomen yellowish, darker posteriorly with three brownish lines, lateral lines somewhat sinuate, lateral margin of each segment broadly whitish; eighth sternite dark brown, somewhat lighter posteriorly, posterior margin truncate with a median rather broad, blunt, rectangular reddish process; lateral angles with a pair of long, rather narrow, flattened appendages the inner margins of which are furnished with a few yellowish hairs; hypopygium large, very dark brown; upper lamella thick, swollen, with a median shallow furrow which is not narrowed anteriorly, posterior margin produced into two rather long, blunt, rounded processes which are separated by a deep, V-shaped incision; wings hyaline, faintly darker toward the tip; costal and subcostal cells faintly tinged with yellow; stigma brown; the posterior cross vein and the portion of the fifth longitudinal vein beyond this vein with a faint very narrow brownish border; a broad whitish interrupted line beginning in front of the stigma and extending across the discal cell into the base of the fourth posterior cell; a small whitish spot beyond the stigma; discal cell twice as long as wide. Length, male 21 mm., wing 22 mm.

Habitat: Battle Creek, Mich., two males. Aldrich. Type no. 178. Wash. Agric. Coll. & S. of S.

Very similar to *T. hirsuta*, but easily distinguished by the structure of the eighth abdominal sternite and the upper lamella of the hypopygium.

Tipula concinna, sp. nov.

Brown; head darker brown; rostrum and palpi yellow; antennæ reaching a little beyond the base of the wings, first two segments yellow, third yellowish-brown, those beyond the third brown, somewhat constricted in the middle; mesonotum light brown with four darker brown stripes; scutellum and metanotum brownish-yellow; pleura grayish-yellow; halteres yellowish, knobs brown, tips lighter; legs brown, tips of femora, tibia and tarsi somewhat darker, femora yellowish toward the base; abdomen brownish-yellow with three brown stripes, the lateral ones not complete; sixth and seventh segments darker brown; eighth sternite brown, posterior margin with a fringe of very long reddish-yellow hair; hypopygium brown; upper lamella lighter toward the tip, with short yellow hair, terminating in two short, blunt processes between which is a rather broad, shallow incision; wings with a brownish tinge; subcostal cell and the anterior margin of the anal cell with a yellowish tinge; the stigma, a spot over the base of the second submarginal and the first posterior cells, and a spot over the origin of the præfurca brown; the great cross vein and the distal portion of the fifth longitudinal vein brown bordered; the whitish band beginning in front of the stigma extending across the base of the discal cell into the base of the fourth posterior cell; a whitish spot beyond the stigma; discal a little more than twice as long as wide. Length, male 15 mm., wing 17 mm.

Habitat: Olympia, Wash., one male. Kincaid. Type no. 197. Wash. Agric. Coll. & S. of S.

Tipula unicincta, sp. nov.

Brown; head grayish-brown with a narrow median line above; rostrum reddish-brown, cinereous above; palpi brown; antennæ not reaching the base of the wing, first two segments yellow, others wholly dark brown, slightly darker at the base, cylindrical; mesonotum light brownish-gray with four brown stripes, the lateral ones rather short; the median ones are separated by a rather broad slate-colored line; scutellum and metanotum brownish; pleura more cinerescent; halteres brown, yellowish at the base, knobs brown, tips lighter; legs brown, tips of the femora, tibia and tarsi darker; abdomen brown with three rather indistinct somewhat broken brown stripes; tergum of the fourth segment nearly wholly brown; eighth sternite reddish-brown, posterior margin with a small median reddish-brown appendage which is fringed with short reddish-brown hairs; lateral angles provided with a pair of very much larger appendages the bases of each whitish, somewhat triangular, the apex bearing a very long, narrow, flattened, reddish-brown claw-like process and a few short, yellow hairs; hypopygium reddish-brown; upper lamella terminating in two rather long flattened acute points between which is a rather deep, V-shaped or U-shaped incision in the base of which arises a whitish tumid heart-shaped process, posterior lateral angles much lighter then the rest of the lamella; base of ovipositor dark brown, upper valves reddish-brown, rather long, slender, obtuse at tip; wings with a brownish tinge, apical half slightly darker; stigma brown; the broad whitish band beginning in front of the stigma and running across the base of the discal and into the base of the fourth posterior cell and the side of the fifth posterior cell; indistinct whitish streaks in all the posterior cells except the first; similar streaks in the

anal, axillary and spurious cells, one or two of which reach the posterior margin of the wing; an indistinct brownish border along the distal portion of the fifth vein; a brown spot over the basal cross veins; discal cell more than twice as long as wide. Length, male 10 mm., female 22 mm., wing 19 mm.

Habitat: Collins, Idaho, two males. (Type) Moscow Mt., Idaho, one male, one female. Piper. Pullman, Wash., one male. Keyport, Wash., three males, six females. Doane. Type no. 180. Wash. Agric. Coll. & S. of S.

The specimens from Keyport are larger with the general color of the body yellowish instead of brownish in all but two females, where the thorax is grayish, the wings are more yellowish with the white markings more distinct. These may possibly represent a distinct species, but as they show so much variation a larger series will be needed before the constant differences, if any, can be determined.

Tipula acuta, sp. nov.

Brown; head grayish-brown with a faintly indicated brownish line above; rostrum reddish-yellow, grayish-brown above; palpi brown, darker toward the tip; antennæ not reaching the base of the wing, first and second segments and the basal portion of the third yellowish, others brown, those beyond the third slightly incrassate at the base; mesonotum grayish-brown with three broad, brown stripes, the median one divided by a grayish line, the lateral ones interrupted anteriorly and posteriorly; scutellum grayish with a narrow median brown stripe; metanotum and pleura slate colored, the former with a median brown stripe, the latter more yellowish posteriorly; halteres yellow, knobs, brown lighter at the tip; legs brown, tarsi and the tips of the femora and tibia somewhat darker, femora yellowish toward the base; abdomen brown with three brown stripes, the lateral ones much broader posteriorly; posterior margin of the eighth sternite with a rather deep rounded incision from the middle of which arises two tufts of long yellow hair and from the sides of which arises a pair of broad reddish-brown two-pointed appendages which bear a fringe of shorter yellow hair along their inner margins; posterior margin of upper lamella of hypopygium with two small, crescent-shaped incisions; lower lamella divided, the posterior lateral angles furnished with a pair of elongated brownish appendages which in turn are provided with two long, slender, twisted pendulous appendages; ovipositor dark reddish-brown, valves straight, acute; wings with a brownish singe which is somewhat darker in the subcostal cell and in the anterior margin of the anal cell; stigma brown; the whitish band running from in front of the stigma across the discal cell into the base of the fourth posterior cell; discal cell about three times as long as wide. Length, male 19 mm., female, 21 mm., wing 23 mm.

Habitat: Palo Alto, Cal., four males. (Type) Doane, four males, four females. Kellogg. Type no. 181, Wash. Agric. Coll. & S. of S.

Close to *T. praecisa* Lw., but differs in the following points: antennæ beyond the third joint wholly brown in both sexes; stripes on

the mesonotum not saturate margined; upper valves of ovipositor acute. I do not have a male of *præcisa* before me so I cannot compare the hypopygia.

Tipula diluta, sp. nov.

Bown; head brownish-gray with a narrow median line above; rostrum short, stout, yellowish, grayish above; nasus nearly half as long as the rostrum; palpi brown, lighter toward the tip; antennæ reaching nearly to base of abdomen, wholly brown, segments one to five lighter brown, those beyond the third slightly incrassate at base; mesonotum light gray with three very broad brown stripes, the median one divided by a darker line; collare brown; scutellum light yellowish; metanotum yellowish-gray; pleura and coxæ light gray; halteres brown; knobs dark brown; abdomen brownish, lighter toward the base, with a lighter dorsal stripe; posterior and lateral margins of each segment gray; hypopygium small, brown; upper and lower lamella indistinctly separated, posterior margin of the former with a short rectangular process the posterior lateral angles of which are produced into short, black points; ventral side of lower lamella light yellow, with a deep narrow incision, outer appendages yellow, broad, irregularly ovate, overlapping; wings with a brownish tinge except in the middle portion which is somewhat whitish hyaline; costal, subcostal and the anterior margins of the first basal and the anal cells darker; stigma brown; an indistinct whitish spot in front of the stigma. Length, male 12 mm., wing 14 mm.

Habitat: Colo., two males. Morrison. Type no. 182, Wash. Agric. Coll. & S. of S.

Tipula leucophæa, sp. nov.

Cinereous; head cinereous, darker posteriorly with a broad dark brown stripe above; rostrum cinereous, long, stout; palpi brown, darker at the tip; antennæ of female reaching a little more than half way to base of wings, first joint yellowish-brown, second joint yellowish, others brown; metonotum cinereous with three slate-colored fusco-margined stripes, the median one divided by a narrow fuscous line; a broad fuscous line just above the dorsopleura suture; collare rather broad, prominent, cinereous, with a median brown spot; scutellum and metanotum cinereous each with a distinct fuscous line; dorsopleural membrane yellowish; ground color of pleura brown, covered with a silvery bloom; abdomen yellowish with three brown stripes; seventh and eighth segments mostly brown; base of ovipositor broad, light brown, shining, upper valves reddish-brown, broad, apex acute, lower valves reaching only to the base of the upper valves; wings cinereous; a spot in the base of the basal cells, another over the origin of the præfurca and a larger one over the stigma brown; all of the veins except in the basal portion of the wing more or less bordered with brown; faint brownish clouds in all the cells and on the apex of the wing; discal cell three times as long as wide. Length, female 30 mm., wing 25 mm.

Habitat: Colo., one female. Morrison. Type no. 183, Wash. Agric. Coll. & S. of S.

Tipula incisa, sp. nov.

Brown; head cinereous with a median narrow dark brown line above; rostrum and palpi yellowish, last joint of latter brown; antennæ reaching to base of wings, first two segments yellow, third yellowish-brown, remaining segments very dark brown, slightly incrassate at the base; mesonotum cinereous with five brown stripes, the lateral ones broad abbreviated anteriorly, the median ones narrower, reaching the anterior margin; collare, scutellum and metanotum brownish-gray, latter with a faint median brown line; pleura cinereous; halteres yellow, knobs brown; legs brownish-yellow, tarsi brown, tips of femora and tibia slightly darker; abdomen yellowish-brown with three brown stripes, posterior and lateral margins of each segment yellowish; posterior margin of eighth sternite with a fringe of rather long reddish-yellow hair; hypopygium reddish-brown; upper lamella with a deep median furrow, posterior margin with a small V-shaped incision; the lower lamella with a broad, deep incision in which there hangs two rather long tumid appendages the tips of which are furnished with rather long yellowish hair, outer lateral appendages broad, apex rounded; ovipositor long, reddish-brown, upper valves slightly arcuated near the tip; wings grayish with three fuscous spots; the first over the origin of the præfurca the second over the stigma and small cross veins, the third near the middle of the anal cell; costal, subcosial and anterior margin of anal cell with a yellowish tinge, the white band beginning in front of the stigma running through the base of the discal cell and fourth posterior cell interrupted in the fifth posterior cell but usually reaching the posterior margin of the wing; a whitish spot before the stigma and on both ends of the oblong fuscous spot in the anal cell; discal cell a little more than twice as long as wide. Length, male 18 mm., female 23 mm., wing 19 mm.

Habitat: Wawawi, Wash., four males, one female. (Type) Pullman, Wash., two females. Doane. Type no. 184, Wash. Agric. Coll. & S. of S.

Tipula subcinerea, sp. nov.

Brown; head cinereous with a rather broad brown stripe above; rostrum and base of palpi reddish-brown, the latter darker toward the tip; antennæ not reaching the base of the wings, brown, first and second joints yellow; joints of flagellum cylindrical, those beyond the first slightly incrassate at base, with verticles of long yellow hair; mesonotum light brown with six brown stripes, the lateral pairs uniting anteriorly, but suddenly diverging and inclosing a rather broad, short, brown spot; the median pair separated by a fusiform grayish-brown line; scutellum and metanotum brownish-gray, both with an indistinct median brown line; pleura gray, a brown stripe running posteriorly from above the base of the anterior coxæ and ending below the base of the wing; an indistinct brown spot above the base of the middle coxæ; halteres brown, base yellow, tips of knobs much lighter; abdomen brownish-yellow, darker laterally and posteriorly, posterior and lateral margin of each segment whitish; eighth tergite wholly brown; hypopygium very dark reddish-brown; upper and lower lamella completely fused together, the latter with a very deep broad incision and a narrow, shallow median yellowish depression; the upper of the two outer pairs of appendages is yellow, broadly spatulate with long whitish-

yellow hairs at the tip; the second pair is reddish-yellow, more strongly chitinized with the apex black, notched; wings long, with a brownish tinge, apex somewhat darker, with several indistinct fuscous and whitish spots; the fuscous spots at the base of the basal cells, at the origin and tip of the præfurca, along the fifth vein and at the tip of the seventh vein being most distinct; indistinct whitish spots in the margin of all the cells in the posterior part of the wings, stigma brown; discal cell about four times as long as wide. Length, male 20 mm., wing 22 mm.

Habitat: Colo., one male. Morrison. Type no. 185, Wash. Agric. Coll. & S. of S.

Tipula armata, sp. nov.

Yellow; head somewhat cinereous above, with a narrow median brown line above; rostrum and palpi yellow, the latter darker at the apex; antennæ reaching a little beyond the base of the wings, yellow, darker toward the apex, the last five or six segments being brownish; the segments beyond the third black and slightly incrassate at the base; mesonotum yellow with four brown stripes; scutellum, metanotum and pleura light yellow; halteres yellow, knobs brown, tips whitish, legs yellow, tarsi and tips of femora and tibia brown; abdomen yellow with three brown stripes, the lateral ones very faintly indicated; eighth sternite somewhat produced and narrowed posteriorly; posterior margin with very thick, bushy, long, reddish-yellow hair; hypopygium large, reddish-brown; upper lamella produced into two, long, flattened somewhat triangular processes, the ends of which are slightly curved downward and inward; the outer lateral appendages of the lower lamella produced into rather long very acute triangular appendages, posterior margin of lamella with two small reddish-brown appendages which are furnished with rather long yellowish hair; wings of a brownish tinge, somewhat darker toward the apex; a faint oblong spot in the first basal cell midway between the base of this cell and the origin of the præfurca; the origin of the præfurca and the stigma brown; costal, subcostal and the anterior margin of the anal cells yellowish; a whitish spot running from in front of the stigma across the base of the discal cell into the base of the fourth posterior cell and following along the vein separating this cell from the fifth posterior cell to the posterior margin of the wing; a whitish spot beyond the stigma and a very faint whitish spot in the posterior margin of the axillary cell. Length, male 17 mm., wing 20 mm.

Habitat: Seattle, Wash., four males. Kincaid. Type no. 186, Wash. Agric. Coll. & S. of S.

Tipula albovittata, sp. nov.

Cinereous; head cinereous; rostrum yellowish, cinereous above; palpi brown; antennæ not reaching the base of the wings, brown; second segment yellow; mesonotum cinereous, with three broad brown stripes, the median one divided near its anterior end by a short gray line; collare cinereous with a median brown line; scutellum, metanotum and pleura brownish-gray; halteres light yellow, knobs brown; legs brownish-yellow, tips of femora, tibia and tarsi brown; abdomen brownish-yellow, much darker posteriorly, with three brown stripes, the lateral ones broken; fourth segment almost wholly brown above; eighth sternite dark reddish-

brown, posterior margin with a tuft of light yellow hair; upper lamella of hypopygium, with a median depression and a slight incision; posterior margin of the lower lamella with a broad blunt triangular process the middle of which is whitish and tumid, the sides reddish-brown; wings brown with three irregular white bands, the first near the base, the second near the middle and the third toward the apex of the wing; the extreme apex of the second submarginal cell, the apical portion of the first posterior cell and the basal portion of the second, third, and fourth posterior cells also white spotted; a small white spot at the origin of the præfurca; costal cell except a brown cloud opposite the origin of the præfurca, and the extreme base of the wing white; discal cell three times as long as wide. Length, male 17 mm., wing 19 mm.

Habitat: Pullman, Wash., one male. *Piper.* Type no. 187, Wash. Agric. Coll. & S. of S.

Tipula albonotata, sp. nov.

Brown; head grayish-brown with a median brown stripe above; rostrum yellowish, brownish above; palpi brown, yellowish toward the base; antennæ reaching the base of the wings, first three segments yellow, others dark brown and deeply excised below in the male; antennæ of female much shorter, first six or seven segments yellowish, others brown; mesonotum brown, with three broad brown stripes, the median one divided by a narrow grayish line; collare grayish-brown with a median brown spot; scutellum brown with a darker brown median stripe; metanotum cinereous; pleura slate-colored; halteres yellow, knobs brown; legs yellowish-brown, tarsi and tips of femora and tibia darker; abdomen brownish-yellow with three brown stripes, the lateral ones faintly indicated, posterior margin of each segment yellowish; eighth sternite and hypopygium reddish-brown; posterior margin of upper lamella depressed, shining black, with a median short, blunt, black process; lower lamella with a rounded incision in which hangs a pair of rather long, brownish tumid appendages; ovipositor long, dark brownish-red, upper valves straight, acute; wings gray with three conspicuous whitish spots, the first incompletely surrounding the stigma and extending across the base of the discal cell into the base of the fourth posterior cell, the second near the distal end of the second basal cell, the third near the middle of the axillary cell; stigma and a small spot at the base of the præfurca brown; costal, subcostal and the anterior margin of the anal cells with a yellowish tinge; discal cell a little more than twice as long as wide. Length, male 15 mm., female 23 mm., wing 16 mm.

Habitat: Battle Creek, Mich., one male, one female. *Aldrich.* Type no. 188, Wash. Agric. Coll. & S. of S.

Tipula spectabilis, sp. nov.

Yellowish; head cinereous with a narrow median dark line above; rostrum reddish-yellow; palpi yellow, apex brown; antennæ reaching nearly to base of abdomen, the first three segments wholly yellow, the next two or three segments yellowish with a brownish tinge, the remaining segments brown, those beyond the third slightly incrassate and darker at the base; mesonotum light yellowish with

four brown stripes, the median pair separated by a fusiform light yellow line; scutellum reddish-brown; metanotum and pleura brownish-gray; halteres yellowish, knobs brown; legs brownish-yellow, tips of femora, tibia and tarsi brown; abdomen yellowish, darker posteriorly, with three brown stripes the lateral ones faintly indicated anteriorly; eighth sternite produced and narrowed posteriorly with a shallow rounded incision from which arises a tuft of very thick, bushy, long reddish hair; hypopygium large, reddish-brown; posterior margin of upper lamella with a slight depression, with two very small median black points; lower lamella with a shallow rounded incision in which lies a pair of small reddish-brown appendages which are furnished with short yellow hair at the tip; outer lateral appendages produced into two long flattened projections the distal thirds of which are broadened and twisted in such a way that the concave surfaces are toward each other; wings brownish, with darker and lighter spots; an oblong spot in the first basal cell midway between the base of this cell and the origin of the præfurca, the origin of the præfurca, the stigma, a less distinct spot over the small cross veins and at the tip of the posterior branch of the second vein darker brown; an irregular whitish band running from in front of the stigma across the discal into the base of the fourth and fifth posterior cells; a spot beyond the stigma, one in the middle of the first basal cell, another in the posterior margin of the axillary cell, and the basal portion of the wing whitish; nearly all the veins border with whitish. Length, male 17 mm., wing 20 mm.

Habitat: Collins, Idaho, ten males. Piper. Type no. 189, Wash. Agric. Coll. & S. of S.

Tipula contaminata, sp. nov.

Tawny; head light brown, darker above with a median fuscous line; rostrum and palpi light brownish; first four segments of antennæ of female yellowish, the others yellowish-brown; mesonotum tawny, each of the four brown stripes margined with darker brown; collare tawny, with three brown spots; scutellum and metanotum brownish with a narrow median brown stripe; dorsopleural membrane yellowish-white; pleura grayish-brown; mesopleura and sternopleura darker brown; halteres wholly light yellow; legs brownish-yellow, tips of femora, tibia and tarsi brown; abdomen yellowish-brown with three brown stripes, the lateral ones indistinct; posterior margin of each segment light yellow; ninth tergite reddish-brown with a yellow border, posterior margin with a broad deep median incision and lateral narrow sharp incisions; posterior margin of ninth sternite with a deep incision; ovipositor very short reddish-brown, upper valves forcep-like, lower valves shorter, leaf-like, somewhat membranous; wings broad with a light brownish tinge, with several indistinct whitish spots in the middle apical portion of the wing; all of the veins in the posterior portion of the wing with a more or less distinct whitish border; the extreme tips of the veins with a dark spot, leaving a whitish spot in the margin of each of the posterior cells and less distinct spots in the anal, axillary and spurious cells; stigma and a small spot on the origin of the præfurca brown; discal cell less than twice as long as wide. Length, female 20 mm., wing 23 mm.

Habitat: Colo., two females. Morrison. Type no. 190, Wash. Agric. Coll. & S. of S.

Tipula abluta, sp. nov.

Brown; head brown, darker above; rostrum and palpi yellowish-brown, latter darker at the tip; first two segments of antennæ yellow, others brown; mesonotum light brown with four brown stripes, the median pair incompletely separated anteriorly; collare yellowish-brown with three brown spots; scutellum, metanotum, pleura, and coxæ reddish-brown; dorsopleural membrane brown; halteres brown, tips lighter; legs brownish yellow, tips of femora, tibia and tarsi brown; abdomen yellowish-brown, darker posteriorly, with lateral brown stripes; posterior and lateral margins of each segment yellowish; eighth and ninth segments separated by a deep furrow above; eighth tergite with two very short, blunt points near the median line; lateral margins of the ninth tergite drawn out into a blunt point posteriorly; ninth sternite divided by a deep quadrate incision; base of ovipositor very stout, upper valves rather short, reddish-brown, slightly arcuated, with a deep dorso-lateral groove; lower valves a little stouter than the upper, acute; wings very similar to *T. contaminata*, but narrower and somewhat darker with a faint brownish spot in the middle of the discal cell and a still fainter spot in the posterior margin of the second basal cell opposite the origin of the præfurca. Length, female 22 mm., wing 21 mm.

Habitat: Colo., one female. Morrison. Type no. 191, Wash. Agric. Coll. & S. of S.

Tipula varia, sp. nov.

Yellow; head yellowish-brown with a median brown stripe above; rostrum and palpi yellow, last joint of the latter brown; antennæ of female reaching half way to base of wings, yellow, segments beyond the fifth dark at base; mesonotum light yellow with four brown stripes; scutellum and metanotum reddish-brown; pleura and dorsopleura membrane yellowish; halteres yellow, knobs brown, lighter at the tip; legs yellowish, tips of femora, tibia and tarsi brown; abdomen brownish-yellow with three brown stripes; ninth abdominal tergite almost concealed beneath the eighth; eighth and ninth sterna and the lower base of the ovipositor fused together, light yellow; upper base of ovipositor reddish-brown, somewhat cylindrical from above; valves of ovipositor reddish-brown, the upper ones straight, slender tips rounded; lower valves shorter, broader and more blunt at the tips; wings tinged with brown, apex somewhat darker; a brown spot in the anterior margin of the first basal cell nearly opposite the tip of the seventh longitudinal vein; darker spots over the stigma and the origin of the præfurca and much fainter spots at the tip of the posterior branch of the second vein and over the base of the second submarginal and first posterior cells; an incomplete whitish band beginning in front of the stigma and extending across the base of the discal cell into the base of the fourth posterior cell; a whitish spot beyond the stigma, and a very faint whitish streak just beyond the tip of the seventh vein; discal cell more than three times as long as wide. Length, female 19 mm., wing 19 mm.

Habitat: Seattle, one female. (Type) Olympia, Wash., one female. Kincaid. Type no. 192, Wash. Agric. Coll. & S. of S.

Tipula albocaudata, sp. nov.

Brown; head cinereous with a median brown stripe above; rostrum brownish-yellow; palpi brown; antennæ of male reaching to base of abdomen, dark brown, first two segments and the base of the third yellow; joints of flagellum cylindrical and very slightly incrassate at base; mesonotum light brown or cinereous, with seven brown stripes, the median one very faintly indicated, the outer pairs united anteriorly; collare yellowish with three brown stripes; scutellum yellowish; metanotum grayish-brown; dorsopleural membrane light yellowish; mesopleura and sternopleura and anterior coxæ slate-colored, rest of pleura light yellowish; halteres brown, base yellowish, knobs blackish; legs brown; femora yellowish toward the base; tarsi and tips of femora and tibia darker; abdomen reddish-brown, blackish posteriorly with two broad blackish lateral lines which are broader posteriorly; hypopygium black, elongate; upper and lower lamella closely fused together, the former with two yellow, black-tipped, short, slender appendages; lower lamella with a deep broad incision and a median yellow line, lateral appendages yellow; wings almost hyaline with a very slight brownish tinge; subcostal cell and the anterior margin of the anal cell very slightly tinged with yellow; stigma brown; the posterior cross vein with a very narrow brown border; the indistinct broken whitish band beginning in front of the stigma running across the base of the discal into the base of the fourth posterior cell; discal cell more than twice as long as wide. Length, male 17 mm., wing 17 mm.

Habitat: Pullman, Wash., two males. (Type) Wawawi, Wash., one male. Doane. Colo., two males. Morrison. Type no. 193, Wash. Agric. Coll. & S. of S.

Tipula cognata, sp. nov.

Brown; head brownish cinereous with a median brown line above; rostrum and palpi brown, the latter darker toward the tip; antennæ of female reaching more than half way to the base of the wings, first and second joints yellow, third and fourth yellowish-brown, others wholly dark brown; mesonotum brownish-yellow with four dark brown stripes; the median pair is separated by a broad grayish stripe which is divided by a light brownish line; collare cinereous with three faintly indicated darker spots; scutellum and metanotum cinereous, the former yellowish posteriorly, each with a narrow median brown line; dorsopleura membrane yellow; pleura slate-colored; metapleura and hypopleura with a yellowish tinge; halteres light yellowish, knobs brown; legs brown, femora yellowish toward the base, tarsi and the tips of the femora and tibia darker brown; abdomen brownish-yellow with two broad, dark brown stripes above and sometimes three or four faintly indicated broken brown stripes below; posterior and lateral margin of each segment grayish; eighth and ninth segments wholly very dark brown; the posterior lateral corner of the ninth tergite drawn out into a short blunt process; base of ovipositor blackish; basal half of upper valves rather broad apical half, slender tip rounded; lower valves broader, blunt, reaching way to tip of upper valves; wings almost hyaline with a faint brownish or grayish tinge; costal, subcostal and anterior margin of anal cells and the base of the wing with a yellowish tinge; stigma brown; the great and small cross veins and the fifth longitudinal vein faintly and very narrowly brownish bordered; discal cell more than

three times as long as wide; petiole of second submarginal cell short. Length, female 10 mm., wing 19 mm.

Habitat: Seattle, Wash., one female. (Type) Olympia, Wash., two females. Kincaid. Moscow Mt., Idaho, three females. Doane. Type no. 194, Wash. Agric. Coll. & S. of S.

I have before me five males from Olympia which evidently belong to this species, although the thorax and head are almost wholly black, and the stripes on the mesonotum faintly distinguishable. The black color is evidently due to desiccation. Antennæ reaching beyond the base of the abdomen; first and second joint and the base of the third yellow, others dark brown; joints of the flagellum conspicuously excised below; hypopygium similar to that of *T. albocaudata*.

Tipula usitata, sp. nov.

Brown; head yellowish, brownish posteriorly, with a median brown line above; rostrum yellow, brownish above; palpi light brown, darker toward the tip; antennæ of female reaching half way to base of wings, first segment brownish-yellow, second yellow, others brown; mesonotum cinereous, with five brown stripes, the lateral ones broadest; collare yellowish with a median brown line; scutellum and metanotum brownish, both with a faintly indicated median brown line; dorsopleural membrane yellow; mesopleura, sternopleura and anterior coxæ slate gray, rest of pleura and other coxæ light yellowish; halteres brown, yellowish at the base; legs brown, tibia and tips of femora and tibia darker; an indistinct lighter band just before the brown band on the stigma; abdomen yellowish-brown with three brown stripes, the lateral ones broadest; base of first segment whitish; posterior margin of each segment grayish or yellowish; ninth segment black above, yellowish below; upper base of ovipositor shining black, valves reddish-yellow, darker toward the tips, tips blunt, rounded; lower valves reaching but little beyond the base of the upper valves; wings almost hyaline, with a grayish tinge, apical portion slightly darker; costal, subcostal and anterior margin of anal cells faintly tinged with yellow; stigma brown; the whitish broken band beginning in front of the stigma extending across the base of the discal cell through the fourth and fifth posterior cells to the posterior margin of the wing; a whitish spot beyond the stigma; discal cell more than three times as long as wide. Length, female 14 mm., wing 14 mm.

Habitat: Tokeland, Wash., one female. (Type) Doane. Corvalis, Ore., one female. Kincaid. Type no. 195, Wash. Agric. Coll. & S. of S.

Tipula graphica, sp. nov.

Brown; head cinereous with a brown stripe above; rostrum yellow; palpi brown; antennæ of female reaching a little more than half way to the base of the wings, first six segments yellow, others brown; mesonotum light gray with three broad grayish-brown stripes each brown-bordered, the median one divided by a narrow brown line;

collare grayish-brown, darker laterally; scutellum and metanotum brownish with a median brown line; dorsopleural membrane whitish; pleura gray, hoary; halteres yellowish, knobs brown; legs yellowish, tarsi and tips of femora and tibia brown; abdomen brown with two broad, interrupted, brown, lateral stripes; posterior and lateral margins of each segment except the last two grayish or yellowish; eighth segment wholly light brown; ninth tergite blackish, lateral margins produced posteriorly into short blunt points; ovipositor dark reddish-brown, upper valves very slightly arcuated, rounded at the tip; lower valves reaching nearly half way to tip of upper valves; wings whitish hyaline with brown markings along the costa and veins; the brown costal border reaching posteriorly to the fourth vein in the middle portion of the wing and to the third vein in the apical portion, interrupted before the stigma by a broad whitish hyaline band; fifth vein and great cross vein broadly, others narrowly, bordered with brown, border of sixth and seventh veins faint; all the posterior cells brown margined, base of first brown; discal cell four times as long as wide, immaculate. Length, male 16 mm., wing 17 mm.

Habitat: Palo Alto, Cal., one female. Doane. Type no. 196, Wash. Agric. Coll. & S. of S.

Tipula decora, sp. nov.

Brown; head cinereous with a median dark brown line above; rostrum and palpi yellow, latter darker toward the apex; antennæ of male reaching beyond the base of the abdomen, first three segments yellow, others dark brown, darker at the base, segments beyond the third very slightly incrassate at base; mesonotum light gray with three very broad brown stripes each divided by a faint narrow grayish line; collare brownish, with three brown spots; scutellum and metanotum yellowish-brown, each with a narrow brown stripe, the latter with two brown spots on the posterior margin; dorsopleural membrane light yellowish; pleura hoary; mesopleura and sternopleura slate-colored, rest lighter gray; halteres yellow, knobs brown; legs brown, base of femora yellowish, tarsi and tips of femora and tibia darker; abdomen brownish-yellow, brown posteriorly, with three brown stripes, the lateral ones indistinct, broken; posterior margin of each segment yellowish; hypopygium small, very dark brown; upper lamella with a very small incision; lower lamella with a deep rather broad incision, appendages lighter brown; wings brownish with whitish spots and a crescent-shaped subapical whitish band, the latter beginning in the costa beyond the stigma and extending through the fourth posterior cell to the margin of the wing; two large whitish spots in the second basal cell, smaller fainter spots in the anal and axillary cells and before the stigma; stigma brown; base of second submarginal and first posterior cells and all that portion of the wing beyond the whitish band brown. Length, male 12 mm., wing 14 mm.

Habitat: Montreal, Can., one male. Chagnon. Type no. 197, Wash. Agric. Coll. & S. of S.

Tipula subtenuicornis, sp. nov.

Brown; head brownish-yellow; rostrum and palpi yellow; antennæ reaching to the base of the third abdominal segment, first two segments and the extreme base

of the third yellow, others brown, cylindrical, very slightly incrassate at the base, bristles of the verticles long, slender; mesonotum brownish-gray with four brown stripes, the median pair slightly broader anteriorly; collare yellowish-brown with three brown stripes; scutellum yellowish-brown; metanotum grayish-brown, sides yellowish; dorsopleural membrane yellowish; mesopleura and the ventral half of the sternopleura blackish-brown, rest of pleura yellowish; halteres yellowish, knobs brown at the base, whitish at the tips; legs yellowish, tarsi and the tips of the femora and tibia darker; abdomen brownish-yellow with lateral narrow brown stripes; posterior border of the second and third segments with a narrow black ring; seventh and eighth and all except the anterior margin of the sixth segments black; hypopygium small, yellow; upper lamella terminating in a median, short rather acute point; wings grayish with faint whitish spots; subcostal cell faintly tinged with yellow; stigma brown, surrounded by whitish; a large whitish spot covering the tips of the basal cells and the base of the discal, fourth and fifth posterior cells; faint whitish streaks in the second basal, anal and axillary cells; first posterior cell lighter than the others; discal cell twice as long as wide. Length, male 14 mm., wing 14 mm.

Habitat: Seattle, Wash., one male. Kincaid. Type no. 198, Wash. Agric. Coll. & S. of S.

Tipula albofascia, sp. nov.

Yellow; head grayish-yellow, darker posteriorly with a very narrow faint black line above; rostrum and palpi yellow, latter darker at the tip; antennæ of female reaching nearly to base of wings, first three segments yellow, others brown, yellowish at the joints; mesonotum light yellowish with three broad reddish-brown stripes; collare yellowish with three darker spots; scutellum and metanotum brownish-yellow; dorsopleural membrane yellow; pleura yellow with a whitish bloom; halteres yellow, knobs brown; legs yellow, tarsi and tips of femora and tibia darker; abdomen yellow with three brown stripes; posterior margin of each segment light yellow; eighth and ninth segments wholly very dark brown; base of ovipositor very dark reddish-brown, shining; upper valves reddish, slender, straight, tips rounded above; lower valves broader, blunt, hardly reaching the middle of the upper valves; wings almost hyaline faintly tinged with yellow, apex slightly darker; costal, subcostal and anterior margin of anal cells slightly tinged with yellow; the whitish band beginning in front of the stigma extending across the base of the discal cell through the fourth and fifth posterior cells to the posterior margin of the wing; discal cell about twice as long as wide. Length, female 20 mm., wing 21 mm.

Habitat: Corvalis, Ore., one female. Kincaid. Type no. 199, Wash. Agric. Coll. & S. of S.

Tipula lucida, sp. nov.

Yellow; head cinereous; rostrum yellow; palpi brownish-yellow, darker toward the tip; antennæ of male reaching a little beyond the base of the wings, first two segments and the base of the third yellow, others brown, cylindrical, very slightly incrassate at the base; antennæ of the female hardly reaching half way to the base of the wing, first three segments yellow, others brown; whole thorax honey yellow,

shining; dorsopleural membrane whitish; halteres yellow, knobs brown; legs yellow, tarsi and the tips of the femora and tibia darker; abdomen honey yellow, darker posteriorly, with black dots on the lateral margin of each segment which are sometimes incompletely connected by brownish stripes; a brownish spot on the first sternite; eighth tergite somewhat produced and narrowed posteriorly, posterior margin with two tufts of long reddish hair; hypopygium large, reddish yellow; posterior margin of upper lamella with a slight median incision, lateral angles produced into short, slender, acute points; lower lamella with a rather deep incision in which lies a pair of short reddish-brown appendages the tips of which are fringed with long yellow hair; base of ovipositor honey yellow, shining, valves reddish, upper valves slightly arcuate, long, slender, acute; lower valves broader, obtuse, reaching beyond the middle of the upper valves; wings hyaline, subcostal cell and stigma with a slight yellowish tinge; a very faint scarcely perceptible whitish streak running from in front of the stigma across the base of the discal cell; discal cell twice as long as wide. Length, male 15 mm., female 18 to 20 mm., wing 17 mm.

Habitat: Moscow Mt., Idaho, one male, one female. (Type) Doane. Collins, Ida., two males. Piper. Type no. 200, Wash. Agric. Coll. & S. of S.

THE SOUTHERN CORN-LEAF BEETLE: A NEW INSECT PEST OF GROWING CORN.

PLATES VII–IX.

BY F. M. WEBSTER.

While investigating the habits of the species of *Simulium*, inhabiting the country adjacent to the Mississippi River in Arkansas and Louisiana, early in April, 1887, I observed in a small field of corn, on the old Perkins Plantation, at Somerset Landing, Tensas Parish, Louisiana, a number of beetles, *Myochrous denticollis* Say, attacking the young corn.

They were found, largely, in the soil about the stems of the plants at or very near the surface of the ground, where they seemed to be engaged in gnawing the bases of the outside leaves, and were not then observed to depredate upon the upper portion of the leaves, nor were they at any time observed running over the plants. At the time, however, the corn plants were very small, not having put forth more than three or at most four leaves. No serious injuries were observed at the time, and more pertinent investigations prevented my giving them further attention. I was not then aware of what has

since been learned, viz., that the beetles are quite easily alarmed, and, when disturbed, drop to the ground and secrete themselves in crevices, under clods, or about the bases of the plants. There was no evidence, in this field, to throw any light upon the food plants of the species, other than corn.

These facts were recorded in substance by the writer in Report of United States Commissioner of Agriculture, for the year 1887, p. 147, and up to the present year, this has remained the only published notice relative to the food habits of the insect, so far as I have been able to learn. Prof. S. J. Hunter, in a recent letter, reports injury to young corn, at Hartford, Kansas, May 31, 1894, and Prof. S. A. Forbes writes me that it had been taken at Cobden, Union county, Illinois, on corn. Mr. W. H. Ashmead, in his "Notes on Cotton Insects in Mississippi" published in Insect Life, Vol. VII, pp. 25–29, 240–247, 1894, includes the species among those found on the cotton plant, but it was not observed to feed thereon.

The species was described in 1824* by Thomas Say, under the name of *Colaspis denticollis*, as follows:

C. denticollis.—Lateral thoracic edge three-toothed; elytra serrate. Inhabits Missouri.

Body black, slightly bronzed, covered with dense, robust, cinereous hairs: antennæ dull rufous at base; thorax with three equal, equidistant teeth on the lateral edge; elytra with lateral edge minutely dentated; tip simple; anterior tibiæ and posterior thighs one-toothed. Length, nearly one-fifth of an inch.

To the ordinary observer, these beetles are about three-sixteenths of an inch long and about one-third as wide as long, frequently so covered with earth, which becomes intermixed with the dense hairs, that they look more like animated bits of soil than they do like insects. See Plate VII, Figs. 1, 2, 1 dorsal, and 2, lateral views.

The species is clearly a southwestern one, and, probably, one of those that has worked its way northward from Mexico, and, perhaps, Central America. But on this point I shall have more to say later. Its distribution in the United States may be outlined as extending from Washington, D. C., to extreme southwestern Iowa, southern Arizona, and Texas, Florida and Virginia. The exact localities, so far as

Jour. Phila. Acad. Nat. Sci., Vol. III, p. 448, being Descriptions of Coleopterous Insects Collected in the late Expedition to the Rocky Mountains, performed by order of Mr. Calhoun, Secretary of War, and under command of Major Long.

I have been able to obtain them, are as follows: Washington, D. C. (Chittenden); Columbus (J. S. Hine), Marietta,* and Cheshire, Ohio (Webster); Kentucky (S. J. Hunter), Kentucky, opposite Cincinnati, Ohio (Dury, 25 years ago); Paxton,* Indiana; Urbana, Champaign county, and Clay, Jackson, Union and Pulaski counties, Illinois (Forbes); Kirkwood,* Cadet,* Missouri City,* Missouri; Eastport, Iowa (Wickham); Lawrence, Douglass county and Hartford, Lyon county, Kansas (Hunter); Vinita, Indian Territory (Wickham); Tucson, Arizona (Wickham); Las Cruces,* New Mexico; El Paso (LeConte), Dallas,* Columbia,* Columbus* (Wickham), Victoria,* Brownsville* (Wickham), Texas; Somerset Landing (Webster), New Orleans (Forbes), Shreveport,* Louisiana; Vicksburg,* Mississippi; Archer,* Capon,* Enterprise,* Florida; Fortress Monroe,* Virginia. LeConte includes the species in his list of Coleoptera of Kansas and Nebraska, and also in his list for eastern New Mexico, but does not give exact localities. See map, Plate IX.

The first information that I had of this insect, in destructive abundance, in Ohio, came from Mr. Alva Agee, of Cheshire, who wrote me under the date of June 2, 1900, to the effect that "The miserable fellows helped to eat up a field of corn."

As Mr. Agee had accompanied his complaint with specimens of the insect, there was no doubt as to its identity, and on June 4th I sent my assistant, Mr. Newell, to investigate the matter. It was found that the area of serious depredation was not confined to a single field, but covered a territory about three miles square, rather rough and uneven in its topography, with the worst infested fields located upon the hills and ridges, and consisting, uniformly, of lands that had the previous year been devoted to pasture, or else had several years prior to the present been allowed to lapse into a semi-wild condition. Farmers in the neighborhood had observed the work of the insect for about four years.

The beetles commence their work, in this locality, about the first week in May, or as soon as the corn plants appeared above ground. They feed during early morning or toward evening, during clear days when the sun shines, but during cloudy days they may be observed thus engaged at any time. If there are passing clouds, they will feed while the sun is obscured, but as soon as the clouds pass from before

* Specimens in the United States Nat. Museum.

the sun, they quickly seek cover from its hot rays and hide themselves away under clods, in crevices in the ground or about the bases of the plants, showing no inclination to take flight, but running rapidly.

On June 7th, a female was dissected, and eggs found in the ovaries. These eggs were yellow in color, cylindrical, and estimated to be about 1 mm. in length and about one-fifth as broad as long, with the ends roundingly truncated. It has not yet been possible to observe where the eggs are deposited, nor have I been able to learn where the insect passes the larval and pupal stages. As it belongs to a group of beetles which includes *Paria*, *Fidia*, *Colaspis*, *Heteraspis* and several other genera, species of which are known to feed upon the roots of plants, in the larval stage, it is fair to presume that the larvæ of this species are of subterranean habits also.

On July 21st, Mr. Newell again visited the same locality and found a few beetles still feeding upon the corn plants, usually inside of the unfolding leaves or on the tassels. The effects of their attacks upon the corn plant is shown in Plate VII, Fig. 3, while the general effect is illustrated in Plate VIII, Fig. 1, from a photograph taken by Mr. Newell on July 23d, showing the condition of a field at that date, the standing corn being that from a second planting. In a corner of this field was a small space where the second planting had not been attacked, and this is illustrated in Plate VIII, Fig. 2, showing what the condition of the entire field should have been, even after the first planting had been destroyed by the *Myochrous*. Both in the fields and in our breeding cages the beetles fed freely on corn, timothy and crabgrass, *Panicum pubescens*, but very sparingly on bluegrass and redtop, and it is doubtful if the beetles can survive on the latter two.

October 24, 1900, I found a few beetles about asters and feeding on young belated broom corn. April 12, 1901, Mr. Newell found one adult among asters, showing that at least some of the insects winter over in that stage. No material damage has been done in the locality the present year, up to July 15th.

A species of larvæ were found in great abundance about the roots of two species of *Aster*, *A. pilosus* var. *platyphyllus* and *A. hirsuticollis*, (?) upon the roots of which they evidently subsist. Owing to the fact these larvæ were swept off in myriads by the ravages of *Sporotrichum globuliferum*, I was only able to rear a single adult, which Prof. C. H. Fernald thinks may prove to belong to a new species of Tortricidæ. Early in November, 1900, I visited the locality and

about the roots of these same species of *Aster* found great numbers of a coleopterous larvæ which from their resemblance to the larvæ of other Eumolpini seemed likely to be those of *Myochrous denticollis*, but again, on account of the attack of *Sporotrichum*, only a single adult has been reared and that a *Paria*.

By the accompanying map, Plate IX, I have endeavored to illustrate the known distribution of this and the other two species of the genus *Myochrous*, not as in any way throwing additional light upon the food habits of *M. denticollis*, though one of them, *M. squamosus*, seems to have the habit of collecting under dried excrement of the Bison, when these existed in its area of distribution, and, later, under the dried excrement of cattle. Mr. Dury tells me that he always collected *M. denticollis* under boards and similar objects laying on the ground, and on low lands.

In their distribution, *M. denticollis* inhabits the country east of a line drawn from southwestern Iowa to Tucson, Arizona, while *M. squamosus* ranges from northern Arizona and New Mexico to the Platte River in Nebraska and northwest into Montana, probably through western South Dakota and Wyoming. *M. longulus*, the only remaining species of the genus to be mentioned, is known to range from southern California and Arizona, northward into Colorado, where it has been reported by LeConte, without exact locality. It not unlikely occurs also in Utah, though it has not yet been reported from there in our literature, so far as I am able to learn, but in any case overlapping the territory inhabited by *M. squamosus* in northern Arizona and New Mexico, and also, probably, in Colorado, while the latter species borders on and possibly mingles with *M. denticollis* in southwestern Arizona, eastern New Mexico, western Kansas, and, probably, extreme southeastern Nebraska.

In their anatomical affinities, *denticollis* is the most remote from *squamosus*, though their habitat is contiguous if not indeed overlapping, and the nearest to *longulus*, whose habitat is far to the south, and only touching in Arizona. Thus is would seem that the first two had been the earliest species to push northward, and have become the most widely separated in structure, while *longulus* seems to have been the latest to enter our fauna. The genus *Diabrotica* offers some very good illustrations of the evolution of species along the west coast, independently, as it would appear, from those along the eastern shores. Hence, *M. longulus* might very probably represent a west coast variation.

From what we know of the genus *Myochrous*, in Mexico and to the southward, we may with more data be able to trace *denticollis* back to its southern home. According to Mr. Martin Jacoby,* *M. melancholicus*, a species very closely allied to *denticollis*, occurs at Durango, Pueblo and Tabasco, in Mexico, and also in Panama, thus already implying a possible origin of the latter species. *M. femoralis*, also closely allied to *denticollis*, occurs in British Honduras, which rather strengthens this theory. Other species of the genus inhabiting the country to the southward of the United States, are *sallei*, *albovillosus* and *carinatus*, from Mexico, and *tibialis*, from British Honduras and Guatemala.

EXPLANATION OF PLATE VII.

Fig. 1. *Myochrous denticollis*, dorsal view.

Fig. 2. " " lateral view.

Fig. 3. Corn plant showing ravages of *Myochrous denticollis*.

EXPLANATION OF PLATE VIII.

Fig. 1. General effect of attacks of *M. denticollis*.

Fig. 2. Corner of same field where the plants from second planting were not destroyed.

EXPLANATION OF PLATE IX.

Map showing distribution of *Myochrous denticollis*, *M. squamosus* and *M. longulus*.

ON SOME BEES OF THE GENUS ANDRENA FROM NEW JERSEY.

By T. D. A. COCKERELL.

The females of the species under consideration may be separated by the following table. I have included two species of *Colletes* which resemble *Andrena* and may be confused with it. The material herein discussed was collected by Dr. J. B. Smith, and consists of species on which he has made biological observations.

Base of metathorax (propodeum) with a transverse ridge enclosing a narrow strongly plicate area.....1.

Base of metathorax without such a ridge.....2.

1. Hair of thoracic dorsum pale ochraceous and black.....*Colletes inæqualis* Say.
   Hair of thoracic dorsum bright orange-ferruginous.....*Colletes thoracica* Smith.

2. Larger species; abdomen shining black without hair-bands; thorax covered with ochraceous hair.....3.
   Smaller species; abdomen with hair-bands at least partially developed.....5.

* Biologia Centrali-Americana, Vol. VI, Pt. 1, and Supplement, Pt. 1.

3. Hair at end of abdomen ferruginous.....*dunningi* Ckll.
Hair at end of abdomen black.....4.
4. Hair of pleura black; process of labrum rounded.....*carlini* Ckll.
Hair of pleura pale; process of labrum truncate.....*vicina* Smith.
5. Abdomen shining, with strong punctures; hair at apex of abdomen pale ferruginous.....*hippotes* Rob.
Abdomen tessellate, with minute punctures; hair at apex of abdomen sooty or purplish-black.....6.
6. Stigma and tegulæ piceous; process of labrum deeply bifid.....sp. incert.
Stigma and tegulæ ferruginous; process of labrum conical in outline, the apex rounded and entire.....*placida* Smith.

Andrena dunningi *Ckll.*

Both sexes from Newark, in May. *A. viciniformis* Rob., is a synonym; at least, I can find no difference.

Andrena vicina *Smith.*

One ♀ from Burlington Co., May; marked "*bicolor.*" It was unexpected so far south.

Andrena carlini *Ckll.*

Females from Jamesburgh, May; Burlington Co., May; Prospertown, June 1; one is marked "*vicina.*"

Andrena bipunctata *Cress.*

♂, Newark, May. ♀, Prospertown, June 1. Not included in the table; the ♂ has the clypeus yellow with two black spots; the ♀ is known by the small size, clypeus (black) punctured only at sides, the middle smooth and shining, process of labrum broad, abdomen tessellate and practically impunctate, wings yellowish, nervures and stigma honey-color, etc.

Andrena hippotes *Rob.*

Newark, May. Marked "*nuda.*" It agrees exactly with a specimen of *hippotes* received from Robertson. The four hind tarsi, and the two hind tibiæ of the ♀ are red.

Andrena placida *Smith.*

Jamesburgh, May. Identified from the description, but I think certainly correct. Marked "*A. viola,*" but not congeneric with *Ionelissa violæ*, Rob.

Andrena, sp. incert. (See table.)

A ♀ with no data; marked "*salicis,*" which it is not.

Colletes inæqualis *Say.*

Lahaway and Newark ; both sexes. April, May. Labelled "*Andrena hilaris.*"

Colletes thoracica *Smith.*

One ♀, Lahaway, June 20. Hitherto known from Florida. It has a superficial resemblance to the European *Andrena nitida.*

Colletes, sp. incert.

Prospertown. Marked "*compacta,*" but not that species ; allied to *C. æstivalis.* I have *compacta* from Mr. Robertson, and believe it is correctly identified. Not in table.

TYPES OF ANTHOMYID GENERA.

By D. W. Coquillett.

The present paper is an attempt to settle the question of what species is the type of each North American and European genus of Anthomyidæ that has been proposed up to the present time, a question of vital importance both as regards the synonymy and also the correct names for the various genera. In those cases where the original describer of a given genus did not designate the type species, and more than one species was mentioned or described, the first species, or at least the first of the recently recognized species, has been selected as the type, and when none of the species have been recently recognized the question of the type species has been left open ; cases of the latter kind are chiefly confined to Rob.-Desvoidy's ill-conceived and very imperfectly described genera and species, and it is to be hoped that some one more familiar with the Anthomyidæ of France will settle this phase of the question in a satisfactory manner.

Genera and their type Species.

Achanthiptera Rondani. Type as given, *Musca inanis* Fallen.

Acroptena Pokorny. Described one species as new, *simonyi.*

Acyglossa Rondani. Type as given, *Acyglossa diversa* new species.

Adia Desvoidy. Described one species as new, *oralis,* not since recognized.

Egeria Macquart. Change in spelling *Egeria.*

Allcostylus SCHNABL. Described one species as new, *sudeticus*.

Allognota POKORNY. One species mentioned, *Cænosia agromyzella* Rondani.

Aminta DESVOIDY. Described five supposed new species, none since recognized.

Anthomyia MEIGEN. Mentions *Musca meditabunda* Fabr., and *Musca pluvialis* Linne. The latter species was designated the type by Westwood, Introd., II, Synop., 143.

Anthomyza ZETTERSTEDT. Change of spelling *Anthomyia*.

Aricia DESVOIDY. Described nine species as new, the first, *impunctata*, = *Musca impuncta* Fallen according to Macquart, His. Nat. Dipt., II, 293. Westwood, Introd., II, Synop., 141, gives *Musca lardaria* Fabr. as the type, but Desvoidy included this species in *Macrosoma*; Rondani, Dipt. Ital., I, 95, gives *Musca erratica* Fallen, but Desvoidy placed this in *Phaonia*; neither of these two species can therefore be regarded as the type of *Aricia*.

Aspilia RONDANI. Type as given, *Anthomyia allotalla* Meigen, but in Dipt. Ital., VI, 65, Rondani queries this identification and places this genus as a synonym of *Spilogaster*.

Atherigona RONDANI. Type as given, *Anthomyia varia* Meigen, placed as a synonym of *Musca quadripunctata* Rossi in Anthom. Ital., 123.

Atomogaster MACQUART. Type as given, *Anthomyia triquetra* Meigen, but Zetterstedt, Dipt. Scand., IV, 1592, states that this is a wrong identification, and named the present species *Aricia macquartii*.

Azelia DESVOIDY. Described 9 species as new, the third, *nebulosa*, is given by Macquart, Hist. Nat. Dipt., II, 330, as a probable synonym of *triquetra* = *Aricia macquartii* Zett.

Blainvillia DESVOIDY. One species as new, *palpata*, not since recognized.

Botanophila LIOY. Type as given, *Anthomyia varicolor* Meigen.

Brachylabis SCHNABL. Type as given, *Musca flaveola* Fallen.

Brachyphyra GIGLIO-TOS. One species as new, *effrons*.

Caricea DESVOIDY. Described eighteen species as new. Rondani, Dipt. Ital., I, 98, gives *Musca tigrina* Fabr., as the type, placing Desvoidy's fourth species, *vulgaris*, as a synonym. Macquart, Hist. Nat. Dipt., II, 344, places the second species, *communis*, as a synonym of *tigrina*.

Centrocera POKORNY. Type as given, *Cænosia decipiens* Meigen.

Charadrella V. d. Wulp. One species as new, *macrosoma*.

Chelisia RONDANI. Type as given, *Cœnosia monilis* Meigen.

Chiastocheta POKORNY. Type as given, *Aricia trollii* Zett.

Chirosia RONDANI. Type as given, *Aricia albitarsis* Zett.

Chlorops DESVOIDY. One species as new, *silvicola*, not since recognized.

Chlorina DESVOIDY. Describes two species as new, neither of which has since been recognized.

Choristomma STEIN. One species as new, *pokornyi*.

Chortophila MACQUART. Describes twenty-two species. Westwood, Introd., II, Synop., 142, gave as the type *Anthomyia sepia*, the fifteenth species.

Cimbotoma LIOY. Type as given, *Delia floricola* Desvoidy, not since recognized.

Cinochira ZETTERSTEDT. One species as new, *atra*.

Calomyia HALIDAY. One species as new, *mollissima*.

Cœnosia MEIGEN. Describes twenty-eight species. Westwood, Introd., II, Synop., 143, gives as the type *Musca tigrina* Fabr., the second species, but according to Zetterstedt, Dipt. Scand., IV, 1713, this was an erroneous identification, and he named this form *Anthomyza ciliatocosta*. Rondani, Dipt. Ital., I, 97, gave *Cœnosia sexmaculata* Meigen as the type, but this also was not among Meigen's species. In his Anthom. Ital., 9, Rondani gives *Musca geniculata* Fallen, the twentieth species described by Meigen.

Cosmostyla LIOY. Type as given, *Hylemyia rufiventris* Macq., not recently recognized.

Cuculla DESVOIDY. Three species as new, none since recognized.

Delia DESVOIDY. Describes twenty-nine species as new, none since recognized.

Dendrophila LIOY. Type as given, *Musca hilaris* Fallen.

Dexiopsis POKORNY. Type as given, *Aricia lacteipennis* Zett.

Dialyta MEIGEN. One species, *Musca crinacea* Fallen.

Dolichogaster STEIN. One species as new, *americana*.

Drymeia MEIGEN. One species, *obscura*, an arbitrary change of name for *Musca hamata* Fallen.

Egeria DESVOIDY. Three species as new, none since recognized.

Eginia DESVOIDY. One species as new, *cylindrica*, not since recognized.

Egle DESVOIDY. Described twenty-one species as new, none since recognized.

Eremomyia STEIN. Four species as new, the first, *humeralis*.

Erioischia LIOY. Type as given. *Chortophila floccosa* Macq.

Eriopoda LIOY. Type as given. *Anthomyia ornata* Meigen, not recently recognized.

Eriostyla LIOY. Type as given, *Cœnosia dubia* Macq., not recently recognized.

Eriphia MEIGEN. One species as new, *cinerea*.

Euphemia DESVOIDY. Four species as new, the first, *pratensis* = *Musca læta* Fallen according to Macquart, Hist. Nat. Dipt., II, 292, and Schiner, Fauna Austr., I, 603. The latter also adds the second species, *claripennis*, to this synonymy.

Euryomma STEIN. One species as new, *hispaniense*.

Eustalomyia KOWARZ. Type as given, *Musca hilaris* Fallen.

Eutrichota KOWARZ. One species, *Cœnosia inornata* Loew.

Fannia DESVOIDY. One species as new, *saltatrix*, = *Musca scalaris* Fabr. according to Macquart, Hist. Nat. Dipt., II, 333, and Schiner, Fauna Austr., I, 654.

Fellæa DESVOIDY. Five species as new, the first, *fera*, = *Anthomyia urbana* Meigen according to Macquart, Hist. Nat. Dipt., II, 287, and Schiner, Fauna Austr., I, 612.

Fucellia DESVOIDY. One species as new, *arenaria*, = *Scatomyza fucorum* Fallen according to Pandelle, Revue Ent., 1900, Etudes Musc., 271.

Gastrolepta LIOY. Type as given, *Musca coarctata* Fallen.

Gymnogaster LIOY. Type as given, *Anthomyia dissecta* Meigen.

Halithea HALIDAY. Two species described, the first, *Scatomyza fucorum* Fallen.

Hammomyia RONDANI. Type as given, *Aricia albescens* Zett.

Hebecnema SCHNABL. Five species mentioned, the first, *Anthomyia umbratica* Meigen.

Helina DESVOIDY. Described seven species as new, the first, *cuphemioidea*, = *Anthomyia pertusa* Meigen according to Schiner, Fauna Austr., I, 623.

Hera SCHNABL. One species as new, *mikii*.

Homalomyia BOUCHE. Three species, the first, *Musca canicularis* Linne, is given as the type by Westwood, Introd., II, Synop., 143.

Hoplogaster RONDANI. Arbitrary change of spelling *Oplogaster*.

Hydrophoria DESVOIDY. Described nine species as new, the fifth and sixth, *tibialis* and *sagittaria*, = *Musca socia* Fallen according to Pandelle, Revue Ent., 1900, Etudes Musc., 222.

Hydrotæa DESVOIDY. Described seventeen species. Westwood, Introd., II, Synop., 142, gives as the type *Musca meteorica* Linne, the eleventh species, but according to Rondani, Anthom. Ital., 12, this was an erroneous identification, and is *Musca irritans* Fallen. Rondani, Dipt. Ital., I, 94, gives *Musca dentipes* Fabr. as the type, and in Anthom. Ital., 11, places Desvoidy's sixth species, *flavifacies*, as a synonym.

Hyetodesia MEADE. Arbitrary change in spelling *Yetodesia*.

Hylemya DESVOIDY. Described sixteen species. Westwood, Introd., II, Synop., 142, gives *Anthomyia hilaris* Meigen as the type, but this is not among the recognized species. Rondani, Dipt. Ital., I, 96, gives *Musca strigosa* Fabr., and in Anthom. Ital., 117, places Desvoidy's first species, *strenua*, as a synonym, following Macquart, Hist. Nat. Dipt., II, 317.

Hylephila RONDANI. Type as given, *Musca buccata* Fallen.

Hyporites POKORNY. Type as given, *Eriphia montanus* Schiner.

Lasiops MEIGEN. Five species mentioned, the first, *Anthomyia apicalis* Meigen, is given as a probable synonym of *Anthomyia semicinerea* Wied. by Schiner, Fauna Austr., I, 619; the second, *Anthomyia occulta* Meigen, belongs to *Hydrotæa*; the third, *Anthomyia cunctans* Meigen, belongs to *Lonchæa* according to Schiner, Fauna Austr., I, 618, footnote, based on a type specimen; the fifth, *Lasiops cinescens* Meigen, an arbitrary change of name of *Chortophila lasiophthalma* Macquart, also belongs to *Lonchæa*. This leaves the fourth species, *Musca hirticeps* Fallen, as the type.

Leucomelina MACQUART. One specimen as new, *pica*.

Leucophora DESVOIDY. Describes five species as new, the third, *cinerea*, = *Aricia obscens* Zett. according to Rondani, Dipt. Ital., VI, 236.

Limnophora DESVOIDY. Describes twenty species as new, none since recognized.

Limosia DESVOIDY. Describes twenty-eight species as new, the sixth, *campestris*, = *Cænosia albicornis* Meigen according to Macquart, Hist. Nat. Dipt., II, 348.

Litorella RONDANI. Type as given, *Ochthiphila littorella* Fallen.

Lispe LATREILLE. Original description not seen by the writer,

but in Hist. Nat. Crust. Ins., III, 462, which appeared six years later, *Musca tentaculata* DeGeer is given as the type.

Lispocephala POKORNY. Type as given, *Anthomyia alma* Meigen.

Macrorchis RONDANI. Type as given, *Musca meditata* Fallen.

Macrosoma DESVOIDY. Two species, the first, *Musca lardaria* Fabr.

Melanochelia RONDANI. Type as given, *Aricia surda* Zett.

Microcera LIOY. Type as given, *Musca ciliata* Fabr.

Musciosoma LIOY. Type as given, *Anthomyia prepotens* Wied.

Myantha RONDANI. Type as given, *Musca canicularis* Linne.

Mycophaga RONDANI. Type as given, *Musca fungorum* De Geer.

Mydæa DESVOIDY. Nine species as new, the fifth, *scutellaris*, = *Musca pagana* Fabr., according to Macquart, Hist. Nat. Dipt., II, 291, and Schiner, Fauna Austr., I, 611.

Mydina DESVOIDY. Describes twenty-two species as new, the fourth, *dispar*, = *Musca quadrum* Fabr. according to Macquart, Hist. Nat. Dipt., II, 295, and Schiner, Fauna Austr., I, 607.

Myoda LAMARCK. Describes eight species, the first, *Musca tentaculata* De Geer.

Myopina DESVOIDY. One species, *reflexa* = *Musca myopina* Fallen according to Macquart, Hist. Nat. Dipt., II, 389, and Schiner, Fauna Austr., I, 658.

Neurota LIOY. Type as given, *Musca grisea* Fallen.

Nerina DESVOIDY. Five species as new, none since recognized.

Ocromyia LIOY. Type as given, *Hylemyia pallida* Macq., not recently recognized.

Onodontha RONDANI. Type as given, *Hydrotæa floccosa* Macq., but in Anthom. Ital., 15, Rondani states that this was an erroneous identification, and names this form *penicillata*.

Ophyra DESVOIDY. Four species, as new. Westwood, Introd., II, Synop., 142, gives as the type, *Anthomyia leucostoma* Wied. The first two species, *nitida* and *pubescens*, are synonyms of this species according to Schiner, Fauna Austr., I, 620.

Oplegaster RONDANI. Type as given, *Musca mollicula* Fallen.

Orchisia RONDANI. Type as given, *Sapromyza costata* Meigen.

Pachystoma LIOY. Type as given, *Anthomyia crassirostris* Meigen = *Musca flavipennis* Fallen according to Rondani, Dipt. Ital., VI, 182.

Palusia DESVOIDY. Ten species as new, the eighth, *testacea*, = *Musca pumila* Fallen according to Schiner, Fauna Austr., I, 665.

Parachortophila BIGOT. No species mentioned.

Paranthomyia BIGOT. Same.

Pariaspilogaster BIGOT. Same. Published as *Parapsilogaster*, a typographical error, since in his preface Bigot informs us that his new names were formed by prefixing *para* to the name of the nearest related genus.

Parazelia BIGOT. Same.

Parhomalomyia BIGOT. Same. *Parmalomyia*, as published, is an error, corrected in an author's extra sent to the writer.

Pegomya DESVOIDY. Describes six species. Westwood, Introd., II, Synop., 143, gives as the type, *Anthomyia fulgens* Meigen, but this is not among the recognized species. The first species, *hyoscyami* Fabr. = *chenopodii* Rondani according to the latter author, Dipt. Ital., VI, 207, and according to Meade, Ent. Mon. Mag., 1883, 9, *chenopodii* is a color variety of *Musca hyoscyami* Panzer.

Pentacricia STEIN. One species as new, *aldrichii*.

Peronia DESVOIDY. One species as new, *rostrata*, = *Musca ciliata* Fabr. according to Schiner, Fauna Austr., I, 614.

Phaonia DESVOIDY. Five species as new, the first, *viarum*, = *Anthomyia erratica* Meigen according to Macquart, Hist. Nat. Dipt., II, 287, and Schiner, Fauna Austr., I, 604.

Philinta DESVOIDY. Four species, the first, *Musca canicularis* Linne.

Phorca DESVOIDY. Four species as new, none since recognized.

Phorbia DESVOIDY. Five species as new, none since recognized.

Phyllis DESVOIDY. Four species as new, the first, *flava*, = *Anthomyia diaphana* Wied. according to Schiner, Fauna Austr., I, 623.

Phyllogaster STEIN. One species as new, *cordyluroides*.

Piczura RONDANI. Type as given, *Piczura pardalina*, sp. nov.

Platycanosia STROBL. One species as new, *mikii*.

Pogonomyia RONDANI. Type as given, *Pogonomyia alpicola* sp. nov.

Polietes RONDANI. Type as given, *Musca lardaria* Fabr.

Potamia DESVOIDY. Two species as new, neither since recognized.

Proboscimyia BIGOT. One species as new, *siphonina*.

Prosalpia POKORNY. Three species as new, the first, *styriaca*, = *Anthomyza morens* Zett. according to Strobl., Verh. Zool.-Bot. Gesell. Wien., XLIII, 265.

Pseudolimnophora STROBL. Mentions six species, the first, *Musca trianguda* Fallen.

Psilometopia LIOY. Type as given, *Chortophila cæsia* Macq. = *Mydæa communis* Desvoidy according to Meade, Ent. Mon. Mag., 1881, 62.

Psiloptera LIOY. Type as given, *Musca irritans* Fallen.

Quadrula PANDELLE. First species is *Anthomyza annosa* Zett.

Rhadina KOWARZ. One species, *Chirosia montana* Pokorny.

Rhynchotrichops SCHNABL. Four species listed, the first, *Anthomyza aculeipes* Zett.

Rohrella DESVOIDY. Nine species, the seventh, *fragilis*, = *Musca pallida* Fabr. according to Macquart, Hist. Nat. Dipt., II, 289, and Schiner, Fauna Austr., I, 605.

Schænomyia WESTWOOD. Arbitrary change of spelling *Schænomyza*.

Schænomyza HALIDAY. Two species listed. Westwood, Introd., II, Synop., 143, gives as the type the first species, *Sciomyza fasciata* Meigen.

Spilogaster MACQUART. Describes thirteen species. Westwood, Introd., II, Synop., 142, gives as the type the seventh species, *Musca quadrum* Fabr.

Stagnia DESVOIDY. Two species as new, neither since recognized.

Stenogaster LIOY. Type as given, *Chortophila angusta* Macq., not recently recognized.

Stroblia POKORNY. Arbitrary change of name of *Pseudolimnophora*.

Syllegopteruła POKORNY. One species as new, *beckeri*.

Tetrachæta STEIN. One species as new, *unica*.

Tetramerina BERG. Change of name of *Tetrachæta*, preoccupied.

Thricops RONDANI. Type as given, *Aricia hirtula* Zett., but in Anthom. Ital., 76, Rondani states that this was an erroneous identification and names this form *anthomyinus*.

Trennia DESVOIDY. One species as new, *nigricornis*, = *Anthomyia errans* Meigen according to Macquart, Hist. Nat. Dipt., II, 287, and Schiner, Fauna Austr., I, 604.

Tricophthicus RONDANI. Arbitrary change of name of *Thricops*.

Trigonostoma LIOY. Type as given, *Chortophila frontalis* Macq., not recently recognized.

Vetodesia RONDANI. Change of name of *Aricia*, preoccupied. Type as given of *Aricia* Rondani (not of Desvoidy), *Musca erratica* Fallen.

Zabia DESVOIDY. One species as new, *longipes*, not since recognized.

Zaphne DESVOIDY. Two species as new, neither since recognized.

SYNONYMY AND TYPES.

The following is only a partial synonymy of the genera, and many names are retained as valid which future study will degrade to the rank of synonyms. As here given, several changes are made in the names of genera from those adopted by Meade in the Ent. Mon. Mag., 1881–1883. Thus, *Hyetodesia* is replaced by *Phaonia*, a much older name; *Spilogaster* is united to *Mydaea*, as Strobl and Stein already have done; *Trichophthicus* is a synonym of *Lasiops*, as stated by Meade, who preferred to perpetuate the error of Rondani rather than to correct it; *Homalomyia* gives way to *Fannia*, an older name, and *Carlomyia* becomes a synonym of it, following Strobl and several others; *Chortophila* and *Phorbia*, which have been united by Stein and some others, are merged into *Pegomyia*, as the slight difference in the coloring of the legs is hardly of generic importance; and finally, *Melanochelia* is a synonym of *Limnophora*, as Rondani has already stated in Dipt. Ital., VI, 103.

Achanthiptera Rond., 1856; *inanis* FALL.

Acroptena Pokorny, 1893; *simonyi* POKORNY.

Acyglossa Rond., 1866; *diversa* ROND.

Allognota Pokorny, 1893; *agromyzella* ROND.

Anthomyia Meigen, 1803; *pluvialis* LINNE.

? Egle *Desv.*, 1830; type?

Anthomyza *Zett.*, 1838; *pluvialis* LINNE. Not *Anthomyza* FALLEN, 1810; nor Swainson, 1833; nor Swainson, 1837.

Paranthomyia 1882; *Bigot*, type?

Atherigona ROND., 1856; *quadripunctata* ROSSI.

Azelia DESV., 1830; *macquartii* ZETT.

Atomogaster *Macq.*, 1835; *macquartii Zett.*

Parazelia *Bigot*, 1882; type?

Brachyophyra GIGLIO-TOS, 1893; *effrons*, GIGLIO-TOS.

Caricea DESV., 1830; *tigrina* FABR.

Centrocera POKORNY, 1893: *decipiens* MEIG.

Charadrella V. D. W., 1896; *macrosoma* V. D. W.

Chelisia ROND., 1856; *monilis* MEIG.

Oplogaster *Rond.*, 1856; *mollicula* FALL.

Hoplogaster *Rond.*, 1870; *mollicula* FALL.

Chirosia ROND., 1856; *albitarsis* ZETT.

Chiastocheta *Pokorny*, 1889; *trollii* ZETT.

Choristomma STEIN, 1895; *pokornyi* STEIN.
Cinochira ZETT., 1845; *atra* ZETT.
Cænosia MEIG., 1826; *geniculata* FALL.
Limnosia *Desv.*, 1830; *albicornis* MEIG.
Palusia *Desv.*, 1830; *pumila* FALL.
? Eriostyla *Lioy*, 1864; *dubia* MACQ.
Orchisia *Rond.*, 1877; *costata* MEIG.
Pseudolimnophora *Strobl*, 1893; *triangula* FALL.
Stroblia *Pokorny*, 1893; *triangula* FALL.
Dialyta MEIG., 1826; *crinacea* FALL.
Dexiopsis POKORNY, 1893; *lacteipennis* ZETT.
Drymeia MEIG., 1826; *hamata* FALL.
Eremomyia STEIN, 1898; *humeralis* STEIN.
Euryomma STEIN, 1899; *hispaniense* STEIN.
Eustalomyia KOWARZ, 1873; *hilaris* FALL.
Dendrophila *Lioy*, 1864; *hilaris* FALL. Not *Dendrophila Swainson*, 1837.
Fannia DESV., 1830; *scalaris* FABR.
Philinta *Desv.*, 1830; *canicularis* LINNE.
Homalomyia *Bouche*, 1834; *canicularis* LINNE.
Coelomyia *Halid.*, 1840; *mollissima* HALID.
Myantha *Rond.*, 1856; *canicularis* LINNE.
? Cimbotoma *Lioy*, 1864; *floricola* DESV.
? Eriopoda *Lioy*, 1864; *ornata* MEIG.
Parhomalomyia *Bigot*, 1882; type?
Fucellia DESV., 1841; *fucorum* FALL.
Halithea *Halid.*, 1838; *fucorum* FALL. Not *Halithea* SAVIGNY, 1817.
Hammomyia ROND., 1877; *albescens* ZETT.
Leucophora *Desv.*, 1830; *albescens* ZETT. Not *Leucophora* Goldf., 1820.
Hydrophoria DESV., 1830; *socia* FALL.
Hydrotæa DESV., 1830; *dentipes* FABR.
Peronia DESV., 1830; *ciliata* FABR. Not *Peronia* BLAINVILLE, 1824.
Onodontha ROND., 1856; *penicillata* ROND.
Psiloptera LIOY, 1864; *irritans* MEIG. Not *Psiloptera* SOLIER, 1833.
Microcera LIOY, 1864; *ciliata* FABR. Not *Microcera* MEIGEN, 1803; nor Mann, 1830; nor Zetterstedt, 1842.

Hylemya DESV., 1830 ; *strigosa* FABR.
? Chloë *Desv.*, 1830 ; *silvicola* DESV.
Musciosoma *Lioy*, 1864 ; *præpotens* WIED.
Gastrolepta *Lioy*, 1864 ; *coarctata* FALL. Not *Gastrolepta* RONDANI, 1862.
? Ocromyia *Lioy*, 1864 ; *pallida* MACQ.
Neurorta *Lioy*, 1864 ; *grisea* FALL.
? Cosmostyla *Lioy*, 1864 ; *rufiventris* MACQ.
Pachystoma *Lioy*, 1864 ; *flavipennis* FALL. Not *Pachystoma* GUILD, 1828 ; nor Alb. 1850.
Hylephila ROND., 1877 ; *buccata* FALL.
Hyporites *Pokorny*, 1893 ; *montanus* SCHINER.
Prosalpia *Pokorny*, 1893 ; *mœrens*, ZETT.
Lasiops MEIG., 1838 ; *hirticeps* FALL.
Thricops *Rond.*, 1856 ; *anthomyinus* ROND.
Tricophthicus *Rond.*, 1861 ; *anthomyinus* ROND.
Rhynchotrichops *Schnabl*, 1889 ; *aculeipes* ZETT.
Leucomelina MACQ., 1850 ; *pica* MACQ.
Limnophora DESV., 1830 ; type? Melanochelia *Rond.*, 1866 ; *surda* ZETT.
Lispe LATR., 1796 ; *tentaculata* DE G.
Myoda *Lamarck*, 1816 ; *tentaculata* DE G.
Lispocephala POKORNY, 1893 ; *alma* MEIG.
Macrorchis ROND., 1877 ; *meditata* FALL.
Mycophaga ROND., 1856 ; *fungorum* DE G.
Eutrichota *Kowarz*, 1893 ; *inornata* LOEW.
Mydæa DESV., 1830 ; *pagana* FABR.
Fellæa *Desv.*, 1830 ; *urbana* MEIG.
Aricia *Desv.*, 1830 ; *impuncta* FALL. Not *Aricia* SAVIGNY, 1817.
Helina *Desv.*, 1830 ; *pertusa* MEIG.
Mydina *Desv.*, 1830 ; *quadrum* FABR.
? Eginia *Desv.*, 1830 ; *cylindrica* DESV.
? Potamia *Desv.*, 1830 ; type ?
? Stagnia *Desv.*, 1830 ; type ?
? Blainvillia *Desv.*, 1830 ; *palpata* DESV.
? Cuculla *Desv.*, 1830 ; type ?
? Zaphne *Desv.*, 1830 ; type ?
Phyllis *Desv.*, 1830 ; *diaphana* WIED.

Spilogaster *Macq.*, 1835; *quadrum* FABR.
Aspilia *Rond.*, 1866; *callotalla* MEIG.
Paraspilogaster *Bigot*, 1882; type?
Myopina DESV., 1830; *myopina* FALL.
Ophyra DESV., 1830; *leucostoma* WIED.
Pegomya DESV., 1830; *hyoscyami* PANZ.
? Egeria *Desv.*, 1830; type? Not *Egeria* ROISSY, 1805; nor Dumeril, 1806; nor Leach, 1815.
? Nerina *Desv.*, 1830; type?
? Adia *Desv.*, 1830; *oralis* DESV.
? Phorbia *Desv.*, 1830; type?
? Aminta *Desv.*, 1830; type?
? Delia *Desv.*, 1830; type?
? Zabia *Desv.*, 1830; *longipes* DESV.
? Phoræa *Desv.*, 1830; type?
? Chlorina *Desv.*, 1830; type?
? Ægeria *Macq.*, 1835; type? Not *Ægeria* FABR., 1808.
Chortophila *Macq.*, 1835; *sepia* MEIG.
Botanophila *Lioy*, 1864; *varicolor* MEIG.
Gymnogaster *Lioy*, 1864; *dissecta* MEIG. Not *Gymnogaster* GRONOV., 1754; nor Dejean, 1833; nor Blanch., 1851.
? Trigonostoma *Lioy*, 1864; *frontalis* MACQ. Not *Trigonostoma* BLAINVILLE, 1825; nor Fitz., 1833; nor Dejean, 1833.
Psilometopia *Lioy*, 1864; *communis* DESV.
Erioischia *Lioy*, 1864; *floccosa* MACQ.
? Stenogaster *Lioy*, 1864; *angusta* MACQ. Not *Stenogaster* SOLIER, 1833; nor Hahn., 1835; nor Koll., 1853.
Paracortophila *Bigot*, 1882; type?
Brachylabis *Schnabl*, 1889; *flavcola* FALL. Not *Brachylabis* DOHRN, 1864.
Pentacricia STEIN, 1898; *aldrichii* STEIN.
Phaonia DESV., 1830; *erratica* MEIG.
Trennia *Desv.*, 1830; *errans* MEIG.
Euphemia *Desv.*, 1830; *læta* FALL.
Rohrella *Desv.*, 1830; *pallida* FABR.
Hera *Schnabl*, 1888; *mikii* SCHNABL.
Hebecnema *Schnabl*, 1889; *umbratica* MEIG.
Quadrula *Pandellé*, 1898; *annosa* ZETT.
Phyllogaster STEIN, 1898; *cordyluroides* STEIN.

Yetodesia *Rond.*, 1861 ; *erratica* FALL.

Hyetodesia *Meade*, 1875 ; *erratica* FALL.

Allcostylus *Schnabl*, 1888; *sudeticus* SCHNABL.

Piezura ROND., 1866 ; *pardalina* ROND.

Platycænosia STROBL, 1894 ; *mikii* STROBL.

Pogonomyia ROND., 1870 ; *alpicola* ROND.

Eriphia *Meig.*, 1826 ; *cinerea* MEIG. Not *Eriphia* LATREILLE, 1817.

Polietes ROND., 1866 ; *lardaria* FABR.

Macrosoma *Desv.*, 1830 ; *lardaria* FABR. Not *Macrosoma* HÜBNER, 1816.

Proboscimyia BIGOT, 1883 ; *siphonina* BIGOT.

Dolichogaster *Stein*, 1898 ; *americana* STEIN. Not *Dolichogaster* MACQUART, 1848.

Rhadina KOWARZ, 1893 ; *montana* POKORNY.

Schænomyza HALID., 1833 ; *fasciata* MEIG.

Schænomyia *Westwood*, 1840 ; *fasciata* MEIG.

Litorella *Rond.*, 1856 ; *littorella* FALL.

Syllegopterula POKORNY, 1893 ; *beckeri* POKORNY.

Tetramerina BERG, 1898 ; *unica* STEIN.

Tetrachæta *Stein*, 1898 ; *unica* STEIN. Not *Tetrachæta* EHR., 1844.

Ravages of Myochrous denticollis.

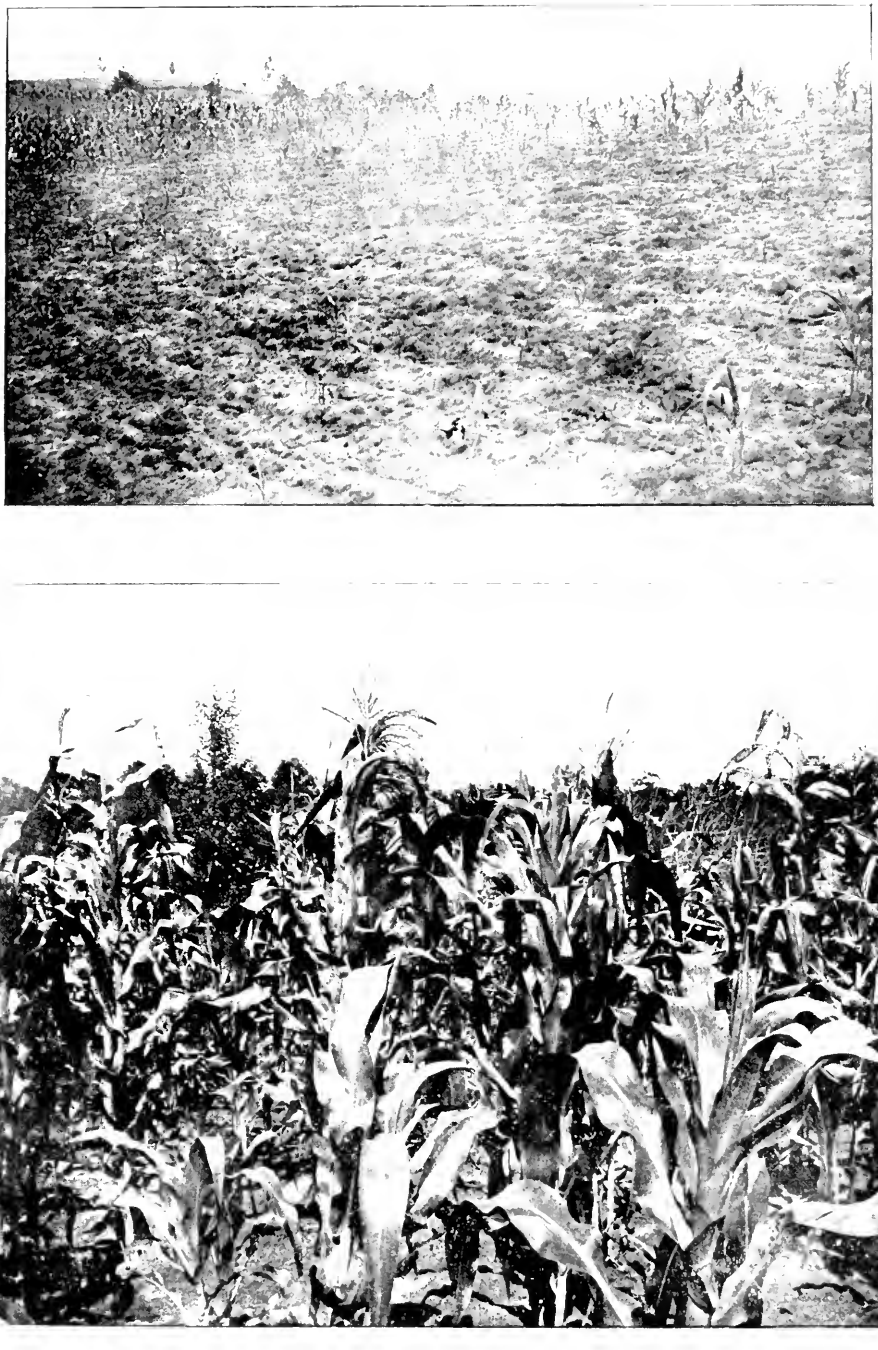
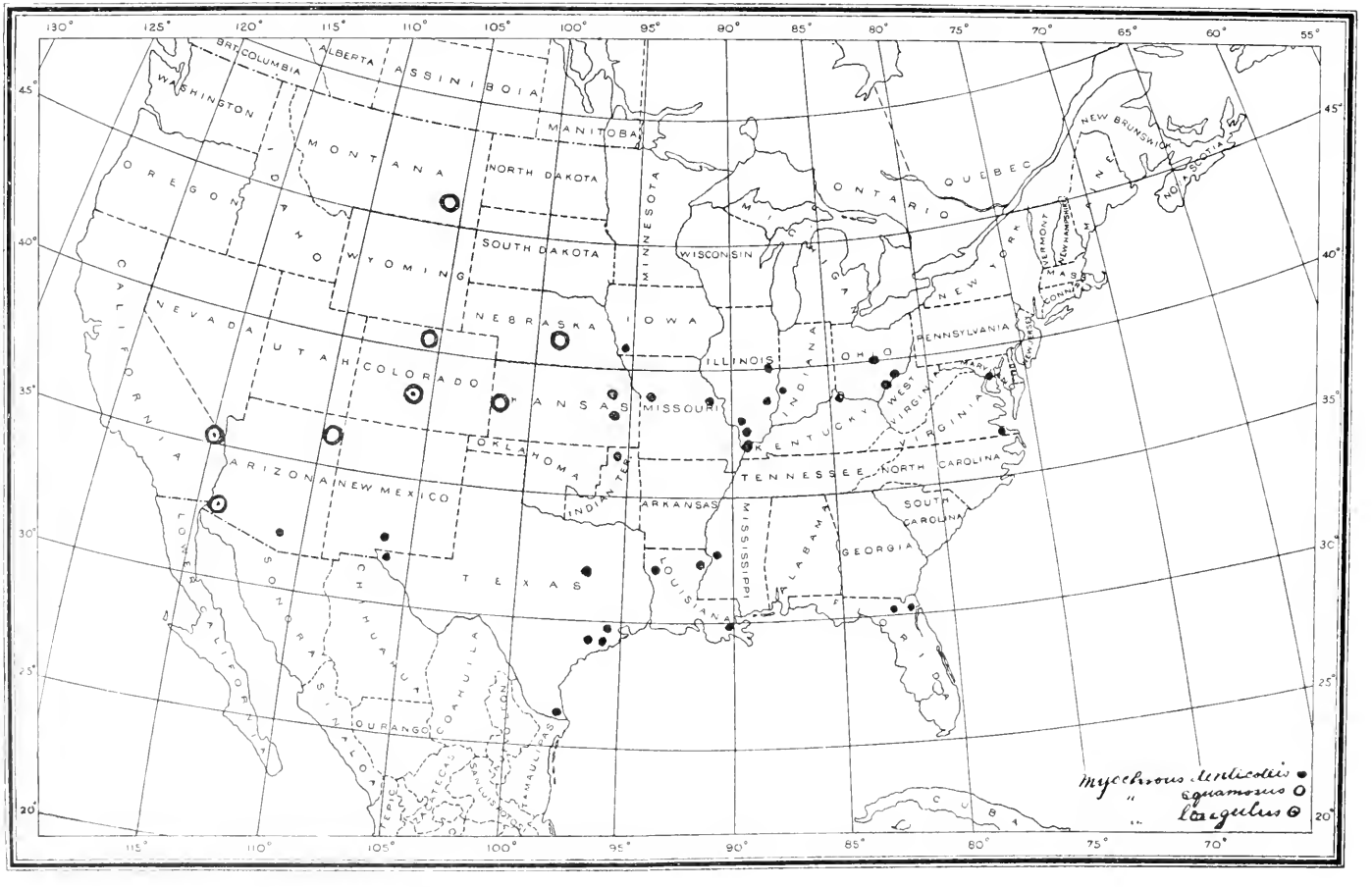


FIG. 2.

Ravages of Myochrous denticollis.



Distribution of Myochrous.

JOURNAL

OF THE

New York Entomological Society.

Vol. IX. DECEMBER, 1901. No. 4.

CATALOGUE OF THE DESCRIBED TRANSFORMATIONS OF AUSTRALIAN LEPIDOPTERA.

By William Beutenmüller.

The present Catalogue was prepared by me some years ago, but for obvious reasons the publication of the same has been delayed, and it is possible that a number of titles may have been added since or that some have been omitted. A number of New Zealand species are also included.

RHOPALOCERA.

Ornithoptera priamus var. **pronomus** *Gray.*

1885—Larva, chrysalis. *G. F. Matthew.* Proc. Linn. Soc. N. S. W., Vol. X, p. 262.

1887—Larva, chrysalis. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt., p. 168.

Food-plants: *Ipomaa*, *Aristolochia.*

Papilio capaneus *West.*

1887—Life-history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 179 (as *P. indicatus* Butl.).

Food-plant: *Citrus.*

Papilio erithonius *Cramer.*

1857—Larva, chrysalis. *Horsefield & Moore.* Cat. Lepid. E. I. C., Vol. I, 1857, p. 105, pl. III, fig. 6.

1887—Life-history (brief). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 169.

Food-plant: *Salvia.*

Papilio macleayeanus *Leach.*

1888—Larval stages (figs.), chrysalis (brief). *A. S. Olliff.* Ann. Mag. Nat. Hist., p. 358.

1889—Larva, chrysalis (brief). *A. S. Olliff.* Austral. Butterflies, p. 36.

Food-plant: Orange.

Papilio eurypylus var. **lycaon** *Westw.*

1887—Life-history. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 177

1889—Larva (brief). *A. S. Olliff.* Austral. Butterflies, p. 35.

Food-plant: Custard apple (*Anona*).

Papilio ulysses *Linn.*

1855—Larva, chrysalis. *Chenu.* Ency. Nat. Hist. Papillons, p. 35.

Papilio enactus *Ma. I.*

1887—Life-history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 176.

1889—Larva, chrysalis. *H. Tyron.* Insect and Fungi Pests, Queensland (Rep. Dept. Agricul., p. 105).

Food-plant: Orange.

Papilio sarpedon *Linn.*

1863—Larva, chrysalis (fig.). *J. G. Wood.* Nat. Hist., p. 500.

1874—Larva, chrysalis. *J. G. Wood.* Insects Abroad, p. 509.

1880—Larva, chrysalis. *J. G. Wood.* Insects Abroad, p. 509.

1888—Larval stages. *A. S. Olliff.* Ann. Mag. Nat. Hist., p. 357, pl. 20 (var. *choredon, Field*).

1889—Larva, chrysalis. *A. S. Olliff.* Austral. Butt., p. 35 (var. *choredon, Field*).

Food-plant: Camphor Laurel.

Papilio agamemnon *Linn.*

1857—Larva, chrysalis. *Horsfield & Moore.* Cat. Lepid. E. I. C., Vol. I, p. 114, pl. 111, figs. 9 and 9*a*.

Papilio ægeus *Don.*

1887—Life-history (2 and 3 moults not described). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 172.

1888—Larva, chrysalis (brief). *A. S. Olliff.* Ann. Mag. Nat. Hist., p. 359.

1888—Larva (brief). *C. C. Brittlebank.* Vict. Nat., Vol. V, p. 116.

1888—Larva (brief). *A. S. Olliff.* Austral. Butt., p. 34.

1889—Larva, chrysalis. *H. Tyron.* Insect and Fungi Pests, Queensland Dept. Agricul., p. 106.

1890—Larval stages. *Hy. Edwards.* Vict. Nat., Vol. VII, p. 20.

Food-plants: Orange, *Xanthoxylum*.

Elodina angulipennis *Lucas.*

1887—Egg. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 155.

Food-plant: *Capparis nobilis*.

Terias hecabe *Linn.*

1891—Larva, chrysalis (col'd figs.). *C. Semper.* Reisen in Archipel. der Phillippinen, Vol. V, p. 255, pl. B, fig. 4.

Pieris teutonia *Fabr.*

1887—Life-history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 155.

1887—Larva, chrysalis. *J. G. O. Tepper.* Gard. and Field, Vol. 13, p. 80.

1890—Egg, young larva, chrysalis. *Hy. Edwards.* Viet. Nat., Vol. VII, p. 20.
Food-plant: *Capparis mitchellii.*

Pieris scyllara *Mac L.*
1888—Larva, chrysalis (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., p. 155 (as *P. latilimbata*).

Delias nigrina *Fabr.*
1880—Larva, chrysalis (figs.). *A. S. Olliff.* Austral. Butterflies, p. 28.
Food-plant: *Loranthus.*

Delias aganippe *Don.*
1878—Larva, chrysalis (col'd figs.). *F. McCoy.* Prod. Zool. Viet., Vol. I, Decade I, p. 37, pl. 10.
1887—Larva, chrysalis. *J. G. O. Tepper.* Gard. and Field, Vol. XIII, p. 80.
Food-plants: *Loranthus, Exocarpus.*

Delias harpalyce *Don.*
1878—Larva, chrysalis (col'd figs.). *F. McCoy.* Prod. Zool. Viet., Vol. I, Decade I, p. 33, pl. 9
1880—Larva (brief). *A. S. Olliff.* Austral. Butterflies, p. 28.
Food-plant: *Loranthus.*

Catopsilia pyranthe *Linn.*
1891—Larva, chrysalis (col'd figs.). *G. Semper.* Reisen im Archipel. der Phillippinen, Vol. V, p. 258, pl. B, fig. 5
Food-plant: *Cassia fistula.*

Catopsilia scylla *Linn.*
1857—Larva, chrysalis (fig.). *Horsfield & Moore.* Cat. Lep. E. I. C., pl. I, fig. 6, p. 58.
Food-plants: Various species of *Cassia.*

Catopsilia gorgophone *Bdv.*
1888—Larva, chrysalis (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 158.
Food-plant: *Cassia.*

Danaus chrysippus *Linn.*
1886—Larva, chrysalis (col'd figs.). *G. Semper.* Reisen in Archipel. der Phillippinen, Vol. V, p. 16.
1888—Larva. *J. G. O. Tepper* (quotes Kirby). Gard. and Field, Vol. XIII, p. 91.
Food-plant: *Asclepias.*

Danaus plexippus.
1888—Larva. *J. G. O. Tepper.* Gard. and Field, Vol. XIII, p. 91.
Food-plant: Milkweed.

Euploea corinna *McLeay.*
1890—Chrysalis. *Hy. Edwards.* Viet. Nat., Vol. VII, p. 22.
Food-plant: *Oleander.*

Melanitis leda *Linn.*

1888—Life-history. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 137.
Food-plants: Grasses, *Cladium*, etc.

Epinephele abeona *Don.*

1888—Life-history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 141.
Food-plant: *Cladium.*

Acræa andromacha *Fabr.*

1887—Larval stages (Excl. Egg.). Chrysalis (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 143.
1888—Larva, chrysalis (brief). *A. S. Olliff.* Ann. Mag. Nat. Hist., p. 359.
1889—Larva (brief). *A. S. Olliff.* Australian Butterflies, p. 13.
Food-plant: *Passifloraceæ.*

Pyrameis kershawi *McCoy.*

1888—Larva (brief). *J. G. O. Tepper.* Gard. and Field, Vol. XIII, p. 91.
1890—Larva, chrysalis (col'd figs.). *F. McCoy.* Prod. Zoölogy Viet., Decade 20, Vol. II, p. 3, pl. 198.
1890—Chrysalis. *Hy. Edwards.* Viet. Nat., Vol. VIII, p. 150.
Food-plants: *Compositæ—Cryptostemmon calandulaceæ.*

Pyrameis itea *Fabr.*

1887—Life-history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 145.
1890—Larva, chrysalis (col'd figs.). *F. McCoy.* Prod. Zool. Viet., Decade 20, Vol. II, p. 361, pl. 198.
Food-plant: *Witica.*

Junonia vellida *Fabr.*

1887—Larva, chrysalis (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 146.
Food-plants: *Batatas.*

Rhinopalpa sabina *Cram.*

1888—Larva, chrysalis (col'd figs.). *G. Semper.* Reisen im Archipel. der Phillippinen, V, p. 24, pl. a, fig. 7.

Doleschallia herrichia *Butl.*

1887—Life-history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 147.

Hypobolimnas bolina *Linn.*

1857—Larva, chrysalis (figs.). *F. Moore.* Cat. Lep. Ins. Mus. E. I. C., I, pl. V, fig. 9.
1873—Larva, chrysalis (figs.). *G. Semper.* Journ. Mus., Godeffroy, II, pl. 8, fig. 6 and 7.
1881—Larva. *F. Moore.* Lep. Ceylon, I, p. 58.
1886—Chrysalis (fig.). *Kingsley* (quotes Semper). Trans. N. Zeald. Inst., Vol. XVIII, p. 203 (as *H. nerina*).

1887—Life-history. *G. F. Matthew.* Trans. Ent. Soc. Lond., p. 149.
1888—Egg, larva, chrysalis. *G. F. Matthew.* Trans. Ent. Soc. Lond., p. 150.
1888—Larva, chrysalis (col'd figs.). *G. Semper.* Reisen in Archipel. der Phillippinen, Vol. V, p. 130, pl. a, fig. 9.
Food-plants: *Laportia, Sida rhombifolia.*

Hypobolimnas misippus *Linn.*
1881—Larva, chrysalis (figs.). *F. Moore.* Lep. Ceylon, I, pl. XXIX, fig. 1.
1888—Larva, chrysalis. *G. Semper* (quotes Moore). Reisen in Archipel. der Phillippinen, V, p. 129.
Food-plants: *Portulaca, Abutilon*, etc.

Charaxes sempronius *Fabr.*
1889—Larva (fig.). *A. S. Olliff.* Australian Butterflies, p. 18.
Food-plants: *Acacia brachiton*, Camphor tree.

Mynes geoffroyi *Guerin.*
1874—Chrysalis (note on). *W. H. Miskin.* Trans. Ent. Soc. Lond., p. 239.

Lampides cnejus *Fabr.*
1881—Larva (col'd fig.). *F. Moore.* Lep. Ins. Ceylon, Vol. I, pl. 37.

Lampides phaseli *Math.*
1889—Larva. *G. F. Matthews.* Trans. Ent. Soc. Lond., pt. II, p. 311.
Food-plant: *Leguminosæ.*

Lampides alsulus *H. Sch.*
1890—Larva, chrysalis (col'd figs.). Austral. Lepid. and Transf., Vol. II, p. 10, pl. 12. (Edit. Olliff and Ford.)
Food-plant: *Indigofera australis.*

Lycæna lulu *Math.*
1889—Larva, chrysalis. *G. F. Matthews.* Trans. Ent. Soc. Lond., pt. II, p. 313.
Food-plant: *Leguminosæ.*

Lycæna bœtica *Linn.*
1855—Larva, chrysalis. *Chenu.* Ency. Nat. Hist. Papillons, p. 206.
1881—Larva. *F. Moore.* Lepid. Ceylon, Vol. I, p. 93.
1882—Larva. *Blackburn.* Trans. Ent. Soc. Lond., p. 31.
1886—Larva (col'd figs.). *W. L. Distant.* Rhoph. Maylayana, pl. 20, p. 230. 1882–6.
1890—Larva, chrysalis (col'd figs.). Austral. Lepid. and Transf., Vol. II, p. 10, pl. 12. (Edit. Olliff & Ford.)
Food-plant: *Swainsonia*, etc.

Holochila absimilis *Feld.*
1890—Larva, chrysalis (col'd figs.). *Scott.* Austral. Lepid. and Trans., Vol. II, p. 9, pl. 12. (Edit. Olliff & Ford.)
Food-plants: *Wistaria, Robinia*, etc.

Holochila heathii *Cox.*
1888—Larval stages, chrysalis. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 151.

Holochila erinus *Fabr.*

1890—Larva, chrysalis (col'd figs.). *Scott.* Austral. Lepid. & Transf., Vol. II, p. 9, pl. 12. (Edit. Ford & Olliff.)

Ialmenus evagoras *Don.*

1888—Larval stages. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 153.

1889—Larva, chrysalis (note on). *F. G. A. Barnard.* Viet. Nat., Vol. V, p. 168.

1890—Chrysalis. *Hy. Edwards.* Viet. Nat., Vol. VII, p. 22.

Food-plant: *Acacia dealbata.*

Ogyris genoveva *Hew.*

1883—Larva, chrysalis (col'd figs.). *W. H. Miskin.* (Quotes G. Barnard in lit.) Trans. Ent. Soc. Lond., p. 343.

1886—Larva (brief). *A. S. Olliff.* (Quotes Miskin.) Austral. Butterflies, p. 24.

Food-plant: *Loranthus.*

Netrocoryne repanda *Feld.*

1888—Larva, chrysalis (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 181.

1890—Larva, chrysalis (col'd figs.). Austral. Lep. and Transf., Vol. II, pl. 14. (Edit. Olliff & Ford.)

Food-plant: *Eugenia.*

Pamphila phineus *Cr.*

1888—Life-history. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 170.

1890—Larva, chrysalis (col'd figs.). Austral. Lepid. & Trans., Vol. II, pl. 14 (Edit. Olliff & Ford.)

Food-plants: Various species of palms.

Pamphila bambusæ *Moore.*

1890—Larva, chrysalis (col'd figs.). *G. Semper.* Reisen im Archipel. der Phillippinen, Vol. V, pl. 13, fig. 11.

Apaustus agraulia *Hew.*

1888—Larva, chrysalis (figs.). *A. S. Olliff.* Ann. Mag. Nat. Hist., p. 300.

Food-plant: *Couch-grass.*

Trapezites symmomus *Hb.*

1888—Life-history. *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 183.

Food-plant: *Cladium*, etc.

Hesperilla picta *Leach.*

1889—Life history (col'd figs.). *G. F. Matthew.* Trans. Ent. Soc. Lond., pt. I, p. 185.

Food-plant: *Cladium mariscus.*

Hesperilla ornata *Leach.*

1888—Larva, chrysalis. *G. F. Matthew.* Trans. Ent. Soc., Lond., pt. I, p. 187.

Food-plant: *Cladium mariscus.*

HETEROCERA.

Hemaris hylus *Linn.*

1874—Larva, (brief). *Boisduval.* Spec. Gener. Lepid., p. 377.
1876—Larva, pupa (figs.). *A. G. Butler.* Revue Sphingidæ, pl. 90.
Food-plant: *Gardenia.*

Cizara ardeniæ *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* N. Hist. Lepid. N. S. Wales, pl. 2.
1874—Larva, pupa. *Boisduval.* (Quotes Lewin.) Spec. Gener. Heter., p. 149.
Food-plant: *Grevillea sericea.*

Daphnis horsfieldii *Butl.*

1876—Pupa. *A. G. Butler.* Revis. Sphing., p. 573.

Daphnis hypothous *Cr.*

1874—Larva. *Boisduval.* Spec. Gener. Heters., p. 227.
1881—Larva (col'd figs.). *Horsfield & Moore.* Cat. Lep. E. I. C., pl. 10, fig. 2.
Food-plant: *Cadamba jasminiflora.*

Chœrocampa nessus *Dr.*

1875—Larva. *A. G. Butler.* Rev. Sphing., p. 565.
Food-plant: Yam. *Dioscorea.*

Chœrocampa oldenlandiæ *Fabr.*

1822—Larva pupa (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. Wales, pl. 3.
1874—Larva. *Boisduval.* (Quotes Lewin). Spec. Gener. Heter., p. 243.
1876—Larva (col'd fig.) *A. G. Butler.* Rev. Sphing., p. 559, pl. 91, fig. 1.
Food-plants: *Cissus, Grevillea sericea,* etc.

Chœrocampa scrofa *Boisd.*

1891—Pupa. *Hy. Edwards.* Viet. Nat., Vol. VIII, p. 150.

Chœrocampa pinastrina *Mart.*

1874—Larva. *Boisduval.* Spec. Gen. Heteroc., p. 240 (as *C. silhetensis*).
1876—Larva, pupa (col'd figs.). *A. G. Butler.* Revis. Sphing., p. 560, pl. XCII, fig. 8.
Food-plant: *Colocasia.*

Chœracampa erotus *Cram.*

1889—Larva, pupa. *H. Tryon.* Rep. Ins. and Fungi Pests, Queensland Dept. Agricul., p. 152.
1891—Pupa. *Hy. Edwards.* Viet. Nat., Vol., VIII, p. 150.
Food-plant: *Vitis.*

Chœrocampa celeria *Linn.*

1855—Larva, pupa. *Chenu.* Ency. Nat. Hist. Papillons, p. 204.
1874—Larva, pupa. *Boisduval.* Spec. Gener. Hetero., p. 230.
1888—Larva. *J. G. O. Tepper.* Gard. and Field, Vol. XIII. p. 127.

1893—Larva, pupa (col'd figs.). *C. French.* Handbook Dest. Ins. Vict., p. 100, pl. XXIX.

Chœrocampa pallicosta *Walk.* (probably *C. scrofa* Bd.).

1888—Larva. *J. G. O. Tepper.* Gard. and Field, Vol. XIII, p. 127.

Nephele didyma *Fabr.*

1876—Larva (col'd figs.). *A. G. Butler.* Rev. Sphing., p. 624, pl. 91, fig. 20 (as *N. hespera*).

Macrosila casuarinæ *Walk.*

1875—Larva (brief). *Boisduval.* Spec. Gener. Hetero., p. 110.

Food-plant: *Casuarina.*

Sphinx eremophilæ *Lucas.*

1891—Larva. *T. P. Lucas.* Proc. Linn. Soc. N. S. W., p. 277.

Food-plant: *Eremophila mitchelli.*

Sphinx marmorata *Lucas.*

1891—Larva. *T. P. Lucas.* Proc. Linn. Soc. N. S. W., p. 279.

Food-plant: *Eremophila mitchelli.*

Sphinx roseofasciata *Koch.*

1890—Larva (brief). *E. Meyrick.* Trans. N. Zeald. Inst., Vol. XXII, p. 214 (as *S. convolvuli*).

Food-plant: *Convolvulacea.*

Cœquosa triangularis *Don.*

1874—Larva (brief). *Boisduval.* Spec. Gener. Hetero., p. 10.

1890—Larva, pupa (col'd figs.). Austral. Lepid. and Transf., Vol. II, p. 6, pl. 10. (Edit. Olliff and Ford.)

Cœquosa australasiæ *Don.*

1874—Larva (brief). *Boisduval.* Spec. Gener. Hetero., p. 10.

1890—Pupa. *Hy. Edwards.* Vict. Nat., Vol. VII, p. 22.

Food-plant: *Proteacea.*

Ægeria tipuliformis *Linn.*

1873—Larva (brief). *R. W. Fereday.* Trans. N. Zeal'd Inst., Vol V, p. 291.

1886—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 690.

Food-plant: Currant (in stems).

Agarista glycinæ *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* N. Hist. Lepid. Ins. N. S. Wales, pl. 1.

1878—Larva, pupa (col'd figs.). *F. McCoy.* Prod. Zool. Vict., Vol. I, Dec. 1, p. 30.

1890—Larva, pupa (col'd figs.). Austral. Lepid. and Transf., Vol. II, pl. 15. (Edit. Olliff & Ford.)

1890—Young larva. *Hy. Edwards.* Vict. Nat., Vol. VII, p. 23.

1890—Larva (fig.). *C. French.* Charts Destruct. Ins. Vict.

1891—Larval stages. *Hy. Edwards.* Vict. Nat., Vol. VIII, p. 151.

1893—Larva, pupa (col'd figs.). *C. French.* Handbook, Dest. Inst. Vict., p. 101, pl. XXVIII.
Food-plant: Grape.

Agarista agricola *Don.*
1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 25, pl. 8.
Food-plant: Grape.

Agarista donovani *Bdv.*
1890—Larva, pupa (col'd figs.). Austral. Lepid. and Transf., Vol. II, pl. 15. (Ed. Olliff & Ford.)

Agarista contortus *Walk.*
1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Trans., p. 24, pl. 8 (as *A. casuarinæ*).
1878—Larva, pupa (col'd figs.). *F. McCoy.* Prod. Zool. Vict., Vol. I, p. 29, pl. 8.
1888—Larva. *J. G. O. Tepper.* Gard. and Field, Vol. XIII, p. 141.
1891—Pupa. *Hy. Edwards.* Vict. Nat., Vol. VIII, p. 151 (as *A. casuarinæ*).
Food-plants: *Casuarina, Loranthus.*

Agarista tristificus *Hüb.*
1878—Larva, pupa (col'd figs.). *F. McCoy.* Prod. Zool. Vict., Vol. I, p. 27, pl. 8 (as *A. lewinii*).
1888—Larva. *J. G. O. Tepper.* Gard. and Field, Vol. XIII, p. 141.
1890—Larva, pupa (col'd figs). Austral. Lepid. and Trans., Vol. II, pl. 15. (Edit. Olliff & Ford.)
Food-plant: *Epilobium tetragonum.*

Agarista latinus *Don.*
1890—Larva, pupa (col'd figs.). Austral. Lepid. and Transf., Vol. II, pl. 15. (Edit. Olliff & Ford.)

Procris empyrea *Meyr.*
1888—Larva, cocoon (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 927.

Hydrusa, sp.
1893—Larva, pupa (col'd figs.). *C. French.* Handbook, Dest. Ins. Vict., p. 63, pl. XXIII.

Aganais nesophora *Meyr.*
1888—Larva, pupa (brief). *A. S. Olliff.* Ann. Mag. Nat. Hist., I, p. 300 (as *Hypsa nesophora*).
Food-plant: Native Fig.

Nyctemera annulata *Bdv.*
1877—Larva, pupa. *F. W. Hutton.* Trans. N. Zool. Inst., Vol. IX, p. 355.
1890—Larva. *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XXII, p. 218.
1891—Larva. *Hy. Edwards.* Vict. Nat., Vol. VIII, p. 152.
Food-plants: Various species of *Senecio* (N. Zealand).

Nyctemera conica *White.*

1886—Larva. *E. Myrick.* Proc. Linn. Soc. N. S. W., p. 761 (as *N. amica*).
1888—Larva. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 1.
1891—Pupa. *Hy. Edwards.* Viet. Nat., Vol. VIII, p. 151 (as *N. amica*).
Food-plants: Various species of *Senecio.*

Nola lugens *Walk.*

1890—Larva, cocoon. *Hy. Edwards.* Viet. Nat., Vol. VII, p. 23.
Food-plants: *Eucalyptus.*

Eutane terminalis *Walk.*

1886—Larva (note on). *E. Myrick.* Proc. Linn. Soc. N. S. W., p. 747.
Food-plant: Lichens.

Eutane lydia *Don.*

1891—Egg. *Hy. Edwards.* Viet. Nat., Vol. VIII, p. 152 (as *Asura lydia*).

Lithosia replana *Lewin.*

1822—Larva, pupa, cocoon (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. Wales, pl. 15.
1854—Larva. *F. Walker.* Cat. Lepid. B. Mus., pt. II, p. 507.
Food-plant: Lichens.

Lithosia bicolora *Bdv.*

1888—Larva, pupa. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 2.
Food-plant: *Senecio hypoleucus.*

Utetheisa pulchella *Linn.*

1888—Larva (brief). *J. G. O. Tepper.* Gard. & Field, Vol. XIV, p. 2.
Food-plant. *Erechites arguta.*

Mosoda anartoides *Walk.*

1886—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 729.
Food-plant: Lichens.

Metacrias erichrysa *Meyr.*

1886—Larva (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 750.
1890—Larva (brief). *E. Meyrick.* Trans. N. Zeald. Inst., Vol. XXII, p. 216.
Food-plant: *Senecio bellidioides.*

Ardices fulvohirta *Walk.*

1888—Larva. *J. G. O. Tepper* (quotes Guest in lit.). Gard. & Field, Vol. XIV, p. 37.

Spilosoma obliqua *Bdv.*

1890—Egg. *Hy. Edwards.* Viet. Nat., Vol. VII, p. 24.

Teara tristis *White.*

1822—Larva, cocoon (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 8.
1888—Larva and habits. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 25.
Food-plant: *Pultenea villosa.*

Aglaosoma variegata *Walk.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 15, pl. 5 (as *A. lauta*).

Œnosanda boisduvalii *Newm.*

1888—Larva and habits. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 13 (as *Œ. dupuchelii*).

Food-plant: *Eucalyptus leucoxylon.*

Cebysa felderi *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 20, pl. 9.

Cebysa conflictella *Walk.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 29, pl. 29 (as *Œcina scottii*).

Apina callisto *Walk.*

1888—Larva (brief). *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 13.

Food-plant: Grasses.

Trichetra mesomelas *Walk.*

1891—Pupa. *Hy. Edwards.* Vict. Nat., Vol. VIII, p. 152.

Orgyia tricolor *H.-S.*

1891—Egg, larva, pupa, cocoon. *Hy. Edwards.* Vict. Nat., Vol. VIII, p. 152.

Orgyia postica *Walk.*

1880—Larva, pupa. *H. Tryon.* Insect and Fungi Pests, Queensl'd Dept. Agricul., p. 42.

Food-plant: Apple, etc.

Doratifera chrysochroa *Feld.*

1882—Cocoon. *Dewitz.* Nova Acta Leop.-Carol. Deutsch. Akad. Naturf., Vol. XLIV, p. 258, pl. 8, fig. 5.

Doratifera casta *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. & Transf., p. 18, pl. 6.

Doratifera lewini *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. & Transf., p. 17, pl. 6.

Doratifera longerans *White.*

1888—Larva, pupa, cocoon. *J. O. Tepper.* Gard. & Field, Vol. XIV, p. 63.

1888—Larva (brief). *C. C. Brittlebank.* Vict. Nat., Vol. V, p. 114.

Food-plant: *Eucalyptus.*

Doratifera vulnerans *Lewin.*

1822—Larva, cocoon (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W. pl. 4.

1858—Larva (col'd fig.). *P. M. Duncan.* Nat. Libr., Vol. XXXII, p. 181, pl. 22.

1863—Larva, cocoon (figs.). *J. G. Wood.* Nat. Hist., p. 537.

Food-plant: *Eucalyptus.*

Pelora oxleyi *McL.*

1891—Larva (note on), pupa. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 72.

Apoda infrequens *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Trans., p. 20, pl. 6.

Food-plant: *Scolopia brownii.*

Mecytha semicana *Walk.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Trans., p. 19, pl. 6 (as *Apoda Xylomeli*).

Food-plants: *Xylomeda* and *Banksia.*

Lithula omnivora *Fered.*

1878—Larva, case (figs.). *R. W. Fereday.* Trans. N. Zeal. Inst., Vol. X, p. 260, pl. 9.

1890—Larva, case (brief). *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XXII, p. 212.

1891—Larva. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 73.

Orophora toumatou *Fered.*

1878—Case (fig.). Larva. *R. W. Fereday.* Trans. N. Zeal. Inst., Vol. X, p. 262.

Food-plant: *Discaria toumatou.*

Clania lewinii *Walk.*

1854—Pupa, case (col'd figs.). *J. O. Westwood.* Proc. Zool. Soc. Lond., p. 224, pl. 35.

1888—Larval case. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 37.

Food-plant: *Casuarina.*

Clania tenuis *Roesnt.*

1891—Larval case. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 73.

Metura elongata *Saund.*

1854—Larva, pupa, case (col'd figs.). *J. O. Westwood.* Proc. Zool. Soc. Lond., p. 223, pl. 35.

1863—Larva, case (figs.). *J. G. Wood.* Nat. Hist., p. 534.

1879—Larva, pupa, case (col'd figs.). *F. McCoy.* Prod. Zool. Vict., Dec. 4, p. 43, pl. 40.

1888—Larval case. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 38.

1890—Larva. *Hy. Edwards.* Vict. Nat., Vol. VII, p. 26.

1893—Egg, larva, pupa (col'd figs.). *C. French.* Handbook, Dest. Ins. Vict., p. 77, pl. XXV.

Plant-food: *Pinus insignis*, orange, etc.

Thyridopteryx hübneri *West.*

1854—Larva, pupa, case (col'd figs.). *J. O. Westwood.* Proc. Zool. Soc. Lond., p. 244, pl. 35.

1888—Larva, pupa, case. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 25.
Food-plant: *Eucalyptus.*

Thyridopteryx herrichii *West.*

1854—Pupa, case (col'd figs.). *J. O. Westwood.* Proc. Zool. Soc. Lond., p. 224, pl. 35.
1888—Larva, pupa, case. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 20.
1890—Larva, case. *Hy. Edwards.* Vict. Nat., Vol. VII, p. 25.
1891—Pupa. *W. Beutenmüller* (quotes *Hy. Edwards* in MS.). Bull. Am. Mus. Nat. Hist., Vol. V, p. 74.
Food-plant: *Eucalyptus.*

Cerura australis *Scott.*

1864—Larva, pupa (col'd fig.). *Scott.* Austral. Lepid. & Transf., p. 16, pl. 5.
Food-plant: *Scolopia browni.*

Danima banksiæ *Walk.*

1822—Larva, pupa, cocoon (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 9.
1850—Larva (col'd fig.). *M. P. Duncan.* Nat. Libr., Vol. XXXII, p. 164, pl. 17.
1888—Larva, pupa, cocoon. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 52.
Food-plants: *Banksia, Grevillia,* etc.

Hyleora eucalypti *Dby.*

1848—Larva (col'd fig.). *E. Doubleday.* Proc. Zool. Soc. Lond., p. 119, pl. 5.
1857—Larva (fig.). *Chenu.* Ency. Nat. Hist., p. 108.
Food-plant. *Eucalyptus.*

Hyleora caustopis *Meyr.*

1888—Larva. *J. G. O. Tepper* (quotes Guest in lit.). Gard. and Field, Vol. XIV, p. 52.
Food-plant: *Eucalyptus.*

Caligula eucalypti *Scott.*

1864—Larva, pupa, cocoon (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 1, pl. 1.
1888—Larva, pupa, cocoon. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 63.
1890—Young larva. *Hy. Edwards.* Vict. Nat., Vol. XVII, p. 24.
1891—Egg. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. IV, p. 74.
Food-plant: *Eucalyptus.*

Caligula helena *White.*

1888—Larva (note on). *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 63.
1891—Cocoon. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 74 (as *Antheræa helena*).
Food-plant: *Eucalyptus.*

Opodiphtera astrophele *Walk.*

1890—Larva, pupa (col'd figs.). *Olliff & Ford.* Austral. Lepid. and Transf., Vol. II, pl. 13.

Caligula intermedia *Lucas.*

1889—Cocoon. *H. P. Lucas.* Proc. Linn. Soc. N. S. W., p. 1092 (as *Antheræa intermedia*).

Food-plant: *Loranthus.*

Antheræa janetta *White.*

1801—Egg. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. IV, p. 74.

Darala censors *Walk.*

1891—Cocoon, pupa. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 111.

Darala acuta *Walk.*

1891—Larva, pupa. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 71.

Food-plant: *Eucalyptus robusta.*

Darala ocellata *Walk.*

1888—Cocoon. *J. G. O. Tepper.* Garden and Field, Vol. XIV, p. 25

Cosmotricha exposita *Lucas.*

1822—Larva, cocoon (col'd figs.). *J. W. Lucas.* Nat. Hist. Lepid. Inst. N. S. W., pl. 7.

Food-plant: *Casuarina*

Chelepteryx collesii *Gray.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Trans., p. 21, pl. 7.

1890—Larva, pupa, cocooon (col'd figs.). *F. McCoy.* Prod. Zool. Vict. Dica., 20, p. 350, pl. 197.

1890—Egg, pupa (note on). *Hy. Edwards.* Vict. Nat., Vol. VII, p. 24.

Food-plant: *Eucalyptus.*

Philudoria australasiæ *Fabr.*

1822—Larva, pupa, cocoon (col'd figs.). *J. W. Lucas.* Nat. Hist. Lepid. Ins. N. S. W., p. 45 (as *Opsirhina nasuta*).

Opsirhina fervens *Walk.*

1890—Egg, larva, pupa, cocoon. *Hy. Edwards.* Vict. Nat., Vol. VII, p. 25.

Pinara ignobilis *Walk.*

1879—Larva, pupa, case (col'd figs.). *F. McCoy.* Prod. Zool. Vict. Dec., IV, p. 45, pl. 40.

1888—Life-history. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 37.

1880—Larva, case. *H. Tyron.* Rep. Ins. and Fungi Pests, Queensld. Dept. Agricul., p. 151 (as *Entomeda ignobilis*).

Food-plant: *Psidium* (guava).

Pinara obliqua *Walk.*

1891—Cocoon, pupa. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 72 (as *Rhinogene callisamma*).

Pinara cana *Walk.?*

1888—Larva, cocoon. *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 13.

Endoxyla d'urvillei *H. S.*

1879—Larva, pupa, cocoon (col'd figs.). *F. McCoy.* Prod. Zool. Vict., Vol. I, p. 47, pl. 30.

1890—Larva, pupa, cocoon (col'd figs.). *C. French.* Charts Destruct. Ins. Vict. (as *E. acaciæ*).

1891—Pupa. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V (as *E. cinerea*).

Ptilomacra senex *Walk.*

1888—Larva (note on). *J. G. O. Tepper.* Gard. and Field, Vol. XIV, p. 52.

Discophlebia catocalina *Feld.*

1891—Cocoon, pupa. *W. Beutenmüller.* Bull. Am. Mus. Nat. Hist., Vol. V, p. 71.

Œnetus lignivorus *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* N. H. Lepid. Ins. N. S. W., pl. 16.

1858—Larva (col'd figs.). *M. P. Duncan* (quotes Lewin). Nat. Libr., Vol. XXXII, p. 107, pl. 8.

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 5, pl. 2 (as *C. venusta*).

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. W., Vol. I, p. 29.

Food-plants: *Casuarina*, *Eucalyptus*, *Callistemon*, *Dodonæa*, etc.

Œnetus virescens *Pbl.*

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. W., Vol. II, p. 28.

1879—Larva and habits. *C. H. Gosset.* Trans. N. Zeal'd Inst., Vol. XI, p. 347.

1885—Life-history. *A. Hoffmann.* Stett. Ent. Zeit., Vol. XLVI, p. 315.

1890—Larva (brief). *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XXII, p. 211.

1890—Larva. *E. Steel.* Vict. Nat., Vol. VII, p. 110.

Food-plants: *Olea apetala*, *Aristotelia racemosa* and *Leptospermum* (in trunks).

Œnetus splendens *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 6, pl. 2.

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. W., Vol. I, p. 31.

1889—Larva (note on). *J. G. O. Tepper.* Garden and Field, Vol. XIV, p. 100.

Food-plant: *Casuarina*.

Œnetus eximius *Scott.*

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. W., Vol. I, p. 35.

1890—Larva, pupa (col'd figs.). Austral. Lepid. and Transf., Vol. II, p. 8, pl. II. (Edit. Olliff & Ford.)

Food-plant: *Dodonæa angustifolia*.

Œnetus scotti *Scott.*

1873—Larva (note on). *Scott* (quotes Ramsay). Trans. Ent. Soc. N. S. W., Vol. I, p. 35.

Food-plants: Nettle-tree, *Westaria*.

Œnetus lewinii *Walk.*

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. W., Vol. I, p. 31.

Food-plant: *Casuarina.*

Œnetus ramsayii *Scott.*

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. W., Vol. I, p. 32.

Food-plants: *Acmena, Alectryon,* etc.

Pielus labyrinthicus *Don.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. and Transf., p. 11, pl. 4.

1889—Egg larva, pupa, case. *J. G. O. Tepper.* Garden and Field, Vol. XIV, pp. 100 and 137.

1889—Larva (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., pp. 11 and 35.

Food-plant: *Eucalyptus.*

Porina signata *Walk.*

1873—Larva, pupa (brief). *R. W. Fereday.* Trans. N. Zeal. Inst., Vol. V, p. 290 (as *Pielus variolaria* Guen.).

1877—Larva, pupa. *F. W. Hutton.* Trans. N. Zeal. Inst., Vol. IX, p. 356 (as *Porina variolaris*).

Food-plants: Roots of plants.

Porina umbraculatus *Guen.*

1873—Larva, pupa (brief). *R. W. Fereday.* Trans. N. Zeald. Inst., Vol. V, p. 290.

Food-plant: Roots of grass (as *Pielus umbraculatus*).

Abantiades hyalinata *H.-S.*

1889—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1135 (as *Pielus hyalinatus*).

Food-plants: Roots of grasses.

Zelotypia stacyi *Scott.*

1887—Larva, pupa. *A. S. Olliff.* Proc. Linn. Soc. N. S. W., p. 467.

1887—Larva (note on). *A. S. Olliff.* Proc. Linn. Soc. N. S. W., p. 499 (var. *sinuosa*).

Food-plants.

Bombyx? lewineæ *Leach.*

1822—Larva, cocoon (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 6.

Food-plant: *Eucalyptus.*

Agrotis infusa *Bdv.*

1889—Life-history. *H. Tryon.* Rep. Ins. & Fungi Pests. Queensland, Dept. Agricul., p. 215.

Food-plants: lucerne, etc.

Agrotis vastator *Scott.*

1873—Larva. *Scott.* Trans. Ent. Soc. N. S. Wales, Vol. I, p. 41.

Agrotis spina *Guen.*

1890—Larva, pupa (col'd figs). *C. French.* Charts Dest. Ins. Vict.

Prodenia littoralis *Bdv.*

1889—Larva, pupa. *H. Tyron.* Rep. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 227.

Heliothis peltigera *H. S.*

1889—Life-history. *H. Tyron.* Rep. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 180.

1889—Larva (note on). *H. Tyron.* Rep. Ins. & Fungi Pests. Queensland, Dept. Agricul., p. 150.

Food-plants: Corn, Passion-fruit.

Heliothis armigera *Hüb.*

1873—Larva, pupa (brief). *R. W. Veraday.* Trans. N. Zeal'd Inst., Vol. V, p. 291.

1890—Larva (fig.). *A. S. Olliff.* Agricul. Gazette, N. S. W., Vol. I, p. 120, pl. 3.

1900—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 49, pl. XL.

Leucania, sp.

1889—Life-history. *H. Tyron.* Rep. Ins. & Fungi Pests. Queensland, Dept. Agricul., p. 225.

Dasypodia selenophora *Guen.*

1879—Larva, pupa, cocoon. *W. Colenso.* Trans. N. Zeal'd Inst., Vol. XI, p. 300.

Thalpochares coccophaga *Meyr.*

1886—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1035.

1889—Larva (note on). *H. Tyron.* Rep. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 126.

Feeds on *Coccidæ.*

Othreis fullonica *Linn.*

1885—Larva, pupa (col'd figs.). *F. Moore* (quotes N. S. Ward). Trans. Zool. Soc. Lond., Vol. II, p. 66.

Argadesa materna *Linn.*

1885—Larva, pupa (col'd figs.). *F. Moore.* Trans. Zool. Soc. Lond., Vol. II, p. 75, pl. 12, fig. 4.

1889—Larva, pupa. *H. Tyron.* Rep. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 102.

Food-plants: Orange, *Monospermum glabratum*, etc.

Mænas salaminia *Cram.*

1881—Larva, pupa (brief). *F. Moore.* Trans. Zool. Soc. Lond., Vol. II, p. 72, pl. 12, fig. 3 and 6.

1889—Larva, pupa. *H. Tyron.* Rep. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 102.

1890—Larva, pupa (col'd figs). Austral. Lepid. & Transf., Vol. II, p. 6, pl. 11 (Edit. Olliff & Ford).

Food-plants: Orange, *Sarcopetalum*, *Monospermum glabratum.*

Mamestra composita *Guen.*

1873—Larva pupa. *R. W. Fereday.* Trans. N. Zeal'd Inst., Vol. V, p. 201.

1887—Larva (brief). *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XIX, p. 22.

Food-plants: Various species of grasses and cereals.

Mamestra ewingi.

1900—Larva (col'd fig). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 75, pl. XLVI, fig. 2, 3.

Hadena lignifurea *Walk.*

1877—Larva, pupa. *E. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 357.

Plusia eriosoma *Dbl.*

1881—Larva, pupa. *W. L. Buller.* Trans. N. Zeal'd Inst., Vol. XIII, p. 238.

Food-plants: *Geranium*, etc.

Euplexia insignis *Walk.* (?).

1877—Larva. *E. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 356.

Food-plants: *Clematis, Aristotelia.*

Eucrostis argocrana *Mey.*

1888—Larva (brief). *T. P. Lucas.* Vict. Nat., Vol. V, p. 26.

Food-plant: Flowers of asters.

Iodis illidgei *Lucas.*

1880—Larva (brief). *T. P. Lucas.* Proc. Linn. Soc. N. S. W., p. 604.

Food-plant: *Duboisia myoporoides.*

Iodis insperata *Walk.*

1887—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 897.

Food-plant: *Exocarpus cupressiformis.*

Monoctenia vinaria *Guen.*

1880—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1206.

Dichromodes orectis *Mey.*

1880—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1183.

Food-plants: *Myrtaceæ.*

Prionophora ruptella *Mey.*

1879—Larva, pupa (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 209.

Food-plant: *Casuarina.*

Thalassodes pieroides *Walk.*

1880—Larva, pupa. *H. Tyron.* Rep. Ins. & Fungi Pests. Queensland Dept. Agricul., p. 155.

Food-plant: *Vitis.*

Mnesampelia privata *Guen.*

1900—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 55, pl. XLI.

Cidaria deltoidata *Walk.*

1890—Larva. *E. Meyrick* (quote and Hutton in lit.). Trans. N. Zeal'd Inst. Vol. XXII, p. 220.

Food-plants: Plantago, etc.

Hybernia boreophilaria *Guen.*
1877—Larva. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 357.

Larentia corcularis *Guen* (?).
1877—Egg (brief). *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 358.

Larentia semisignata *Walk.*
1877—Larva. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 357.
Food-plants: *Rumex*, etc.

Anchmis composita *Guen.*
1877—Larva. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 357.
Food-plants: Grasses.

Hippolyte rubropunctaria *Dbl.*
1884—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XVI, p. 69.
Food-plants: *Haloragis alata.*

Epyaxa rosaria *Dbl.*
1886—Egg, larva, pupa. *A. Purdie.* Trans. N. Zeal'd Inst., Vol. XVIII, p. 208.

Asthena subpurpureata *Walk*
1877—Larva. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 357.
Food-plant: *Leptospermum ericoides.*

Coremia robustaria *Walk.* (?).
1877—Larva (brief). *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 358.
Food-plant: *Leptospermum scoparium.*

Coremia inamœnaria *Guen.*
1877—Egg (brief). *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 358.

Eupithecia indicataria *Walk.* (?).
1877—Larva. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 358.
Food-plant: *Clematis indivisa.*

Declana floccosa *Walk.* (?).
1877—Larva, pupa. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 356.
Food-plant: *Aristotelia* and *Ulex.*

Lyrcea alectoraria *Walk.*
1890—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XXII, p. 220.
Food plant: *Pittosporum eugenioides.*

Lyrcea hemipteraria *Guen.*
1890—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XXII, p. 220.

Ceroprepes almella *Meyr.*
1878—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 211.
Food-plant: *Exocarpus cupressiformis.*

Centropseustes astrapora *Meyr.*
1889—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1106.
Food-plant: *Melaleuca genistifolia.*

Ephestia interpunctella *Hb.*
1878—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 216.
Feeds on maize and other cereals.

Ephestia elutella *Hb.*

1878—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 215.
Feeds on various domestic substances.

Ephestia sericaria *Scott.*

1870—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 235.

Hyphantidium sericarium *Scott.*

1859—Larva, pupa (col'd figs.). *Scott.* Proc. Zoöl. Soc. London, p. 207, pl. 61.

Epicrocis terebrans *Olliff.*

1896—Larva, pupa (figs.). *S. A. Olliff.* Sidney Mail, Feb. 22.
1896—Larva, pupa (figs.). *S. A. Olliff.* Record Aus. Mus., Vol. I, p. 34, pl. 2.
Food-plants: Red cedar and other plants.

Achrosea grisella.

1878—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 216.
Food: Bees' wax.

Galleria mellonella *Linn.*

1878—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 216.
Feeds on wax in bee-hives.

Schœnobius imparellus *Mey.*

1878—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 117.
Food-plant: *Juncus prismatocarpus.*

Aphonia latra *Zell.*

1870—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 239.
Food-plant: *Xanthorrhœa hastilis.*

Conogethes punctiferalis *Guen.*

1880—Egg, larva, pupa. *H. Tyron.* Ins. and Fungi Pests, Queensland. Dept. Agric., p. 76.
Food-plant: Peach, dahlia, corn, etc. (in stems).

Heliostibes atychioides *Mey.*

1889—Larva (fig.). *G. V. Hudson.* Trans. N. Zeal'd Inst., Vol. XXI, p. 189, pl. 8.
Food-plant: *Leptospermum.*

Scoparia minusculalis *Walk.*

1885—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XVII, p. 83.
Food-plant: Mosses.

Mecyna deprivalis *Walk.*

1889—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XXII, p. 188.
Food-plant: *Sophthora.*

Diptychophora elaina *Mey.*

1883—Larva. *E. Meyrick.* (Quotes Fereday in lit.) Trans. N. Zeal'd Inst. Vol. XV, p. 18.
Food plant: Mosses.

Scenoploca petraula *Mey.*

1883—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XV, p. 10.
Food-plant: Lichens.

Sceliodes cordalis *Dbl.*

1880—Larva (brief). *E. Meyrick.* (Quotes Hudson in lit.) Trans. N. Zeald. Inst., Vol. XXI, p. 187.
Food-plant: *Solanum aviculare* (in fruit).

Cacœcia responsana.

1891—Larva (col'd figs.). *C. French.* Handb. Dest. Ins. Vict., p. 67, pl. 5.
Food-plant: Apple (in fruit).

Cacœcia postvittana *Walk.*

1881—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., 503.
1890—Larva, pupa. ——— (quotes Meyrick). Agricul. Gaz. N. S. W., p. 8, Vol. I.
Food-plants: *Correa*, *Grevillea*, etc.

Cacœcia australana *Lew.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* N. Hist. Lepid. Ins. N. S. W., pl. 17.
1881—Larva. *E. Meyrick* (quotes Lewin). Proc. Linn. Soc. N. S. W., p. 487.
Food-plant: *Embothrium speciosissimum.*

Tortrix concordana *Meyr.*

1881—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 510.
Food-plant: *Hibbertia linearis.*

Tortrix indigestana *Meyr.*

1881—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 520.
Food-plant: *Hibbertia linearis.*

Tortrix amœnana *Walk.*

1881—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 511.
Food-plant: *Monotoca scoparia.*

Eupselia satrapella *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 221.
Food-plant: *Eucalyptus.*

Ereunetis iuloptera *Meyr.*

1880—Pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 201.

Palæostoma styphelana *Meyr.*

1881—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 423.
Food plant: *Eucalyptus.*

Arotrophora arcuatalis *Walk.*

1881—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 531.
Food plant: *Banksia serrata.*

Arotrophora xythopterana *Meyr.*

1881—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 530.
Food plant: *Lomatia silaifolia.*

Antithesia phyllanthana *Meyr.*

1881—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 642.
Food-plant: *Phyllanthus.*

Palæobia anguillana *Meyr.*

1881—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 663.
Food plant: *Correa speciosa.*

Palæobia hibbertiana *Meyr.*

1881—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 666.
Food plant: *Hibbertia volubilis.*

Strepsiceros ejectana *Walk.*

1881—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 682.
1883—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XV, p. 63.
Food-plants: *Leptospermum*, and other Myrtaceæ.

Strepsiceros macropetana *Meyr.*

1881—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 684.
Food-plant. *Eucalyptus.*

Strepsiceros fluidana *Mey.*

1881—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 687.
Food-plant: *Leptospermum.*

Holocola thalassinana *Meyr.*

1881—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 673.
Food-plant: *Leptospermum lævigatum.*

Holocola triangulana *Meyr.*

1881—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., Vol. V, p. 706.
Food-plant: *Acacia decurrens.*

Taractrocera papyria *Bdv.*

1888—Pupa. *J. O. Tepper.* Gard. & Field, Vol. XIII, p. 116.
Food plant: *Acæna.*

Eudemis botrana *Schiff.*

1881—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 650.
1880—Larva (brief). *H. Tyron.* Rept. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 156.
Food-plant: Grape.

Carpocapsa pomonella *Linn.*

1887—Larva and habits (fig.). *J. O. Tepper.* Gard. & Field, Vol. XIII, p. 81.
1880—Life history. *H. Tyron* (quotes various authors). Rept. Ins. and Fungi Pests, Queensland, Dept. Agricul., p. 44.
1890—Larva, pupa (figs). *A. S. Olliff.* Agricul. Gazette N. S. W., Vol. I, p. 6, pl. 1.
1890—Larva, pupa (note on). *E. C. Christy.* Vict. Nat., Vol. VI, p. 164.
1891—Larva, pupa (col'd figs). *C. French.* Handb. Dest. Ins. Vict., p. 45, pl. 2.
1891—Larva (fig.). *C. French.* Charts Dest. Ins. Vict
Food-plant: Apple (in fruit).

Cacœcia alopecana *Mey.*

1885—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XVII, p. 148.
Food-plant: *Phyllocladus alpinus.*

Cacœcia exessana *Walk.*

1883—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. 15, p. 49.
1889—Larva (fig.). *G. V. Hudson.* Trans. N. Zeal'd Inst., Vol. XXI, p. 190, pl. 8.
Food-plants: *Leptospermum, Panax arboreum.*

Adoxophyes conditana *Walk.*

1883—Larva, pupa. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XV, p. 41.
Food-plant: *Genista.*

Pædisca privatana *Walk.*

1877—Larva. *F. W. Hutton.* Trans. N. Zeal'd Inst., Vol. IX, p. 358.
Food-plants: Various shrubs.

Pædisca obliquana *Walk.*

1883—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XV, p. 61
Food-plants: *Rumex, Veronica, Lonicera,* etc.

Pyrgotis plagiatana *Walk.*

1883—Larva, pupa. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XV, p. 39.
Food-plant: Oak.

Semiocosma platyptera *Meyr.*

1890—Larva. *E. Meyrick* (quotes Hudson in lit.). Trans. N. Zeal'd Inst., Vol. XXII, p. 220.
Food-plant: *Elæocarpus dentatus.*

Tinea vivipara *Scott.*

1866—Larva, case (fig.). *Scott.* Trans. Ent. Soc. N. S. W., Vol. I, p. 33.
Feeds on woolens, flannel, etc.

Tinea tapetzella *Linn.*

1857—Larva, case. *Chenu.* Ency. Hist. Nat. Papillons, Vol. II, p. 289.
1859—Larva. *H. T. Stainton.* Brit. Butt. & Moths, Vol. II, p. 290.
1859—Larva. *Humphreys.* Gener. Brit. Moths, p. 107.
1864—Larva, cocoon. *Jaeger.* Life N. Am. Ins., p. 180.
1872—Larva, cocoon (figs.). *Figuier.* Insect World, p. 280.
1874—Larva, cocoon (figs.). *A. S. Packard.* Half-hours with Insects, p. 311.
1891—Larva, pupa (figs.). *C. French.* Charts Dest. Ins. Vict.

Tinea cossuna *Leze.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* N. Hist. Lep. Ins. N. S. W., pl. 18.
Feeds on decayed wood.

Tinea granella *Linn.*

1900—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Vict., Pt. III, p. 129, pl. LV.

Tinea biselliella *Hum.*

Tinea pellionella *Linn.*

Choreutis bjerkandrella *Thunb.*

1880—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 210.
Food-plant: *Cnicus*, etc.

Simaethis sycopola *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 212.
Food-plant: *Ficus stipulata.*

Cryptophaga immaculata *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. Transf., p. 9, pl. 3.
Food-plant: *Banksia integrifolia.*

Cryptophaga rubescens *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 12.
1858—Larva, pupa. *J. Duncan* (quotes Lewin). Nat. Libr., Vol. XXXII, p. 121.
1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 35.
Food-plant: *Acacia longifolia.*

Cryptophaga unipunctata *Don.*

1890—Larva, pupa. *Hy. Edwards.* Proc. Linn. Soc. N. S. W., p. 300.
1890—Larva, pupa. *Hy. Edwards.* Insect Life, Vol. III, p. 384.
1891—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Vict., pt. I, p. 113, pl. XIII.
Food-plants: Apricot, apple, plum, quince, etc. (in branches).

Cryptophaga pultenææ *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 13.
1858—Larva, pupa. *J. Duncan* (quotes Lewin). Nat. Libr., Vol. XXXII, p. 121.
1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 30.
Food-plant: *Pultenæa villosa.*

Cryptophaga delocentra *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 39.
Food-plant: *Ceratopetalum gummiferum.*

Cryptophaga stochastis *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 31.
Food-plant: *Hakea.*

Cryptophaga hierastis *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 30.
Food plant: *Hakea.*

Cryptophaga lurida *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 37.
Food plant: *Eucalyptus viminalis.*

Cryptophaga epadelpha *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 37.

Food-plant: *Tristania conferta.*

Cryptophaga bipunctata *Scott.*

1864—Larva, pupa (col'd figs.). *Scott.* Trans. Austral. Lepid., p. 6, pl. 3.

Cryptophaga dolerastis *Meyr.*

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 30.

Food-plant: *Banksia.*

Cryptophaga leucodelpha *Meyr.*

1890—Larva (brief). Trans. Roy. Soc. S. Austral., p. 35.

Food-plant: *Casuarina.*

Cryptophaga balteata *Walk.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 38.

Food-plant: *Eucalyptus.*

Cryptophaga irrorata *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 10.

1858—Larva, pupa (figs.). *J. Duncan.* Nat. Libr., Vol. XXXII, p. 117, pl. 10.

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 34.

Food-plant: Trunks of *Casuarika.*

Cryptophaga albicosta *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 11.

1858—Larva, pupa. *J. Duncan.* Nat. Libr., Vol. XXXII, p. 110.

1864—Larva, pupa (col'd figs.). *Scott.* Austral. Lepid. Trans., p. 8, pl. 3.

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 33.

Food-plants: *Banksia, Callicoma,* etc.

Cryptophaga strigata *Lewin.*

1822—Larva, pupa (col'd figs.). *J. W. Lewin.* Nat. Hist. Lepid. Ins. N. S. W., pl. 14.

1858—Larva, pupa. *J. Duncan* (quotes Lewin). Nat. Libr., Vol. XXXII, p. 122.

Food-plant: *Banksia serrata.*

Cryptophaga spilonota *Scott.*

1864—Larva, pupa (col'd figs.). *E. Myrick.* Austral. Lepid. Trans., p. 10, pl. 10.

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 35.

Food-plant: *Banksia serrata.*

Macrobathra argonota *Meyr.*

1885—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 811.

Food plant: *Acacia myrtifolia.*

Macrobathra desmotoma *Meyr.*

1885—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 807.

Food-plant: *Acacia decurrens.*

Macrobathra leucopeda *Meyr.*
1885—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 813.
Food-plant: *Acacia discolor.*

Macrobathra ceraunobola *Meyr.*
1885—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 819.
Food-plant: *Acacia glaucescens.*

Macrobathra rhodospila *Meyr.*
1885—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 815.
Food-plant: *Acacia suaveolus.*

Macrobathra myriophthalma *Meyr.*
1885—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 822.
Food-plant: *Acacia pubescens.*

Macrobathra alternatella *Meyr.*
1885—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 812.
Food-plant: *Polybothrium formosum.*

Macrobathra chrysotoxa *Meyr.*
1885—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 804.
Food-plant: *Acacia decurrens.*

Macrobathra nephelomorpha *Meyr.*
1885—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 821.
Food plant: *Acacia decurrens.*

Macrobathra porphyrea *Meyr.*
1885—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 820.
Food-plant: *Acacia myrtifolia.*

Macrobathra anemodes *Meyr.*
1885—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 820.
Food-plant: *Acacia.*

Zonopetala decisana *Meyr.*
1888—Larva, cocoon. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1682.
Food-plants: Lichens.

Œcophora scholæa *Meyr.*
1890—Larva. *E. Meyrick* (quotes Hudson in lit.). Trans. N. Zeal'd Inst., Vol. XXII, p. 200.
Food: Roots of trees?

Œcophora pseudospretella *St.*
1884—Larva (brief). *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XVI, p. 34.
1886—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 782.
Feeds on furs, skins, etc.

Philobota bimaculana *Don.*
1888—Larva, pupa (brief). *S. A. Olliff.* Ann. Mag. Nat. Hist., p. 360.
Food-plant: *Eucalyptus.*

Lichenaula lichenea *Meyr.*
1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 49.
Food-plant: Lichens.

Lichenaula tuberculata *Meyr.*

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 51.
Food plant: *Crowea saligna.*

Lichenaula undulatella *Walk.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 47.
Food-plant: *Acacia decurrens.*

Lichenaula choriodes *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austral., p. 50.
Food-plant: Lichens.

Machæritis sallignes *Meyr.*

1886—Larva, case. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 768.
Food-plant: Lichens.

Palparia lambertella *Wing.*

1849—Larva (col'd fig.). *W. Wing.* Proc. Zool. Soc. Lond., Vol. XVII, p. 105, pl. XIV.

Palparia micrastrella *Meyr.*

1882—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 434.
Food-plant: *Eucarpus cupressiformis.*

Palparia aurata *Meyr.*

1888—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1681.
Food-plant: *Eucalyptus.*

Palparia uncinella *Meyr.*

1881—Larva, cocoon. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1681.
Food-plant: *Eucalyptus.*

Ocystola tyranna *Meyr.*

1884—Larval case. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1069.
Food-plants: *Eucalyptus.*

Ocystola pyramis *Meyr.*

1884—Larval habits. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1074.
Food-plant: *Eucalyptus.*

Ocystola callista *Meyr.*

1884—Larval case. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1068.
Food-plant: *Eucalyptus.*

Ocystola hemicalypta *Meyr.*

1888—Larval case. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1680.
Food-plant: *Eucalyptus.*

Heliocausta serva *Meyr.*

1888—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1682.
Food-plant: *Eucalyptus.*

Heliocausta incarnatella *Meyr.*

1888—Larva, pupa (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 1082.
Food-plant: *Eucalyptus.*

Heliocausta eudora *Meyr.*

1886—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 831.
Food-plant: *Eucalyptus leucoxylon.*

Heliocausta paralyrgis *Meyr.*

1883—Larva (brief). *E. Meyrick* (quotes Guest). Proc. Linn. Soc. N. S. W., p. 480.
Food-plant: *Eucalyptus.*

Heliocausta hemiteles *Meyr.*

1883—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 476.
Food-plant: *Eucalyptus terticornis.*

Heliocausta elæodes *Meyr.*

1883—Larva, pupa (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 475.
Food-plant: *Eucalyptus.*

Satrapia thesaurina *Meyr.*

1885—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 824.
Food-plant: *Eucalyptus.*

Peltophora argutella *Zell.*

1884—Larva (note on). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 727.
Food plant: *Monotoca elliptica.*

Machæritis calligenes *Meyr.*

1880—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 768.

Cœysra dichroëlla *Zell.*

1884—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 767.

Gracillaria linearis *Butl.*

1880—Larva. *E. Meyrick.* Trans. N. Zeal'd Inst., Vol. XXI, p. 148.
Food plant: Cariaria of various species.

Gracillaria œnopella *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 141.
Food plant: *Tetrantheca ferruginea.*

Gracillaria tricuneatella *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 147.
Food plant: *Typha latifolia.*

Gracillaria cænotheta *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 149.
Food plant: *Velopa spatiosissima.*

Gracillaria argyrodesma *Meyr.*

1882—Larva, pupa (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 195.
Food plant: *Grevillea linearis.*

Gracillaria chionoplecta *Meyr.*

1882—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 196.
Food plant: *Phebalium dentatum.*

Gracillaria didymella *Meyr.*

1882—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 198.
Food plant: *Acacia longifolia.*

Gracillaria ida *Meyr.*

1882—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 190.
Food-plants: *Eucalyptus piperita.*

Gracillaria toxomacha *Meyr.*

1882—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 198.
Food-plant: *Pultenæa.*

Gracillaria alysidota *Meyr.*

1882—Larva, pupa (brief). *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 198.
Food-plant: *Acacia longifolia.*

Gracillaria thalassias *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 150.
Food-plant: *Leptospermum lævigatum.*

Gracillaria calicella *St.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 151.
Food-plant: *Eucalyptus.*

Coriscium ochridorsellum *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 167.
Food-plant: *Phyllanthus ferdinandi.*

Bucculatrix eucalypti *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 180.
Food plant: *Eucalyptus.*

Lithocolletis aglaozona *Meyr.*

1882—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 200.
Food-plant: *Desmodium.*

Phyllocnistis diaugella *Meyr.*

1880—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 173.
Food-plant: *Euphorbia sparmanni.*

Erechthias acontistes *Meyr.*

1880—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 267.
Food-plant: *Xanthorrhœa australis* (in seed-heads).

Erechthias mystacinella.

1891—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Vict., p. 57, pl. III.
Food-plants: In stems of apple.

Stegommata sulfuratella *Meyr.*

1882—Larva, pupa. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 201.
Food-plant: *Banksia integrifolia.*

Telecrates parabolla *Walk.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 64.
Food plant: Cones of *Banksia.*

Telecrates lætiorella *Walk.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 63.
Food-plant: *Eucalyptus.*

Uzucha humeralis *Walk.*

1890—Larva, pupa (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 26.
Food-plant: *Eucalyptus* bark.

Tymbophora peltastis *Meyr.*

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 57.
Food-plant: *Anzophora lanceolata.*

Catoryctis subparallela *Walk.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 43.
Food-plant: *Casuarina.*

Scieropepla typhicola *Meyr.*

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 69.
Food-plant: *Typha angustifolia.*

Lita solanella *Bdv.*

1870—Larva. *E. Meyrick.* Proc. Linn. Soc. N. S. W., p. 112.
1880—Life-history. *H. Tyron.* Rep. Ins. & Fungi Pests. Queensland, Dept. Agricul., p. 175.
1892—Egg, larva, pupa (figs.). *C. V. Riley.* Insect Life, Vol. IV, p. 239.
1893—Larva, pupa (col'd figs.). *C. French.* Handbook Inj. Ins. Vict., p. 147, pl. 33.
Food-plant: Potato.

Xylorycta synaula *Meyr.*

1890—Larva (brief). *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 59.
Food-plants: *Hakea.*

Xylorycta strigata *Lew.*

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 59.
Food-plants: *Banksia, Lambertia.*

Xylorycta luteotactella *Walk.*

1890—Larva. *E. Meyrick.* Trans. Roy. Soc. S. Austr., p. 61.
Food-plants: *Banksia* and other *Proteaceae.*

Enæmia caminæa *Meyr.*

1888—Larva (brief). *S. Olliff.* Ann. Mag. Nat. Hist., p. 361.
Food-plant: *Eucalyptus.*

Plutella cruciferarum *Zell.*

1880—Life-history (brief). *H. Tyron.* Rep. Ins. & Fungi Pests, Queensland, Dept. Agricul., p. 170.
1893—Larva, pupa (col'd figs). *C. French.* Handbook Inj. Ins. Vict., p. 157, pl. 34.
Food-plant: Cabbage.
1888—Larva, pupa. *S. Olliff.* Ann. Mag. Nat. Hist., p. 361.
Food-plant: *Pyricoras fragrans.*

Batrachedra arenosella *Walk.*

1889—Larva. *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XXI, p. 181.
Food-plant: *Juncus.*

Callicotis crucifera *Meyr.*

1880—Larva. *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XXI, p. 170.
Food-plant: Ferns.

Limnœcia phragmitella *St.*

1880—Larva. *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XXI, p. 173.
Food-plant: *Typha angustifolia.*

Proteodes carnifex *Butl.*

1884—Larva. *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XVI, p. 7.
Food-plant: *Fagus solandii.*

Nymphortola galactina *Feld.*

1884—Pupa (brief). *E. Meyrick.* Trans. N. Zeal. Inst., Vol. XVI, p. 6.
Food plant: *Myrtus bullata.*

ADDENDA.

Teia anartoides *Walk.*

1900—Life-history (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 95, pl. XLVIII.
Food-plant: Golden Wattle (*Acacia pycnantha*), and other species of *Acacia.*

Pieris teutonia *Fabr.*

1900—Larva, chrysalis (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 101, pl. XLIX.
Food-plant: *Capparis spinosa.*

Zeuzera eucalypti *Boisd.*

1900—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 107, pl. L.
Food-plant: *Acacia decurrens.*

Antherea eucalypti *Scott.*

1900—Egg, larva, cocoon (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 113, pl. LI.
Food-plant: *Eucalyptus.*

Danima banksiæ *Leac.*

1900—Larva, pupa (col'd figs.). *C. French.* Handb. Dest. Ins. Victoria, Pt. III, p. 121, pl. LIII.
Food-plant: Honey-suckle (*Banksia*).

DESCRIPTIONS OF THE LARVÆ OF THREE MOSQUITOES.

BY HARRISON G. DYAR, PH.D.

(PLATE X, FIGS. 1–3.)

The larvæ here described have not been previously illustrated. Prof. J. B. Smith has written considerably on the habits of the first

one (see Howard, Mosquitoes, pp. 83 to 90, and Ent. News, XII, 93, 125, 189, 220 and 254), but they were at first incorrectly identified as *Culex pungens*. I am indebted to Prof. Smith for examples of the larvæ. The other species were found and bred by myself.

Aëdes smithii *Coquillett.* (Plate X, Fig. 1.)

Head rounded, pentagonal, flattened: eyes very small, round, black;* mouth brushes large, but not long; antennæ small, slender, the tuft imperceptible, end hairs small; pale brown, weakly but distinctly and uniformly colored; widest part of the head just behind the eyes, then gradually narrowing to antennæ; colorless, transparent, the thicker parts brownish. Thorax quadrate, a little wider than long, rather squarely angled, the three segments incised roundedly and equal; lateral hairs long, equal, the anterior and dorsal ones very small. Abdomen slender, submoniliform, segments equal; lateral hairs long on all the segments, the hairs diminishing in number, but not in length posteriorly; subdorsal tufts short, of three or four hairs. Lateral comb of the eighth segment a single row of stout teeth. Air-tube shorter than two abdominal segments, moderate, narrowed at the tip, with two rows of hairs on the upper and two on the lower aspect. Anal segment short, funnel-shaped, with two large inflated processes as clear as glass, reaching as far as the end of the tube and containing fine tracheal branches; subdorsal, lateral and subventral tufts of long hair terminally; no ventral brush.

Larvæ from the leaves of the pitcher-plant (*Sarracenia*), New Jersey.

Culex territans *Walker.* (Plate X, Fig. 2.)

Head large, flattened, squarely rounded, broad; antennæ large, long, the tuft at the outer third and well developed; distinctly white centrally, blackish at base and tip, appearing banded; eyes black, large, transverse, pointed inwardly; translucent, pale luteous; mouth broadly brown. In some a shade or distinct black band across vertex of head. Thorax short, wide, at maturity swollen like a thick ring, green or greenish; abdomen slender, uniform; anal segment as long as the seventh abdominal, with four slender finger-like processes; dorsal paired tuft and ventral brush normal, long; air-tube very long and

* In some specimens, a brown-black dotted shade extends from before the eye upward and backward, making the eye look to be transverse.

slender, with tufts of fine hair. Abdomen colorless or greenish, centered by the dark alimentary canal and silvery tracheal tubes; hair tufts on the sides gradually smaller posteriorly; lateral comb of the eighth abdominal segment a patch of fine spines about three rows wide.

In a spring pool, a small lake and a transient fresh-water marsh, Bellport, New York.

Culex confinis *Lynch.* (Plate X, Fig. 3.)

Head round, flat, narrowed before; eyes large, transverse; pale brownish, dark brown on the vertex; antennæ long, slender, uniform, the outer two-thirds black, tuft at the middle, small, often folded and invisible; three end hairs and a spine; mouth brushes normal. Thorax moderate, rounded, bulbous. Abdomen cylindrical, thick, the segments only slightly bulging, gradually a little smaller posteriorly. Hairs rather abundant in subequal tufts, short, scarcely any more than two-thirds the width of the thorax in length, less visible posteriorly. Air tube brown, subfusiform, about three times as long as wide with a double pecten below, normal; side combs of the eighth abdominal segment with a few teeth only, each with a dentate plate-like base; last segment longer than wide, brown ringed; double dorsal tuft rather short, the ventral brush also short but extending over nearly the whole ventral line of the segment. Anal processes slender, inconspicuous.

Found in a muddy puddle of rain water by the banks of the canal near Cabin John, Maryland.

THE LIFE-HISTORY OF URANOTÆNIA SAPPHIRINA *O. S.*

BY HARRISON G. DYAR, PH.D.

(PLATE XI, FIGS. 1–4.)

This mosquito is not common nor troublesome. The species is the only one of its genus at present known from North America. The larvæ occurred in a cold stream which was formed into a large pool by a dam and in a warm marshy pool. They occurred sparingly distributed and were not abundant. Both places were permanent bodies

of water and contained aquatic plants, *Lemna*, *Spirogyra*, etc. The water was somewhat stagnant. The locality was at Bellport, on the south shore of Long Island. The eggs form a boat-shaped mass floating on the surface of the water, much as in *Culex pungens*, but the mass is smaller, containing a less number of eggs and is less regularly elliptical, more angular. It floats less on the surface, the middle eggs being nearly half submerged. The sculpture and color of the individual eggs also are different. The newly hatched larva at once takes up the usual feeding position. This is essentially as in *Culex*, but the body is held more flatly, more parallel to the surface, yet below the surface film. Consequently, though feeding as *Culex*, the larvæ resemble *Anopheles* at a casual glance and were several times at first mistaken for them. The larvæ are fond of resting below the leaves of the *Lemna*, where they remain with the air tube penetrating the surface film and feed, often with a rotary motion of the body on the air tube as an axis. Occasionally they bend up to feed at the surface. They are not timid and often a considerable commotion of the water is necessary to send them to the bottom. The head may be partly rotated on the neck, but the habit is not so completely developed nor so frequent as in *Anopheles*, which regularly feeds with the head inverted. It has an elongate, dark brown head with a contrasting pale body, the hairs of the anterior abdominal segments markedly longer than those of the succeeding ones. Of the local species (at Bellport), it most suggests the species of *Anopheles*, as above noted. The long anterior hairs assist in the deceptive appearance. There seem to be four larval stages, the last three being essentially alike, except for the successively larger size. This is shown best by the head, as in Lepidopterous larvæ. The head gradually becomes paler, being black in the young larva and brown in the large ones. The pupa resembles that of *Culex*, but is very small and has unusually long air tubes. The species seems to breed continuously all summer, preferring warm stagnant pools of some size, containing *Spirogyra*. It did not occur in the marshes which were well filled with larvæ of *Culex sylvestris* and *C. sollicitans*.

The figures of the accompanying plate were drawn by Mrs. Perle N. Knopf from fresh specimens immediately after collection. I am indebted to Mr. D. W. Coquillett for verifying my determination of the species.

Egg. (Fig. 1.)—Erect, the micropylar end down, closely placed,

but not appressed, forming a triangular mass about 2 mm. in diameter. Egg elongate cylindrical, bluntly rounded at the large (micropylar) end, smooth without central elevation, tapering consderably to the small end; smooth, the terminal fourth roughly granular with large projecting granules. Dark brown, shading to black on the apical fourth.

Stage I. (Fig. 2.)—Head rounded elliptical, flattened, smooth, with four coarse, black setæ on the lower part of the face as in the mature larva; antennæ long, divergent, rather thick with the middle tufts very small. Black, paler above the mouth; eyes black; width about .2 mm. Thorax short, wide, flattened; abdomen slender, segments submoniliform, subequal; anal segment twice as long as wide, cylindrical, weakly chitinized, the four anal finger-shaped processes about half as long as the segment; terminal hairs in a tuft above and in a long brush below as usual. Air tube moderate, cylindrical, slightly tapering, blackish chitinized, about four times as long as thick. Hairs of the thorax long, equal; those of abdominal segments 1 and 2 similar; of segment 3 somewhat shorter and then successively shorter, those of segments 7 and 8 only about one-third as long as those of the first abdominal, but all similar hair tufts, differing only in length. Lateral combs of segment 8 distinct, but without as strong a plate as in the adult larva.

Stage II.—Head about .3 mm. wide; at first pale with a dark shade above, but soon turning black. Hairs of the thorax and first two abdominal segments long, black; the rest of the hairs short and stellate as in the mature larva.

Stage III.—Width of head about .4 mm. Other characters as in the last stage, but the head more blackish.

Stage IV. (Fig. 3.)—Head ovate, longer than wide, proportionately small, pointed before, the antennæ moderate, divergent. All brown black; width .6 mm. Thorax enlarged laterally, not annular, flattened to the size of the abdomen dorso-ventrally. Abdomen uniform, tapering a little posteriorly; last segment moderate with the usual four anal fingers. Eighth abdominal segment bearing the air tube, which is rather short, not longer than two segments, widened at the tip by four, distinct, flattened teeth, as long as the width of the tube. Lateral comb a large plate with a row of stout teeth on the posterior edge. All yellowish subopaque, the alimentary canal dark, edged by the silvery tracheal tubes. Hairs black, the thoracic ones

equal, long, those of the first two abdominal segments also long; but the rest very short and inconspicuous, stellate. Dorsal tufts and ventral brush of anal segment long.

Pupa. (Fig. 4.)—Essentially as in *Culex*. Thorax and cases forming a large elliptical mass, round which the slender, distinctly segmented abdomen curves, bearing a pair of anal paddles. Segments dorsally tufted with stellate hairs and some small tufts about the eyes and between the prothoracic air tubes. Tubes long, slender, uniform in width, not flared, but slightly bent in the middle, about twelve times as long as wide.

NOTES ON SOME SPIDERS OF WALCKENAER, KOCH, AND OTHERS.

BY NATHAN BANKS.

The descriptions of new species in Walckenaer's Insectes Aptères fall into two classes: descriptions based on specimens, and descriptions based on figures. The former class are undoubtedly valid and I intend to accept them wherever I can apply them. Descriptions of figures, however, I hold, have no claim on the naturalist. Not only are they based on figures, but the figures have never been published. Many of the descriptions are sufficient for identification, but most are not. But no matter how complete, they are not descriptions of spiders; but of figures of spiders. They rank with "hearsay evidence." I shall not use them nor list them; I shall ignore them. The species Walckenaer described from specimens are usually marked with an "M," indicating, as he states, that the specimen was in the Paris Museum. In a few cases the type was in his own collection. In the following pages I have tried to identify such species that were described from the United States. The second volume of the "Aptères" bears date of 1837, it should be as late as 1842 since there are references in it to 1841.

A number of species described by C. L. Koch in "Die Arachniden" from the United States have never been identified by later arachnologists. Most of them can be easily placed; a few are still doubtful.

I have added notes on a few other spiders, principally on some of Keyserling's Attidæ, few of which have been noticed by current writers.

SPECIES FROM WALCKENAER.

Attus morsitans *Walck.*, I, p. 432, 1837.

Walckenaer says "I have described this species after an individual of the collection of Bosc." There is no other indication that Bosc had a collection, or that Walckenaer saw it. All the other species referred to Bosc are certainly based wholly on the Bosc MSS. In the preface where Walckenaer speaks of Bosc's MSS. he does not say a word of any specimens. So I do not believe that Walckenaer ever saw the spider which he named *Attus morsitans*.

Attus milberti *Walck.*, I, p. 433, 1837.

Specimen taken by Milbert in New York; it is a synonym of *Marptusa undata* De Geer.

Attus cunctator *Walck.*, I, p. 433, 1837.

Appears also to be *Marptusa undata*.

Attus signatus *Walck.*, I, p. 434, 1837.

Type from New York. Cannot place it, unless it is a young specimen of *Phidippus rufus* Hentz.

Lycosa rabida *Walck.*, I, p. 320, 1837.

This is evidently *Lycosa scutulata* Hentz, and has priority.

Lycosa avida *Walck.*, I, p. 322, 1837.

This is plainly *Lycosa communis* Emerton; *L. sagitta* Hentz is probably the same species.

Lycosa mordax *Walck.*, I, p. 321, 1837.

Described from a specimen from New York. Probably the young of either *L. carolinensis* Hentz or of *L. nigroventris* Emerton. Abbott's figures doubtless refer to a different species, *L. lenta* Hentz.

Lycosa milberti *Walck.*, I, p. 336, 1837.

Apparently *L. carolinensis* Hentz, and has priority; type is from New York.

Lycosa sayi *Walck.*, I, p. 337, 1837.

Appears to be the same as the preceding in spite of what Walckenaer

says. The type is from New York, and there are not two species of this appearance in that vicinity.

Lycosa helluo *Walck.*, I, p. 337, 1837.

Plainly *L. nidicola* Emerton [*L. babingtoni* Blackwall]. Type is from New York. *L. riparia* Hentz is practically identical, but this southern form may prove to be separate since it is always more plainly marked. *Trochosa rafra* Koch is the same species.

Lycosa gulosa *Walck.*, I, p. 338, 1837.

Apparently the same as the preceding; locality is given as "Amer. septent."

Lycosa tarentula carolinensis *Walck.*, I, p. 285, 1837.

This is *L. carolinensis* Hentz, and has place priority over *L. milberti* and *L. sayi*. *Lycosa tarentuloides philadelphiana* Walck. is based on a figure found on a plate in the Journ. Philad. Acad. Nat. Sci., II, pl. 5. There is no description in that work.

Linyphia argyrodes *Walck.*, II, p. 282, 1842.

According to Walckenaer the description is taken from a specimen in his collection that came from either Guadeloupe or Algeria. It certainly is not the *Argyrodes trigonum* Hentz, but appears to be *Argyrodes nephilæ* Taczanowski (Horæ Soc. Ent. Ross., IX, p. 114, 1872), and has priority.

Epeira cauta *Walck.*, II, p. 35.

From New York. It is indeterminable, may be *Epeira sclopetaria*, or *E. domiciliorum* young.

Epeira benjamina *Walck.*, II, p. 42.

The type is from Martinique; it is probably not *E. domiciliorum* to which McCook refers it.

Epeira graduata *Walck.*, II, p. 48.

From New York. Appears to be *Epeira insularis* Hentz without any doubt. The male is described from Abbott's figures, and comes first, so it is the type.

Epeira circulata *Walck.*, II, p. 79.

Walckenaer says he describes it from a specimen in his collection. He records it from several Southern localities. Apparently the young of *E. balaustina* McCook.

Epeira jaspidata *Walck.*, II, p. 59.

His description is based on Abbott's figures, so is not of value, but he gives as a synonym *Epeira gigas* of Leach (Zool. Miscell., II, 132). All Leach says as regards locality is, "I suspect this gigantic Epeira to be a native of North America." Leach's description and figure are poor, but sufficient, I think, to indicate that he had a large *Epeira insularis* Hentz before him. He figures the patellæ dark only at tip; this suits *E. insularis*, but not *E. trifolium*. The shape of the body shows it not to be *E. domiciliorum*. Thus, by elimination, it must be *Epeira insularis* Hentz. The species will stand as follows:

Epeira gigas *Leach.*

E. gigas LEACH, Zool. Miscell., II, p. 132, pl. 109, 1815.

E. jaspidata WALCK., Aptères, II, p. 59, 1842.

E. insularis HENTZ, Jour. Bost. Soc. N. H., V, p. 470, 1850.

E. obesa HENTZ, Jour. Bost. Soc. N. H., V, p. 471, 1850.

E. annulipes GIEBEL, Zeitschr. f. Ges. Naturwiss., XXXIII, p. 250, 1869.

E. conspicellata (WALCK.) MCCOOK, Amer. Spid., III, p. 143, 1893.

SPECIES FROM C. L. KOCH.

Corinna amœna *Koch*, Die Arachn., IX, p. 21, 1842.

This is plainly the same as *Herpyllus ornata* Hentz, and has five years' priority.

Corinna cingulata *Koch*, Die Arachn., IX, p. 22, 1842.

This is Keyserling's *Castaneira bivittata*, and, of course, has priority.

Corinna tricolor *Koch*, Die Arachn., IX, p. 24, 1842.

Appears to be a species distinct from anything described by later authors; I have a form which agrees with it from near Washington, D. C. Koch's descriptions in this genus are very good for the time and far superior to those of Hentz; his figures are fully as good. Walckenaer (Apt., IV, p. 561) puts these species in the genus *Sparassus*.

Thomisus luctans *Koch*, Die Arachn., XII, p. 63, 1845.

Plainly *Xysticus quadrilineatus* Keys., and, of course, has priority. The type comes from Pennsylvania.

Pachygnatha tristriata *Koch* and **P. xanthostoma** *Koch.*

These are as McCook has them in his Amer. Spiders, Vol. III. The types are from Pennsylvania.

Dolomedes scapularis *Koch*, Die Arachn., XIV, p. 119, 1848.

This is Hentz's *D. sexpunctatus*, a young male; Hentz's name dates from 1845. Type of Koch is from Pennsylvania.

Dolomedes ærugineus *Koch.*

The locality is given as "Amerika," so probably not from the United States. *D. binotatus* is given as from "Nordamerika." I cannot now place it; apparently not Hentz's *D. urinator* which also has two spots on the cephalothorax.

Trochosa vafra *Koch*, Die Arachn., XIV, p. 135, 1848.

This is plainly *Lycosa nidicola* Emerton, the *L. helluo* of Walckenaer, 1837. Locality is given as "Amerika."

Mævia sulphurea *Koch*, Die Arachn., XIV, p. 71, 1848.

This is plainly the male of *Wala* (*Anoka*) *mitratus* Hentz. *M. pallida* Koch is the female of the same species, as Peckham states.

Mævia tibialis *Koch*, Die Arach., XIV, p. 78, 1848.

It is Peckham's *Admestina tibialis*, as I have previously stated, and has priority.

Mævia aurulenta *Koch*, Die Arach., XIV, p. 84, 1848.

It is the female of *Icius elegans* Hentz; *M. cristata* Koch is the male of the same species as stated by Peckham.

Mævia annulipes *Koch*, Die Arach., XIV, p. 80, 1848.

This appears to be *Astia vittata* Hentz; *M. pencillata* Koch is the dimorphic male (*Attus niger* Hentz) of the same species, as noted by Peckham.

Euophrys amabilis *Koch*, Die Arach., XIII, p. 215, 1846.

Not listed in Marx's "Catalogue." The type is from Pennsylvania; it appears to be the young of *Phidippus rufus* Hentz.

Euophrys leucophæa *Koch*, Die Arach., XIII, p. 216, 1846.

The specimen (♂) comes from Pennsylvania: it appears to be the *Salticus borealis* Blackwall, the *Hasarius hoyi* Peckham, and should now be called *Ergane leucophæa* (Koch).

Euophrys humilis *Koch*, Die Arach., XIII, p. 217, 1846.

It appears to be an immature specimen of *Phidippus rufus* Hentz, or some closely allied form.

Phidippus auctus *Koch*, Die Arach., XIII, p. 148, 1846.

This, in my opinion, is *Phidippus insolens* Hentz; Peckham has considered it identical with *Philaeus rimator* Walck.

Phidippus testaceus *Koch*, Die Arach., XIII, p. 160, 1846.

Plainly *Phidippus rufus* Hentz.

Phidippus electus *Koch*, Die Arach., XIII, p. 144, 1846.

This is *P. albomaculatus* Keyserling, and has priority.

Phidippus concinnatus *Koch*, Die Arach., XIII., p. 145, 1846.

It is *P. audax* Hentz.

Phidippus dubiosus and **P. elegans** *Koch*, Die Arach., XIII, pp. 135 and 142, 1846, are both referable to *P. audax* Hentz.

Phidippus insigniarius *Koch*, Die Arach., XIII, p. 130, 1846.

It is the male of *P. insolens* Hentz.

Phidippus paludatus *Koch*, Die Arach., XIII, p. 149, 1846.

Is a male of *P. cardinalis* Hentz.

Phidippus personatus *Koch*, Die Arach., XIII, p. 141, 1846.

It is a young *P. audax* Hentz. Possibly some species referred to *P. audax* were based on *P. miniatus* Peckham, but one cannot tell from these figures, but few of Koch's specimens came from far enough south to be the latter species.

Phidippus castrensis *Koch*, Die Arach., XIII, p. 141, 1846.

This is a male of *P. rufus* Hentz.

Phidippus togatus *Koch*, Die Arach., XIII, p. 129, 1846.

This is plainly *P. obscurus* Peckham, and has priority.

Phidippus carolinus *Koch*, Die Arach., XIII, p. 136, 1846.

I cannot now place this species, which appears to have some affinity with *P. variegatus*.

ATTIDÆ OF KEYSERLING.

Phidippus purpuratus *Keys.*, Verh. Zool.-Bot. Ges. Wien, 1883, p. 489.

The specimen from Maine must certainly be *P. audax* Hentz. The Utah specimen may be different.

Phidippus albomaculatus *Keys.*, *ibid.*, p. 491.

Appears to be *P. mystaceus* without doubt.

Phidippus ruber *Keys.*, *ibid.*, p. 493.

Peckham has considered this identical with *P. rufus* Hentz; I think it is certainly *P. cardinalis* Hentz, or the northern representative of that species.

Phidippus gracilis *Keys.*, *ibid.*, p. 495.

Appears to be *P. obscurus* Peck., which is a synonym of *P. togatus* Koch.

Phidippus clarus *Keys.*, *ibid.*, p. 497.

Belongs to the *P. rufus* group, and I think a true *P. rufus* Hentz.

Phidippus pulcherrimus *Keys.*, *ibid.*, p. 492.

This is a good species; I have it from Florida.

Phidippus bicolor *Keys.*, *ibid.*, p. 496.

This is a good species, and has been lately redescribed by Peckham under the names of *P. ardens* and *P. californicus*.

Wala albovittata *Keys.*, *ibid.*, p. 517.

This is *Icius palmarum* Hentz. The genus is, I think, distinct, so that *Anoka* Peckham, proposed for a congeneric species, becomes a synonym of *Wala* Keyserling.

OTHER SPIDERS.

Ariadne rubella *Keys.*, Amer. Spinn., Fam. Pholcid. Scytod., u. Dysderidæ, 1877, p. 229.

This name is omitted from Dr. Mark's catalogue; it is from New Orleans, and is the same as Hentz's *Ariadne bicolor*.

Singa maculata *Emerton.*

This name is preoccupied by Thorell in 1875; I propose to call it *S. truncata*.

Epeira incestifica *Keys.*

This is without doubt the same as *Epeira corticaria* Emerton. I have seen co-typical specimens.

Epeira bucardia *McCook.*

Typical specimens of this species prove to be *Cyrtophora californiensis* Keys., an Epeirid very common on the West Coast.

Larinia forata *Keys.*, Die Spinn. Amer., IV, p. 295, 1893.

Type is the same as type of *Larinia nigrofoliata* Keys. It is an *Epeira* as indicated by McCook in his plates, but not mentioned in the text.

THE LARVA OF CATOCALA ILLECTA.

By WILLIAM BEUTENMÜLLER.

Head pale violet gray, lower part yellowish; four black, vertical stripes on each lobe in front, not reaching the top; on the triangular frontal piece is also a black stripe, and one on the sides. On top are two black spots. Mouth part and antennæ yellowish, semitranslucent. First segment above, including the cervical shield orange; the latter with two black dots, closely together in front; hind edge with black spots and three small ones on each side. Body tapering at the ends, smooth, without lateral fringes, and with black and sordid white transverse bands, giving the larva a very striking appearance. Below the spiracles is a broad white stripe narrowing towards the first and last segments. On each side of the body along the subdorsum are two orange spots, the anterior pair closer together than the posterior pair. On each of the second and third segments is a broad, orange, transverse band. Along the sides is a row of orange red spots enclosing the black spiracles. On the last segment all the spots become confluent. Anal plates orange red, marked with a little black. Thoracic feet black, semitranslucent, dull amber yellow inside. Abdominal legs black outside, with a shining black corneous plate on each; pinkish inside. Underside of body with the transverse lines less defined; the light ones pinkish. Anal legs orange. Length, 50 mm.

Food-plant: Honey locust (*Gleditschia triacanthos*).

The larva in the previous stage is very similar to the last. Received from Mr. O. C. Poling, Quincy, Illinois.

NOTE ON SESIA SIGMOIDEA.

By Louis H. Joutel.

The history and food-habits of *Sesia sigmoidea* seem to be imperfectly understood as Mr. Beutenmüller in his monograph of the Sesiidæ says of this species, "said to be found on willow, but we have no definite knowledge of its breeding in this plant," so that these few notes may be of interest.

Having need of some willow leaves I brought home a few plants of *Salix discolor* and planted them in the garden. They were infested in part by the imported *Cryptorhynchus lapathi* which I killed. Noticing some time after that a few of the branches were dying they were examined for more weevils, but instead a *Sesia* larva was found at work near the ground. A closer examination of the plants revealed several more larvæ. These were left at work and examined from time to time to note progress. Late in August the larvæ pupated and shortly after produced *Sesia sigmoidea*.

LARVA OF ISOCHÆTES BEUTENMÜLLERI ON STATEN ISLAND, N. Y.

By Louis H. Joutel.

This beautiful larva was rather strangely discovered on September 1, 1901, while collecting with Mr. Wm. T. Davis on Staten Island. We sat down by the side of a wood path to eat lunch, and while complaining of the lack of insects my attention was attracted to a bluish patch on the ground in front of me. While looking at it I thought that if I were in Florida or Washington I would take it (the patch) for a larva of *I. beutenmülleri* of which Dr. Dyar had shown me examples. Finishing my lunch I decided to examine it, and was surprised to find that it was the cast-off horns of that species. We immediately looked overhead and discovered several larvæ still feeding on the *Quercus palustris* under which we were sitting.

The recorded observations of this species other than the above are as follows: A single female (the type) taken by Wm. Beutenmüller in Florida in 1887. Several larvæ found by Dr. Dyar near Washington, D. C., in 1898 from which he raised a male.

A SELF-DECORATING GEOMETRID LARVA.

BY LOUIS H. JOUTEL.

While collecting beetles near Jamaica, N. Y., I noticed a little mass of sand and dirt moving about. Not knowing what it could be I picked it up, and in cleaning it I found a small Geometrid larva; not suspecting that the larva had decorated itself, but that it had been enmeshed by a spider, I put the larva in a paper box, and was surprised on opening the same at night to find that it had bitten off small pieces of paper and fastened them to its body in place of the sand I had taken off. I then took off most of the paper shreds and placed it in a tin with leaves and the next morning it had a fine coat of green shreds on its back. Since then it has always added to its ornaments as they were brushed off or lost. This habit is evidently a means of protection and an excellent one at that, as no one would ever suppose that the small mass of refuse contained a caterpillar.

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A NEW GENUS OF SPHINGICAMPID MOTHS ALLIED TO BUNÆA.

BY A. S. PACKARD.

This genus is proposed for *Bunæa phædusa* (Drury) and may be named *Lobobunæa* in allusion to the slight lobe on the inner angle of the hind wings. This well known species inhabits western and central Africa. What other species of *Bunæa* should be associated with it could not be stated until their venation has been examined. Unfortunately I have only a male for examination, but the female is represented as very similar in form and markings. I regard *Bunæa alcynoe* (Stoll) (*B. caffra* Huebner) as the type of *Bunæa*.

Head wider than in *Bunæa*. Antennæ not so wide as in *Bunæa*, and the end is subfiliform, with very short pectinations for a distance nearly equal to width of the entire antenna; joints short and thick, two pairs of pectinations to a joint and those of the distal pair are as long as the basal ones. Palpi larger and longer than in *Bunæa* and the third joint reaches to the front, passing slightly beyond it. Thorax with a definite collar, the prothoracic squamation being more distinct than usual. Forelegs long and stout, tibia of ♂ with a naked, probably odoriferous, sack, like that present in certain Deltoid moths, on the under side two thirds as long as the tibia itself, and the scales separate from it, leaving it naked and easily seen from beneath.

Forewings large and broad, costa straight on the basal half, but beyond much curved, so that the wing is falcate; outer edge more deeply excavated than in *Bunæa*. Hind wings much more rounded at the apex and inner edge *distinctly produced into a rounded lobe*, which projects slightly inward. The hind wings do not reach the end of the abdomen, having nearly the same relative length as in *Bunæa*.

Venation: The present genus differs remarkably from *Bunæa* in Vein II_1 (first subcostal), arising opposite the middle of the discal cell, and within the origin of the common stalk of veins III_1, III_2 (or subcostal branches 5 and 6). In the hind wings the discal cell is shorter and wider than in *Bunæa*, and the hind edge of the wing is much more elongated, as also vein VII. There are minor differences in the venation, which can only be shown by figures.

Markings: A very small half round transparent discal spot on the forewings; on those of the hinder pair a very large ocellus, which is nearly opake, and larger than in *Bunæa*. The discal spots of both wings are represented beneath by a sort of rosette.

THE LARVA OF HOMOPTERA EDUSA.

By William Beutenmüller.

Head rounded, flat and concave in front; pinkish and thickly covered with whitish markings in form of irregular spots and stripes which are contiguous; on each side in front is a brown black, irregular vertical band, on which are placed clusters of minute whitish dots on top. Body color whitish, thickly covered with black and fleshy brown irrorations, giving it a dark gray appearance. Along each side of the back is a broad, irregular shade line, and another on each side along the spiracles; a bright orange mark above, on the junctions of the fourth and fifth segment, and a smaller one on the fifth and sixth segments. The eleventh segment is elevated, with two blunt tubercular-like processes, edged with pale ochreous. Tubercles small. Underside sordid white with pinkish dots and a black patch on each segment from the first to ninth, thence continued as a broad band to the last segment. Thoracic feet translucent white, marked with pink. Abdominal legs translucent greenish white, dotted with pinkish. The body gradually becomes wider towards the last segments. Length, 55 mm.

Food plant: Willow.

In general appearance this larva looks very much like that of a *Catocala* and may be readily known by the orange patches on the junctions of the fourth, fifth, and fifth and sixth segments.

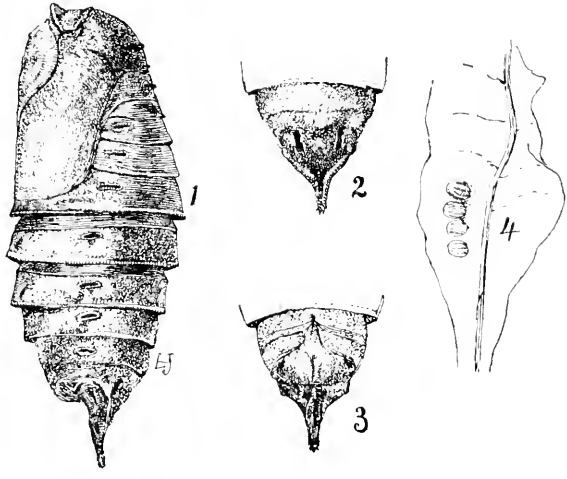
NOTES ON THE EARLIER STAGES OF LOBOBUNÆA PHÆDUSA.

BY WILLIAM BEUTENMÜLLER.

(PLATE XII.)

In connection with the preceding article on page 191 by Dr. A. S. Packard the following brief notes on the egg, larva and pupa of *Lobobunæa phædusa* may be of interest:

The egg (Fig. 4) is finely and regularly reticulated, and measures 3 mm. in length and 2.25 mm. in width. The color is dirty white and banded longitudinally with brown. Laid early in May, in clusters on the under surface of a leaf. The fully grown larva (Fig. 5) is robust with the last segments somewhat smaller than the anterior. In life the color is probably green or yellowish green with the margins of

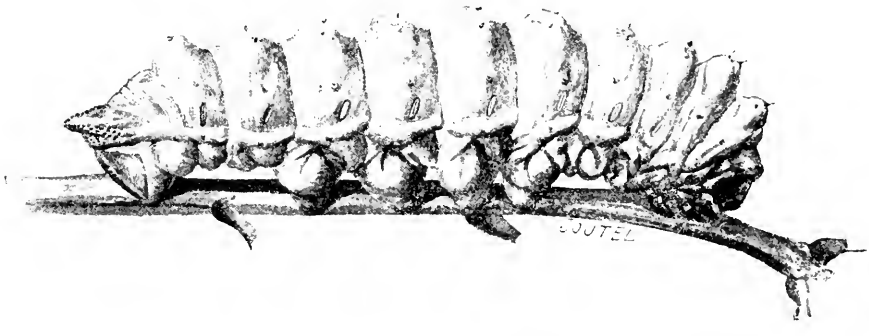


Lobobunæa phædusa. 1, pupa; 2, last segment showing two openings; 3, underside of last segment and anal process; 4, eggs.

the anal plates and cervical shield orange. The dorsal parts of each segment, except the last, are prominently elevated with a depression on each elevation. Along the sides below the spiracles is a prominent fold, broken at the junctions of the segments. The spiracles are large, and the tubercles are very short and inconspicuous. In length it measures about 95 mm.

The pupa (Fig. 1) is large and robust, with a curved ridge on the anterior part of the thorax. The anal process (Fig. 3) is long, compressed at the base above and below. Anal segment has two oblong apertures above (Fig. 2).

The imago (Plate XII) measures about 7.75 inches across the fore wings. It is of a gray-brown color with the black eye-like spot on the hind wing surrounded with a brick red and a pinkish white ring. On the fore wing is a small glass-like mark and another in the black eye-spot on the hind wings.



5. Larva of *Lobobunea phædusa*.

Specimens of the eggs, larva (alcoholic), pupa-cases and imagos are in the collection of the American Museum of Natural History. These were donated by Mr. William Schaus. The figures were kindly drawn by Mr. L. H. Joutel.

HABITS OF EUDÆMONIA BRACHYURA.

By William Beutenmüller.

In a letter from Mr. A. J. Clements, Sierra Leone, Africa, to Mr. William Schaus, the following notes on the habits of *Eudæmonia brachyura* were taken. "The food-plant is a tree which does not seem to attain any great size, but this may be for lack of opportunity, as the bush on which it occurs has been of recent growth. It is *Dialium guineense* Willd., belonging to the Leguminosæ. The only near ally likely to be available as a food plant is *Ceratonea siliqica* of the Mediterranean coast. The larvæ feed gregariously and are of a

brownish green with black spines. The eggs are laid on the young green stems at the top of the tree, and the pupæ are found under the food-tree, lying on the surface beneath leaves. The imago emerges in the beginning of March, this being evidently their season; since then a few have emerged at intervals, but most of them dwarfed. A very large percentage are stung by an ichneumon."

Notes on the larvæ of this species and *E. argiphontes*, and figures of the moths of both species, were published by me in Volume V, p. 166, and plates XI and XII of this JOURNAL.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF JUNE 4, 1901.

Held at the American Museum of Natural History. President Beutenmüller presiding. Seven members and one visitor present.

Mr. Beutenmüller exhibited a number of *Catocala* larvæ and called attention to some structural characters by means of which the larvæ may be divided into three groups, viz.: 1. With a process or elevation on the 8th segment. 2. Without a process or elevation on the 8th segment. To the first group belongs *C. cara*, *neogama*, *amatrix*, *grynea*, *ultronia*, *paleogama*, *innubens*, *parta*, etc., and to the second group, *C. consors*, *baglia*, *piatrix*, *illecta*, *mulierecula* and *antimympha*. He further stated that the second group could again be divided into two groups, with filaments or without filaments, along the sides of the body. To the latter group belong, *C. amica*, *judith* and *habilis*. He also states that the shapes and markings of the heads of the different species are very different, and afford good specific characters. In raising larvæ Mr. Beutenmüller said that by wrapping a wet sponge, cotton or rags around the stems of the food-plants the same could be kept fresh for a greater length of time and was preferable to the custom of putting the stems in wet sand or water, in the latter case the larvæ often get drowned, especially the night-feeding *Catocala* larvæ which leave their food-plants at dawn, to seek a hiding place at the base of the plant.

Mr. Schaeffer exhibited a small collection of beetles collected by Mr. Seifert in Florida.

Mr. Watson showed some fresh specimens of *Thecla damon*, and stated that the species was double brooded, the first brood appearing in April and the second in July. He said that the markings on the underside of the hind wings of the second brood were paler than those of the first brood. Mr. Watson also exhibited some larvæ of *Lycæna pseudargiolus* and *Melitæa phæton* and said that the latter feed very readily on *Plantago* as well as other plants. Mr. Beutenmüller remarked that he had raised this species on fern.

Mr. Barber spoke on a scheme for recording exact localities of captures of insects. After discussion the meeting adjourned until October 1st.

MEETING OF OCTOBER 1, 1901.

Held at the American Museum of Natural History. Vice-President Kearfott in the chair. Eight members and two visitors present.

Mr. Frank W. Holms was elected an active member of the Society.

The matter relating to the advisability of holding one meeting a month was discussed, but no definite action was taken.

Mr. Joutel recorded the capture of the caterpillars of *Isochætes beutenmülleri* on Staten Island, N. Y. (see ante, p. 190).

Mr. Schaeffer exhibited specimens of *Xylophilus melsheimeri*, *piceus*, taken by him in the Highlands, N. J. He said that these species are generally rare in collections, which is due to the peculiar habits of the same. When beaten from branches into the umbrella they are difficult to detect amongst the rubbish. They remain motionless for a few seconds, and suddenly take flight. *X. subfasciatus* and *fasciatus*, which were also taken, are comparatiuely slow and can be readily seen and bottled. *X. melsheimeri* was taken only on hickory, *X. piceus* on oak, *X. fasciatus* and *subfasciatus* on dogwood. The last two species are common and always found in company with the Staphylinid, *Palaminus testaceus*. He also showed a specimen of *Cafius sericeus* taken at Highlands, N. J., this being the first record of its occurrence in New Jersey. The very rare *Psammæcus desjardinsi*, known from the Madeira Islands and in North America from Oregon to California, was taken by him in his home, resting on a piece of white cloth. A collection of local Cioidæ was also exhibited by Mr. Schaeffer. After discussion, adjournment.

MEETING OF OCTOBER 15, 1901.

Held at the American Museum of Natural History. President Beutenmüller in the chair. Eight members and four visitors present.

A letter from Mr. Joseph Kittel was read, inviting the members of the Society to visit his property, the "Herbert Domain," in Tennessee, which he thought would prove to be a good collecting ground. On motion, a vote of thanks was extended to Mr. Kittel.

The advisabillty of holding one meeting a month was again discussed, but all the members present were in favor of holding two meetings.

Mr. Beutenmüller spoke on some *Catocala* larvæ which he raised during the past summer. He stated that it was rather impossible to separate the larvæ of *C. muliercula* and *C. badia*, though the imagos are very distinct. He further stated that the larvæ of *C. badia*, *muliercula*, *antinympha* and *consors* were day feeders, which is contrary to the habits of many of the other species of the genus, which feed at night. Colored drawings of a number of species, as well as a collection of Catocalas, from Dr. William Barnes, were exhibited.

Mr. Joutel spoke on a Geometrid caterpillar, which has the peculiar habit of covering itself with grains of sand or the like, and suggest that this habit may be a means of protection for the larva (see ante, p. 191).

Mr. Schaeffer recorded the capture of the larva of *Ceratomia catalpa* at Lakehurst, N. J. Mr. Beutenmüller called attention to the social habits of the larvæ of this species, and stated that it would undoubtedly before long extend its range northward. Dr. Van Dyke said that the larvæ of *Philampelius vitis* in California had similar habits to *catalpa*.

Mr. Schaeffer exhibited a specimen of *Matisfa brunnea* taken in Lakehurst, N. J., and a specimen of *Trachykele blondeli* from Fresno Co., Cal.

Mr. Lyon spoke on the larva of *Selandria caryæ*, which is covered with long filaments of a waxy secretion.

MEETING OF NOVEMBER 19, 1901.

Held at the American Museum of Natural History.

Mr. William Beutenmüller, president, in the chair, and fifteen members and four visitors present.

The secretary being absent at the opening of the meeting, on motion of Mr. Joutel duly seconded Mr. Weeks was appointed secretary *pro tem.*

The minutes of the last meeting were read and approved. The secretary read the name of Mr. J. R. de la Torre Bueno of No. 437, Central Park West, proposed by Mr. Beutenmüller as an active member.

Mr. Joutel proposed Dr. James D. Needham, of Lake Forest University, Lake Forest, Illinois, as a corresponding secretary.

A letter from Dr. N. L. Britton, secretary of the council of the Scientific Alliance of New York, addressed to the secretary of the Society was read giving notice that in pursuance of article 7 of the constitution a total assessment of $200 had been levied upon all the societies and that the amount apportioned to the Entomological Society was $7, payable to Dr. E. G. Love, treasurer of the Council, and that payment might be made in installments, if preferable, of $3.50, one before Jan. 1, 1902, and the other before April 1, 1902.

On motion of Mr. Weeks, duly seconded, the treasurer was authorized to pay the sum of $7, the amount of the assessment due from the Society.

Mr. Beutenmüller reported that he had received a letter from Mrs. Slosson which was accompanied by specimens of lepidoptera for disposal at the annual auction sale to be held by the Society, and on motion of Mr. Weeks, the secretary was directed to express to Mrs. Slosson the thanks of the Society therefor.

Mr. Beutenmüller stated that at the next meeting he would have ready for inspection by the members the various publications received as exchanges and that it would be necessary to appoint a committee to take charge of the same and also of such as might be received hereafter.

Dr. Edwin J. Van Dyke, of San Francisco, California, then spoke upon the subject of the evening, "Observations upon the Faunal Regions of California from the standpoint of a Coleopterist." California is some 800 miles in length by 200 in width and is naturally divided longitudinally into three sections by the Coast Range and the Sierra Nevadas. The latter have an altitude of some 6,000 to 15,000 feet and form a boundary between the arid lands of the eastern portion and the greater bulk of the two western portions. These arid lands widen at the south by reason of the western trend of the Sierras and here include the valleys of Mono, Owen's and Death and portions of the Mojave and Colorado deserts. The Coast Range practically ends at Santa Barbara, although the islands directly south may have originally formed a continuation before submergence of the intervening territory. The altitude of this range varies from 1,000 to 10,000 feet, the latter height chiefly obtaining in the north. This range constitutes the dividing line between the narrow belt of coast

and this great valley region, which is enclosed at both the northern and southern ends by transverse ranges. Through breaks in the Coast Range, flow two large rivers into San Francisco Bay.

Chronologically, the Sierras are older than the Rocky Mountains, California existing when the Great Basin region was a vast inland sea. It was also much less subjected to glacial influences, thus permitting the survival of much of the ancient fauna. Contignity to the ocean of a land of such great variation in topography naturally causes much diversity of climate. Four distinct climatic areas are recognized, viz.: the coast, interior valley, Sierra or higher mountain, and desert or semi-desert. The climate of the coast is tempered by the Japan current, and is cool and even; that of the valley (600 miles in length) is warm in summer, but without rain, and the reverse in winter; that of the Sierra mild and dry in summer with little rain, but severe in winter; and that of the desert intensely hot and dry in summer, and dry and mild or cold in winter, varying with the altitude. We find Dr. Merriam's theory that there are traces of two distinct insect faunas, one derived from the Boreal and the other from the Sonoran regions corroborated by the fact that among the coleoptera identical or affiliated forms and species indigenous to the Boreal region occur more frequently as we go northward with like result as regards the Sonoran as we go southward, representatives of both faunas overlapping. Contributions from the Alaskan Maritime region also prevail along the coast belt, certain species even occurring as far south as San Francisco, but in no case east of the Coast Range. In the northern elevated section between and including the Coast Range and the Sierras are found representatives of the so-called Canadian fauna and these often follow the ranges even to Lower California. It is probable that among the highest Sierras could be found examples or affiliated forms of the Hudsonian, timber line and Arctic faunas. The fauna of that portion of the Colorado desert within the State lying east of the San Bernardino Mountains and including the counties of San Diego, San Bernardino and the southern part of Inyo is distinctly Sonoran.

Immediately north lies the subregion of the Sonoran (so termed by Dr. Merriam) also known as the subregion of the Great Basin, including the larger part of Inyo, all of Mono, the larger portions of Modoc and Lassen and a small part of Plumas. Here *Acmæodera*, *Asida* and *Eleodes* abound.

The California faunal region proper includes practically all the lowlands of the State, the fertile valleys of southern California and the extensive valleys of the San Joaquin and Sacramento, the lesser valleys along the coast and the foothills bordering them. The fauna prevailing throughout these portions are so affiliated with Sonoran forms, particularly toward the south as to warrant the designation of such portions as Sonoran sub-regions, and by the extension of these forms into the foothills where they have interbred with Boreal types through a series of ages genera characteristic of both parent regions have been evolved. *Omus*, *Brennus* (a cychrid subgenus), *Metrius*, *Promecognathus*, *Pleocoma* and *Rosalia* with others while more or less related to anjacent northern forms probably developed from a rich circumpolar fauna under the influence of adaptation to environment. *Omus* occurs rather generally throughout the state, and *Metrius* and *Promecognathus* similarly but less frequently in the moist timber belt of the Coast Range, although an Alpine variety of *Metrius* is found in the Sierras, and *Brennus* is confined to the coast. Many other examples

of restricted location could be given. In earlier periods California was more isolated particularly from the Sonoran region and northern influences prevailed. Then such genera as *Omus* and *Plocoma* became first established. Subsequently a few southern forms such as *Coniontis* and its congeners gained access. These constituted the old California fauna, but when the southern isolation ceased, followed by the invasion of Sonoran forms, a new or later fauna was developed. This theory is partially supported by the fact that in the islands off the coast and in certain still isolated areas are faunas which are largely *sui generis*, and typical of the old California fauna above described. A better knowledge of the hitherto unexplored adjacent regions is required however before a satisfactory determination of the origin of species can be reached. Enough has been said however to demonstrate of how little value is the mere designation of material as Californian-North American would be nearly as definite.

On motion of Dr. Love, duly seconded a vote of thanks was extended to Dr. Van Dyke for his instructive and entertaining remarks. Dr. Van Dyke, in response to questions from the members, gave much valuable information relating to localities, the distribution and character of the native vegetation, and the occurrence and methods of capture of lepidoptera and coleoptera derived from his extensive experience in collecting in nearly every county of the State.

On motion the meeting then adjourned.

MEETING OF DECEMBER 3, 1901.

Held at the American Museum of Natural History, New York.

President Beutenmüller, in the chair. Eight members and two visitors present.

The minutes of the last meeting read and approved.

Mr. J. N. de la Torre Bueno was elected an active member of the Society.

Dr. E. C. Van Dyke, Oakland, Calif., and Mr. H. C. Fall, Pasadena, Calif., were proposed for corresponding membership by Mr. Schaeffer.

The resignation of Miss Valpey was read and accepted.

After discussion it was decided that an auction sale of insects be held on the second meeting of the Society in January, 1902.

The publications received in exchange for the Journal were exhibited and the advisability of appointing a librarian was discussed, but no definite action was taken.

Mr. Seifert exhibited a beautiful series of *Olene leucophaea* which he raised from the eggs collected by him in Florida. Mr. Schaeffer showed a series of ten species of *Oxyporus* and stated that he had on some occasion expressed his doubts, as to the validity of *O. fasciatus*, taking it to be a color variety of *O. vittatus*, but finding a number of specimens amongst the extensive materials collected by Mr. Beutenmüller, in the Black Mts., N. C., which agree perfectly with the description of *O. vittatus*; he said that we may have to restore Gravenhorst's name *cinctus* to the form, with dark head, thorax and abdomen, of which *O. fasciatus* seems to be a variety. He also exhibited two species of *Derobrachus forreri*, one without locality and one from the Hy. Edwards collection from Lower California, as *D. geminatus*. It is very distinct from *geminatus*, by the much longer antennæ, with the joints comparatively more slender and longer, the very approximate eyes, the narrower neck, the spinose apex of the elytra and other characters.

Mr. Schaeffer also exhibited a new species of the Scymenid genus *Lophioderes*, collected by Mr. Beutenmüller in North Carolina and hitherto only known from the Pacific Coast.

Mr Watson recorded the abundance of *Catopsilia eubule* in New York City, during the past season.

Mr. Beutenmüller announced the death of the well-known lepidopterist, Dr. Herman Strecker, of Reading, Pa.

After discussion, adjournment.

HERMAN STRECKER, PH.D.

It is with the deepest feelings of sorrow that we have to announce the death of the great veteran lepidopterist, Herman Strecker, Ph.D., at his home in Reading, Pa., at 7:40 a. m., November 30, 1901. He was stricken with apoplexy shortly after leaving his place of business on November 29th and lingered unconscious until he passed into the great beyond.

Dr. Strecker was born in Philadelphia, Pa., March 24, 1836, and received his early education in the public schools of Reading, Pa., which was his home from the time he was eleven years old until his death. He was a sculptor by profession and to this he devoted most of his days but as a recreation he spent his nights and holidays in the collection of lepidoptera. His collection is the largest, most valuable and in every way the most remarkable private collection of lepidoptera on the American continent. Dr. Strecker described several hundred of new species the types of which are all in his collection as well as many types of species described by other authors. His book on "Lepidoptera, Rhopaloceres and Heteroceres, Indigenous and Exotic, 1872–1877," was published under difficulties. It was illustrated with fifteen colored plates. He saved enough to buy a lithographic stone and then drew and engraved upon it a group of butterflies or moths. This was sent to Philadelphia and the plates printed from it. In this way the stone travelled to and from Philadelphia until the plates were all finished and the book issued. Fifteen parts and four supplements have been published of this work. In consideration of his scientific knowledge Franklin and Marshall College, some years ago, conferred upon him the degree of Doctor of Philosophy. He leaves a widow, son and daughter.

WM. BEUTENMÜLLER.

Index to Volume IX.

ERRATA.

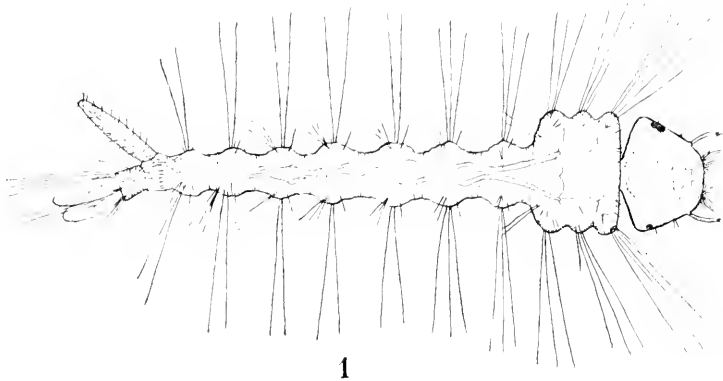
Page 142, line 14 from below: Transfer "*Bigot*" to follow "Paranthomyia."

Page 144, line 19: Transfer "Melanochelia Rond., 1866; *surda*," to replace "ZETT.," moving the latter to the end of the line.

Page 145, line 12 from below: For Paracortophila, read Parachortophila.

Page 146: Transfer the first three lines to follow line 5 from below on the preceding page.

HERMAN STRECKER, Ph.D.



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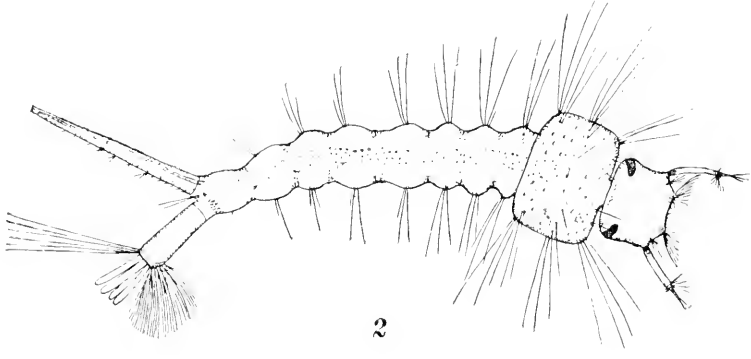

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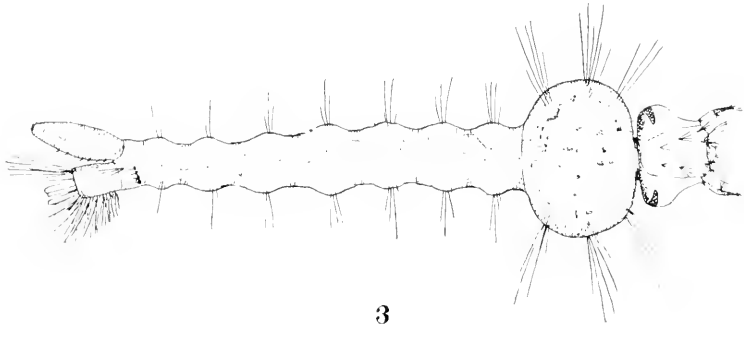
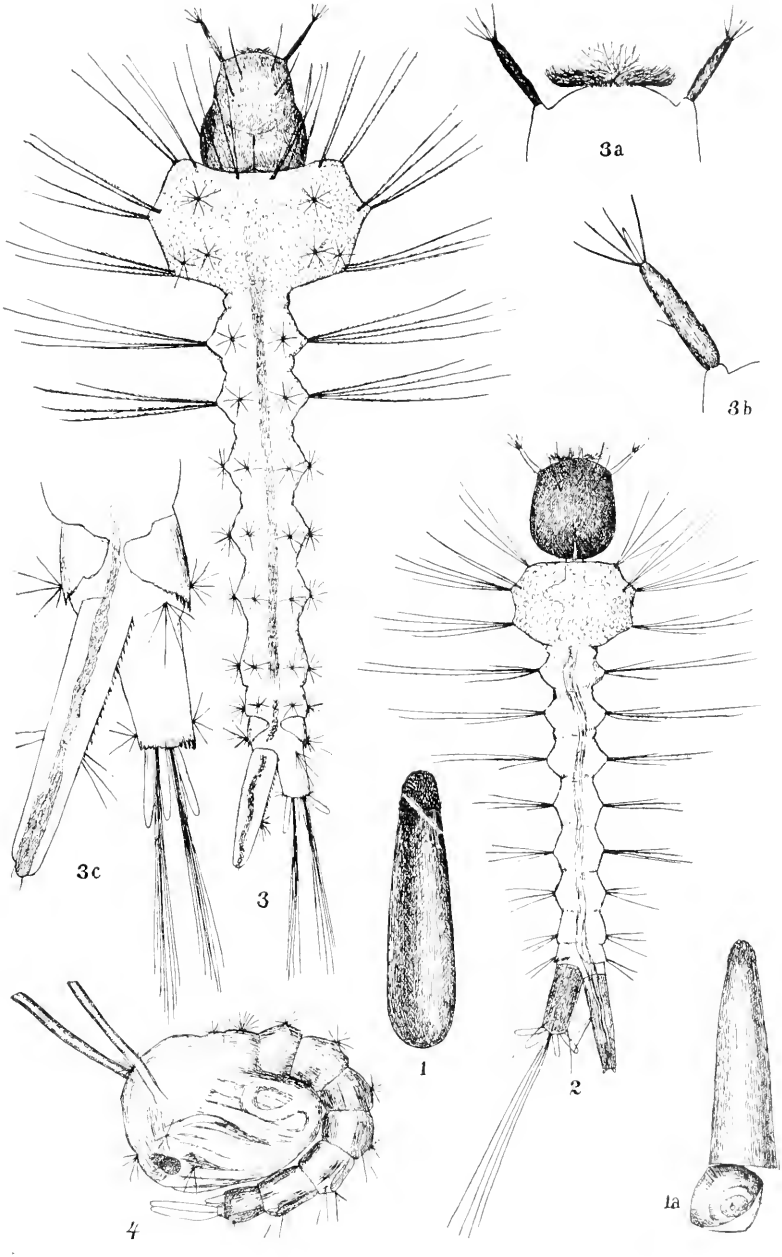
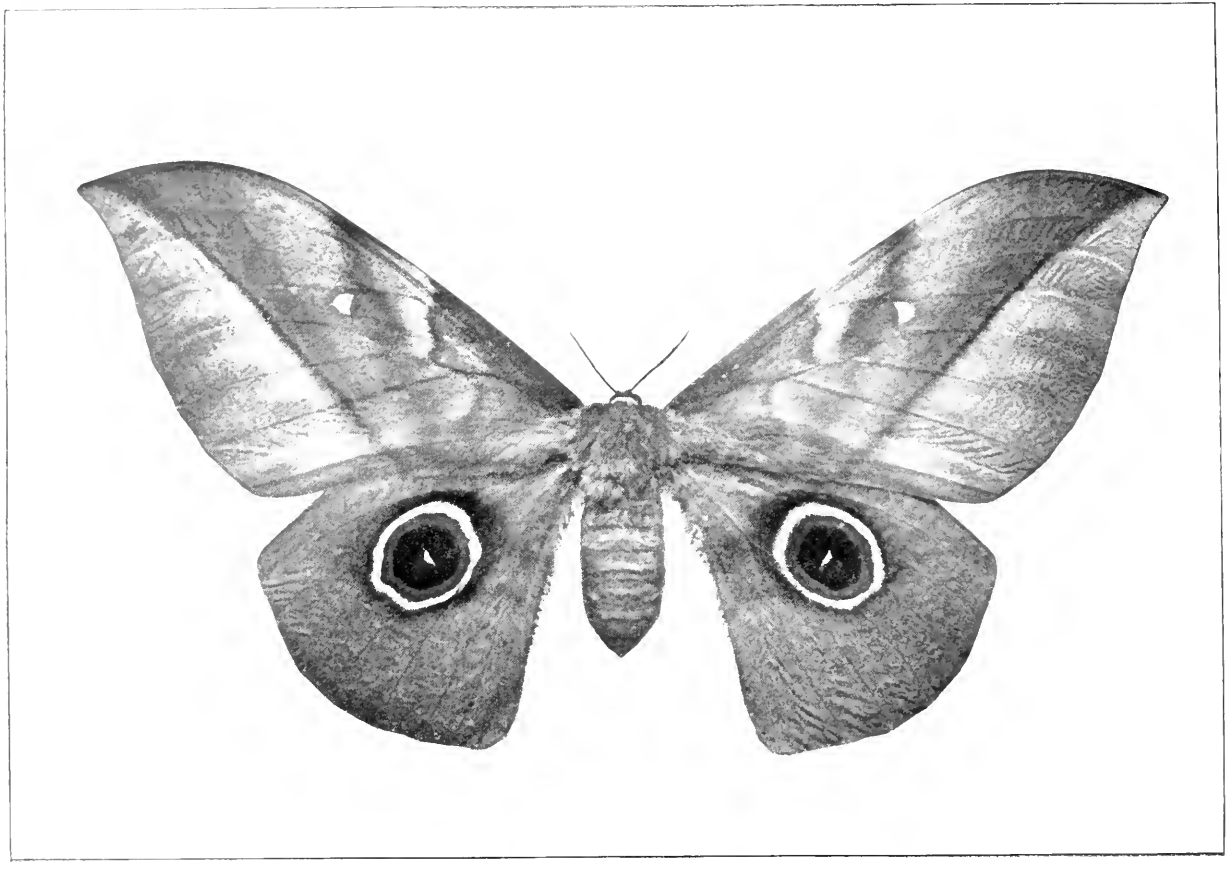


3

Three Mosquitoe Larvæ.



Life-History of Uranotænia sapphirina.



Lobobunæa phædusa.

(Reduced.)