



JOURNAL

OF THE

NEW YORK

ENTOMOLOGICAL SOCIETY.

Devoted to Entomology in General.

Volume III, 1895.

EDITED BY WM. BEUTENMÜLLER.

NEW YORK:
PUBLISHED FOR THE SOCIETY
QUARTERLY.

1895.



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591 -

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JOURNAL
OF THE
New York Entomological Society.

Vol. III.

MARCH, 1895.

No. 1.

NOTES ON THE PSEUDOSCORPIONIDA.

By NATHAN BANKS.

Mr. H. G. Hubbard has lately sent me a large number of interesting Pseudoscorpions from various parts of the United States. Several new species are contained in the collection, which also affords new localities for many known forms. I hope sometime in the future to make a somewhat elaborate work on this interesting group of Arachnida, but I am aware that there are many new forms yet to be discovered in the arid and in the mountainous regions of the west. Therefore I would only give at present a revision of all the forms known to me.

The Pseudoscorpions form a very strongly circumscribed group. Of the general structure of the scorpions, they differ from them in several ways. They have no post-abdomen; there is no longitudinal furrow on the cephalothorax, while transverse ones are frequently present; there is no median pair of eyes; there are no pectines, which perhaps may find their homologue in the spinning organs; and there are some minor differences in the mandibles, legs, etc.

Prof. Luigi Balzan has (in Ann. Soc. Ent. France, 1891) given a new and elaborate classification of the Pseudoscorpions based principally on the South American forms. The principal new point introduced by him, is the value he assigns to the serrula of the mandibles. This, I think, he has much over-estimated; and would put more faith in the sutures of the cephalothorax and in the longitudinal division of the abdominal scutæ. The two main divisions do not differ much in their composition; but *Olpium* and *Atemnius*, which according to Balzan are placed with the Cheliferidæ, I would place in the Obisiidæ. Moreover I have tried to bring the classification into the style of that usually adopted by the best entomologists.

I would consider these Arachnids as representing an order — Pseudoscorpionida; tabulating the genera and other groups as follows:

1	{	Cephalothorax with a transverse median suture; abdominal scute divided; mandibles small, with a stylet, the serrula attached above to the mobile finger; cephalothorax rounded in front; clavate hairs frequently present. (CHELIFERID.E) 2
		No transverse suture; abdominal scute entire; no clavate hairs; cephalothorax usually truncate in front; mandibles usually large; the stylet often lacking, and the serrula usually detached from the mobile finger (OBISIID.E) 4
2	{	Four eyes; cephalothorax narrowed quite suddenly in front of eyes; no trochantins to the anterior pairs of legs. . . (GARYPIN.E) Giarypus.
		Two or no eyes; cephalothorax evenly rounded in front; trochantins to anterior legs. (CHELIFERIN.E) 3
3	{	Femur of palpus not pedicellate, gradually and slightly enlarged from base to tip; palpi very long and slender; two distinct eyes (except cave-form) Chelifer.
		Femur of palpus distinctly pedicellate, suddenly enlarged near base; palpi short and stout; eyes usually wanting Chelanops.
4	{	Mandibles with a stylet; mandibles small, cephalothorax rounded in front; the serrula attached above (OLPHIN.E) 5
		Stylet often absent; mandibles large, serrula detached above; cephalothorax truncate in front (OBISIID.E) 6
5	{	Four distinct eyes. Olpium.
		Two or no eyes. Atemnus.
6	{	Mandibles with a stylet (IDEOBISINI) 7
		No stylet present. 8
7	{	Four eyes Ideobisium.
		Two eyes Ideoroncus.
8	{	Tibia of palpus chalice-like (CHTHONINI) 10
		Tibia normal (OBISINI) 9
9	{	Four eyes; (except cave forms); palpi short and stout. Obisium.
		No eyes; palpi very long and slender. Blothrus.
10	{	Four eyes; (except cave forms); palpi long. Chthonius.
		Two eyes; palpi shorter. Lechyti.

Family CHELIFERID.E.

Sub-family CHELIFERIN.E.

Chelifer *Geoff.* Our species may be separated by the following key:

1	{	No eyes, cave form, tibia swollen on the inner side. mirabilis.
		Two distinct eyes 2
2	{	Tibia a little convex on inner side, fingers a little shorter than hand, western species scabrisculus.
		Tibia not convex on inner side, fingers as long as hand. 3

3	{	Hand much darker than the other part of the palpus.....	muricatus.
	{	Palpi unicolorous.....	4
	{	Tibia longer than cephalothorax plus mandibles, on outer side at base distinctly concave.....	floridanus.
4	{	Tibia not longer than cephalothorax plus mandibles, outer side not concave.....	5
	{	Body red-brown; hand quite thick; larger granules on the cephalothorax.....	cancroides.
5	{	Body pale yellowish; hand more slender; no larger granules on the cephalothorax.....	biseriatum.

Chelifer cancroides Linn.—Faun. Suec.

This common species probably occurs all over the United States. I have it from Ithaca, N. Y.; Sea Cliff, L. I.; Washington, D. C.; Ohio (C. M. Weed); Ft. Collins, Colo. (Baker); Missouri (G. Van Ingen); Grosse Isle, Detroit River, (Hubbard); Lake Tahoe, Calif., (Hubbard); and Brazos Co., Texas.

Chelifer biseriatum, sp. nov.

Length, 2.2 mm. Pale brownish, palpi and anterior part of cephalothorax darker, a black spot at base of cephalothorax; abdomen with two series of brown spots. Cephalothorax as usual; sutures not very distinct, the anterior one curved forward, the posterior one nearly straight; eyes not prominent; no larger granules in either sex; palpi slender; trochanters as usual; femur longer than cephalothorax, gradually enlarged from base to tip; tibia shorter, no thicker and pedicellate, enlarged from near base to tip; hand shorter than tibia, more than twice as long as broad, tapering to the fingers, which are as long as the hand and much curved. Hard parts granulate and with many clavate hairs.

Many adult ♀ and ♂, the former with egg-bunches, beaten from palmetto-fans; Lake Poinsett, Florida, (H. G. Hubbard). Differs from *C. cancroides* in having no larger granules, in the more slender hand, more thickly clothed with clavate hairs, and in the pale color and markings.

Chelifer floridanus Bks.—Can. Entom., Aug., 1891.

Southern Florida, (E. A. Schwarz).

Chelifer muricatus Say.—Comp. Writings, Leconte Ed.

This easily recognized species tho' not common anywhere, appears to be quite widely distributed in the eastern United States. I have it from Ithaca, N. Y.; Sea Cliff, L. I.; Fredricksburg, Va., (Richardson); Salineville, Ohio, (A. D. MacGillivray); Bee Spring, Ky., (Hubbard); St. Lucie, Fla., and Sand Point, Fla., (Hubbard); Citrus Co., Fla., (C. M. Weed); and Punta Gorda, Fla., (Mrs. A. T. Slosson).

Chelifer scabrisculus *Simon*.—Ann. Soc. Ent. Fr., 1878.

Ch. degeneratus BALZAN, Ann. Soc. Ent. Fr., 1891.

Described from Southern California; I have it from S. Calif. one specimen (Cooper Curtice); Lake Tahoe, Calif., one specimen (Hubbard); Hood's River, Oreg., one specimen (Hubbard); and two specimens under stones, Utah Lake, Utah, (Hubbard), are reddish and have slightly longer fingers, but are hardly different.

Chelifer mirabilis, sp. nov.

Length, 2.6 mm. Cephalothorax and palpi red-brown; abdomen and legs brownish. Cephalothorax rounded, and slightly narrowed near anterior margin; no eyes; sutures distinct; surface finely granulate, no larger granules. Abdomen quite broad, about twice as long as the cephalothorax. Palpi slender; trochanter pedicellate, tubercled above near tip; femur slightly longer than cephalothorax, gradually enlarged from base to near tip, inner margin straight, outer slightly convex; tibia three-fourths as long, and slightly broader than femur, quite long pedicellate, outer margin slightly and evenly convex; inner margin convex at base, then nearly straight; hand about as long as tibia, slightly convex on outer margin, quite strongly and evenly on the inner margin, tapering to the fingers, which are about as long as the hand and quite strongly curved. Short clavate hairs on whole of palpi except fingers; similar ones on rest of body.

Three specimens, Indian Cave, Barren Co., Ky., June, (H. G. Hubbard); two specimens, Cave at Pennington Gap, Va., (H. G. Hubbard). A very peculiar species, particularly on account of the form of the tibia of the palpus, which is quite unlike that of our other species, but somewhat like the European *C. latreillii*.

Chelanops *Nicolet*.

Tömösvary in 1882 (Pseudosc. faun. Hungar.) divided this genus into *Lamprochernes* (those with long and simple hairs on the palpi) and *Trachychernes* (those with short, thick hairs). Nearly all of our forms belong in the latter group. The species from the United States I would arrange in the following way:

1	}	Hairs on the palpi very long and simple, abdomen long and of equal width throughout. (<i>Lamprochernes</i>)	oblongus, grossus.
		Hairs on the palpi short and thick often clavate, abdomen much the widest in the middle. (<i>Trachychernes</i>)	2
2	}	Hand with a projection on inner side	dentatus.
		Hand without any projection	3
3	}	Fingers as long or nearly as long as hand	4
		Fingers much shorter than hand	11
4	}	Hairs not distinctly clavate	5
		Hairs distinctly clavate	8

	{ Inner margin of hand not greatly swollen at base	7
5	{ Inner margin of hand very much swollen at base, so that the hand is nearly as broad as long.	6
6	{ Palpi greenish	latimanus.
	{ Palpi nearly black	virginica.
7	{ Fingers a little longer than hand	tristis.
	{ Fingers a little shorter than hand.	morosus.
8	{ Inner margin of hand greatly swollen at base	10
	{ Inner margin of hand but weakly swollen at base.	9
9	{ Palpi pale yellowish.	pallidus, affinis.
	{ Palpi, dark red-brown.	sanborni, dorsalis, pallipes.
10	{ Florida species	tumidus.
	{ California species	validus.
11	{ Two distinct eyes, hairs clavate	texanus.
	{ No eyes, hairs not clavate	acuminatus, floridæ, latus.

Chelanops oblongus *Sqr.*—Comp. Writings, Leconte Ed.

Chelanops alius LEIDY, Proc. Phil. Acad. Sci., 1877.

Probably in all the eastern United States; I have it from Ithaca, N. Y.; Washington, D. C.; Brazos Co., Texas; Citrus Co., Florida, (C. M. Weed); Sand Point, Fla., (Hubbard); Retreat, N. C., (Hubbard); Fredricksburg, Va., (Richardson); Detroit, Mich., (Hubbard).

Chelanops grossus *Bks.*—Can. Entom., March, 1893.

Quite common in Colorado (Dr. C. F. Baker).

Chelanops texanus *Bks.*

Chelifera texanus BANKS, Can. Entom., Aug. 1891.

Tho' this species has distinct eyes I place it here on the form of the femur. Brazos Co., Texas.

Chelanops acuminatus *Simon.*

Chelifera acuminatus SIMON, Ann. Soc. Ent. Fr., 1878.

California; Olympia, Wash. State, (T. Kincaid).

Chelanops floridæ *Balzan.*

Chernes floridæ BALZAN, Ann. Soc. Ent. Fr., 1891.

Three specimens from Punta Gorda, Fla., (Mrs. Slosson); very close to *C. latus*, but the fingers are shorter, and the tibia more swollen on inner side, and the body more slender.

Chelanops latus *Bks.*—Can. Entom., March, 1893.

Runnymede, Fla.; Palatka, Fla., (Hubbard).

Chelanops dentatus, sp. nov.

Length, 2 mm. Cephalothorax and palpi reddish-brown, abdomen brownish; legs pale. Cephalothorax rounded in front, no eyes or eye-spots, mandibles small; abdomen broad, depressed, scutæ divided; palpi short and stout, the trochanter slightly swollen behind, convex in front; the femur shorter than the cephalothorax, pedicellate, about of even width throughout; tibia about as long as femur, a little broader, pedicellate, moderately convex on outer margin, quite strongly swollen on inner margin; claw large, as long as femur plus trochanter, nearly twice as broad as femur, broadest at base and tapering to the fingers, which are as long as the hand and curved; on the inner margin of the hand is a large tooth-like process projecting outward and pointed in front. Body and appendages finely granulate, and with strongly clavate hairs, the usual simple ones on the fingers.

One specimen of this curious species without locality (Hubbard); but probably from Florida. The only similar species is *Ch. armiger* Balzan from Venezuela, which has two projections, one on each side of the hand.

Chelanops latimanus, sp. nov.

Length, 3 mm. Pale greenish, cephalothorax tinged with brownish, two series of brown spots above on the abdomen. Cephalothorax narrowed and rounded in front, two large white eye-spots; abdomen depressed, moderately broad, twice as long as cephalothorax; palpi short and stout, trochanters much swollen above, convex in front; femur much shorter than cephalothorax, short pedicellate, broadest near base, and two and one-half times as long as broad; tibia as long as, but little broader than femur, pedicellate, but little convex on either side; claw about as long as cephalothorax, very broad at base, fully twice as broad as femur, the basal angles but little rounded, then tapering to the fingers, which are stout, but little shorter than the hand, and curved. Hard parts finely granulate, and furnished with short, thick, but not clavate hairs.

One specimen, Punta Gorda, Fla., (Mrs. A. T. Slosson). Readily distinguished by its greenish color, and by the very broad, almost angulate hand; it is bluish when alive.

Chelanops virginica, sp. nov.

Length, 1.6 mm. Cephalothorax, abdominal scutæ and palpi, except fingers which are reddish, very dark brown; the hand almost shining black above; legs brownish. Cephalothorax with eye-spots and suture indistinct; palpi short and stout; femur much shorter than cephalothorax, slightly tapering to tip; tibia about as long as femur and a little broader, pedicellate, quite strongly swollen at base on inner side, then nearly straight; claw a little longer than cephalothorax, hand very broad, slightly rounded on outer side, very strongly swollen on inner side, fingers stout, curved, and but little shorter than the hand. Hard parts granulate, with short, thick, but not clavate, hairs. Abdomen short, broad and depressed.

Two specimens, Fredricksburg, Va., (W. D. Richardson).

Chelanops tristis Bks.—Can. Entom., Aug., 1891.

Only known to me from Long Island, N. Y. It lives under stones between a tide-marks.

Chelanops morosus, sp. nov.

Length, 2 mm. Cephalothorax and palpi dark red-brown, abdomen brown, legs pale brownish. Cephalothorax with indistinct eye-spots, sutures distinct; abdomen broad; palpi large and stout; trochanter globose above, rounded behind and convex in front; femur shorter than cephalothorax, pedicellate, nearly cylindrical; tibia about as long as femur, slightly broader, quite long pedicellate, suddenly and strongly swollen on inner side near base, beyond concave, outer margin evenly convex; claw large, longer than the cephalothorax plus mandibles, but little rounded on the outer side, strongly and evenly on the inner side; fingers stout, curved and barely shorter than the hand. Hard parts with short thick hairs, not distinctly clavate.

Two specimens, Isle Royale, Lake Superior, (H. G. Hubbard).

Chelanops tumidus, sp. nov.

Length, 1.5 mm. Cephalothorax and palpi pale brownish yellow, abdominal scute brownish, legs pale. Cephalothorax rounded in front, sutures distinct, no eye-spots; abdomen moderately narrow, twice as long as cephalothorax, scute broadly divided; palpi short and stout; trochanter globose above and behind, convex in front; femur nearly as long as cephalothorax, pedicellate, broadest near base, slightly tapering to the tip; tibia but little shorter and a little broader than femur, pedicellate, outer margin evenly convex, inner margin quite strongly convex near base, beyond tapering; claw longer than cephalothorax, hand short and very broad and rounded at base, outer margin but little convex, inner strongly and suddenly swollen, then tapering to the fingers, which are plainly longer than the hand, and curved. Hard parts finely granulate and furnished with short clavate hairs.

Several specimens from under logs on the sea-beach, Indian River Inlet, Florida, April, 1880, (H. G. Hubbard).

Chelanops validus, sp. nov.

Length, 2 mm. Cephalothorax dark brown, palpi dark red-brown, abdominal scute brown, legs brownish. Cephalothorax with distinct sutures, and two faint eye-spots; abdomen one and one-half times as long as cephalothorax, scute well divided; palpi large; trochanter globose above and behind, convex in front; femur slightly shorter than the cephalothorax, pedicellate, very broad; tibia shorter than femur and plainly broader, pedicellate, evenly convex on outer side, inner margin much more strongly convex near base, concave beyond; claw as long as cephalothorax plus mandibles, very large, strongly and evenly convex on each side of hand, tapering to the stout fingers, which are about as long as hand, and curved. Hard parts finely granulate, and provided with short clavate hairs.

Several specimens, under bark; Lake Tahoe, Calif., July, (Hubbard). Differs from *Ch. tumidus* in larger size, broader body, darker color, more evenly convex hand and shorter fingers.

Chelanops pallipes Bks.—Can. Entom., March, 1893.

California.

Chelanops sanborni Hagen.*Chernes sanborni* HAGEN, Record Am. Ent., 1868.

Known to me from Ithaca, N. Y.; Poughkeepsie, N. Y., (G. Van Ingen); Cambridge, Mass., (Hubbard).

Chelanops dorsalis, sp. nov.

Length, 2 mm. Cephalothorax and scutæ brown, palpi pale red-brown, legs brownish. Cephalothorax moderately narrow, sutures distinct, no eye-spots; palpi moderate; trochanter as usual; femur shorter than the cephalothorax, pedicellate, broadest near base, concave on inner margin near tip; tibia a little shorter and slightly broader than the femur, pedicellate, evenly convex on outer side, more strongly on inner side near base, beyond concave; claw moderate, as long as cephalothorax plus mandibles, not much convex on outer side, quite strongly on inner side at base, tapering to the fingers, which are nearly as long as the hand, and curved. Hard parts are finely granulate, and with short clavate hairs.

Several specimens under bark; Lake Tahoe, Calif., July, (Hubbard). Differs from *Ch. pallipes* in shorter fingers, smaller size, etc. Related to *Ch. sanborni*, but with shorter and stouter fingers, a more elongate body, and a more swollen tibia.

Chelanops pallidus Bks.*Chernes pallidus* BASKS, Can. Entom., Aug., 1890.

I only know the type specimen from Ithaca, N. Y.

Chelanops affinis Bks.—Insect Life, May, 1894.

Crescent City, Florida, (Hubbard).

Sub-family GARYPINÆ.

Garypus Koch.

Three species of this well-marked genus are known to me from the United States. They may be tabulated as below:

1	{ Cephalothorax with lateral ridges and prolonged antero-lateral angles, trochantins not distinct	bicornis.
		{ Cephalothorax without lateral ridges or prolonged angles, posterior trochantins distinct
2	{ Claw very much darker than rest of palpus, large species	floridensis.
	{ Palpus all of one color, small species	granulatus.

Garypus bicornis, sp. nov.

Length, 2.5 mm. Brownish yellow, the cephalothorax and palpi darker than the other portions, a pale spot on the middle of the last two or three ventral seg-

ments. Cephalothorax narrow, somewhat triangular, much longer than broad, with a high elevated ridge each side, about parallel with the side margins, the space between the ridges concave in anterior portion, convex behind; the anterior margin of the elevated portion is rounded; each lower antero-lateral angle of the cephalothorax is prolonged into a conic tubercle, or horn, which is slightly longer than broad at base. There is a trace of the posterior suture, but the anterior one is very obscure; on each side there are two prominent eyes about their diameter apart, the posterior one on a tubercle and looking backward. The abdomen is broad and depressed, narrower at base than at posterior margin, broadest on the 6th segment, the segments plainly divided. Palpi long and slender; trochanter swollen on the posterior side, anterior margin nearly straight; femur short-pedicellate; cylindrical, much longer than cephalothorax; tibia gradually enlarged from base to near tip, about as broad and nearly one-half as long as the femur; neither margin much convex; claw as long as femur, hand about one and one-half times as broad as femur, nearly cylindrical, and about twice as long as broad; fingers much longer than hand, very slender and nearly straight. Legs about as usual, but no trochantins visible on the posterior hairs. All hard parts coarsely granulate; no hairs on palpi, except fine ones on fingers, a few thick ones on the legs with fine ones on tarsi.

This interesting species was found by Mr. Hubbard between the laminae of rocks at Specimen Ridge, Yellowstone National Park. Many were young and had formed little cases of silk and earth, in which to pass the moulting period. The structure of these young forms is not, however, different from that of the adult. This species might, on account of the structure of the cephalothorax and the absence of trochantins, form a new genus.

Garypus floridensis, sp. nov.

Length, 4 mm. Body pale brown, legs and palpi, except claw, pale brownish yellow, claw red-brown. Cephalothorax with mandibles triangular, longer than broad, very much narrowed in front, anterior margin emarginate and about one-fourth as long as posterior margin; sutures distinct; two eyes each side nearly touching, the posterior one looking backward. Abdomen depressed, much broader behind than in front, broadest on 7th segment, scutae short and quite broadly divided. Palpi moderately slender; trochanter swollen behind, convex in front; femur gradually enlarged from base to tip, slightly longer than the cephalothorax; tibia a little pedicellate, enlarged from base to near tip, about two-thirds as long as femur and a trifle broader, neither margin much convex; claw pedicellate, longer than femur, hand about as long and nearly twice as broad as tibia, somewhat cylindrical; fingers about as long as hand, and plainly curved. Hard parts finely granulate, and with short, fine, scattered hairs. Trochantins quite plain on posterior legs.

Several specimens of this large species were collected by Mr. Hubbard under drift-wood on the ocean beach, near St. Lucie River, Indian River, Florida, in April 1880.

Garypus granulatus Bks.—Can. Entom., Aug., 1891.

In the crevices of a cliff, Ithaca, N. Y.

Family OBISIIDÆ.

Sub-family OLPIINÆ.

Olpium *Koch.*

This genus and the next form the transition from the previous family to the true Obisiidæ.

Olpium obscurum *Bks.* — Can. Entom., March, 1893.

Besides the type, I have one specimen from Punta Gorda, Fla., (Mrs. Slosson).

Atemnus *Canasta.*

Differs from *Olpium* principally in lacking eyes, and in having the trochantins visible on all the legs.

Atemnus elongatus, sp. nov.

Length, 3 mm. Cephalothorax and legs yellowish, abdomen brownish, palpi red-brown. Cephalothorax smooth, one and one-half times as long as broad, narrowed in front, no trace of eyes; mandibles about one-third the length of cephalothorax, with a long slender, and simple stylet; abdomen not broader than cephalothorax and fully twice as long. Palpi heavy, but not long; trochanter swollen behind, convex in front; femur pedicellate, shorter than cephalothorax, about twice as long as broad, broadest near base; tibia about as long and as broad as femur, pedicellate, outer margin moderately, inner margin quite strongly convex; claw about as long as cephalothorax plus mandibles, much broader than tibia, broadest near base and tapering to the fingers, which are stout, curved, and plainly shorter than the hand. Legs short and stout, trochantins distinct on all pairs. Body and appendages with scattered simple hairs. One specimen with almost black cephalothorax and palpi does not differ otherwise from typical specimens.

Beaten from dead hickory wood in April, near St. Lucie Riv., Indian River, Florida, by Mr. Hubbard; also at Sand Point, and Enterprise, Florida, Punta Gorda, Fla., (Mrs. Slosson). A young specimen taken by myself at Runnymede, Fla., may belong to this species; the hand is more slender and the fingers longer, and there is a more prominent projection on the posterior margin of the trochanter.

Sub-family OBISINÆ.

Tribe IDEOBISINI.

Ideobisium *Balzan.*

Cephalothorax smooth, without transverse sutures, nearly as broad in front as behind, four distinct eyes; mandibles large, with a distinct stylet; abdomen moderately elongate, scutæ entire; palpi moderate, fingers curved; body with simple hairs. We have two species:

Cephalothorax about as broad as long **threveneti**.
 Cephalothorax distinctly longer than broad **rufulum**.

Ideobisium threveneti *Simon*.

Obisium threveneti SIMON, Ann. Soc. Ent. Fr., 1878.

Common on the Pacific Coast States. In moss and rotten wood, Portland and Astoria, Oreg., (Hubbard); Portland, Oregon, (Schwarz); Temino, Wash., (Hubbard); Olympia, Wash., (Kincaid); Simon had it from California.

Ideobisium rufulum *Bks.*

Olpium rufulum BANKS, Can. Entom., Aug., 1891.

Washington, D. C.; Fredricksburg, Va., (Richardson).

Ideoroncus *Balzan*.

Differs from the preceding genus in having but two eyes. The males which I have seen lack the stylet to the mandibles, a strange exception.

Ideoroncus obscurus *Bks.*—Can. Entom., March, 1893.

The specimens from which I described the species were not quite adult; adult ♀'s are often 4 mm. long and usually darker than described. It is common in the extreme West. Olympia, Wash., (Kincaid); Nat'l. Park, (Hubbard); Bear Paw Mts., Mont., (Hubbard); Assiniboine, Mont., (Hubbard); one specimen, Lake Tahoe, Calif., (Hubbard).

Tribe OBISINI.

Obisium *Ill.*

Our species of this genus may be separated as follows:

- 1 { No eyes, cave form **cavicola**.
- 1 { Four eyes, not cave 2
- 2 { Tibia of palpus with the inner side first convex, then nearly straight,
 fingers longer than hand 3
- 2 { Tibia of palpus with inner side evenly convex 4
- 3 { Hand about twice as long as broad, large species **carolinensis**.
- 3 { Hand one and one-half times as long as broad, small species . **brunneum**.
- 4 { Fingers very much longer than hand **macilentum**.
- 4 { Fingers a little shorter than hand **parvulum**.

Obisium cavicola *Pack.*—Am. Nat., Feb., 1884.

Unknown to me. Somewhat peculiar in the shape of the cephalothorax and in the form of the tibia of the palpus. New Market Cave, Va.

Obisium brunneum *Hagen*.—Record Am. Ent., 1868.

This is the common species in the northern states. It occurs under leaves in woods. Ithaca, N. Y.; Sea Cliff, L. I.; Salineville, Ohio, (A. D. MacGillivray); Poughkeepsie, N. Y., (G. Van Ingen); Cambridge, Mass., (Hubbard); Detroit, Mich., (Hubbard); and one specimen from Wasatch and Alta, Utah, (Hubbard), seems to be the same species.

Obisium parvulum, sp. nov.

Length, 1.6 mm. Cephalothorax and mandibles pale yellowish brown, palpi except fingers paler, abdomen sprinkled with silvery dots. Very similar to *O. brunneum* but the tibia of palpus is shorter, less pedicellate, broader and strongly and evenly convex on inner side; the claw is a little larger, the hand longer and the sides more nearly parallel; the fingers stouter and shorter, about equal to, or a little shorter than the hand.

One adult and several young, without locality (Hubbard). This was in the same vial as *Chelanops dentatus*, which I think must be from Florida.

Obisium macilentum *Simon*.—Ann. Soc. Ent. Fr., 1878.

South California (Curtis), one specimen.

Obisium carolinensis, sp. nov.

Length, 3 mm. Cephalothorax dark brownish, shining, abdomen brown, palpi red-brown, legs yellowish. Cephalothorax smooth, narrowed a little in front of eyes, a small median tooth on the anterior margin, the two eyes each side nearly touching. Abdomen but little broader than cephalothorax, two and one-fourth times as broad. Palpi moderately long; trochanter simple; femur longer than cephalothorax, about as broad as a mandible, nearly equally broad throughout; tibia pedicellate, as long as width of cephalothorax, little broader than the femur, and but slightly convex on inner side; claw about as long as cephalothorax plus mandibles, nearly twice as broad as tibia, broadest near base and tapering to the fingers, which are longer than hand, and curved. Body, legs and palpi with simple hairs; above on the superior finger two larger hairs near base and one near tip. Legs as usual.

Retreat, N. C., under leaves in woods; and Lee Co. Va., (H. G. Hubbard).

Blothrus *Schiodte*.

Readily separated from the preceding genus by its very long palpi. Most of the European species are from caves; the one from the United States is not known to be from a cave.

Blothrus californicus *Bks.*

Atemnus californicus BANKS, Can. Entom., Aug. 1891.

California (Dr. Cooper Curtice).

Tribe CUTHONINI.

Chthonius *Koch.*

The six species may be separated as follow :

1	{ Cave species, two or no eyes.....	2
	{ Not cave species, four eyes.....	3
2	{ Hind legs about twice as long as the abdomen.....	packardi.
	{ Hind legs not much longer than abdomen.....	cæcus.
3	{ Cephalothorax and mandibles with small spines, each tipped with a hair.....	spinosus.
	{ Without any spines.....	4
4	{ Eyes close together, almost touching.....	mæstus.
	{ Eyes distinctly separated.....	5
5	{ Hind eye about twice its diameter from front eye, cephalothorax much wider in front than behind.....	pennsylvanicus.
	{ Hind eye not twice its diameter from front eye, cephalothorax but little wider in front than behind.....	longipalpis.

Chthonius packardi *Hag.*—Zool. Anzeiger, July, 1879.

Indian Cave, Barren Co., Ky., (Hubbard); Mammoth Cave, Ky.; Wyandotte Cave, Ind.

Chthonius cæcus *Pack.*—Am. Nat., Febr. 1884.

Unknown to me. Weyer's Cave, Va.

Chthonius pennsylvanicus *Hag.*—Rec. Am. Ent., 1868.

Pa.; Poughkeepsie, N.Y., (G. Van Ingen); one specimen, Lake Poinsett, Fla., (Hubbard).

Chthonius longipalpus *Bks.*—Can. Ent., Aug. 1891.

Ithaca, N.Y.; Sea Cliff, N.Y.; Washington, D.C.; Fredricksburgh, Va., (Richardson).

Chthonius mæstus *Bks.*—Can. Ent., Aug. 1891.

Ithaca, N. Y.

Chthonius spinosus *Bks.*—Can. Ent., March 1893.

Citrus Co., Fla., (C. M. Weed).

Lechytiya *Balzan.*

Proposed by Prof. Balzan for his *Roncus chthoniiformis* with which my *Roncus pacificus* appears to be congeneric. The palpi are shorter than in *Chthonius*.

Lechytiya pacifica *Bks.*

Roncus pacificus BANKS, Can. Entom., March, 1893.

Olympia, Washington, (Trevor Kincaid).

NEW NORTH AMERICAN TETTIGINÆ. I.

By ALBERT P. MORSE, Wellesley, Mass.

Having received for determination a considerable amount of material in this sub-family from Prof. Otto Lugger, Mr. S. H. Scudder, Mr. Samuel Henshaw, Cornell University, Museum of Comparative Zoology, and a set of the different forms in the collection of Prof. Lawrence Bruner, it has seemed worth while to undertake the preparation of a Synopsis of the North American forms of this group, to be illustrated with drawings of the diagnostic characters. Such being the case, I shall be glad to examine all material sent to me, or to obtain material in this group by purchase or otherwise. Pending the publication of such a work it seems advisable to make known by description the following forms.

Measurements are in millimeters, the extremes alone being given. "Length" refers to the length of the insect from the front of the vertex or head to the tip of the pronotum or wings, as the case may be. "Pronotum > hind femora" means that the pronotum passes the hind femora, and if the quantity is preceded by a - sign, the pronotum fails to pass by that amount. With these explanations the tables of measurements will probably be clear.

Nomotettix parvus, sp. nov.

Small. Vertex of head projecting in advance of eyes about $\frac{2}{3}$ the length of an eye, the anterior margin obtuse-angulate, its sides nearly straight, rounding shortly into sides of crown, the mid-carina showing from above as a very small, slightly projecting tooth. Mid-carina low on the crown, disappearing opposite the middle, or middle of the posterior half, of the eyes. Profile rounded or round-angulate at top, deeply excavate opposite eyes, subprotuberant opposite lower border of eyes, the face more retreating than in *cristatus*. Sides of crown sub-parallel, slightly excavate opposite anterior portion of eyes. Mammillæ of occiput scarcely distinct. Pronotum sharply tectiform, the mid-carina lower and less arched longitudinally than in *cristatus*; anterior margin of dorsum projecting but little over the head, obtuse-angled, the sides straight or very slightly excavate. Surface scabrous.

	Length.	Pron.	Pron. < Hind fem.	Wings < Pron.	Hind fem.	Antenna.
♂	6.5—6.8	5.5—6.	.3—1	.0—5	4.	2.
♀	8.5	7.6	.5	.3	4.2	2.

This species differs from *N. cristatus* Harr. in the smaller size; lower carina, less angulate anterior margin, and more scabrous surface of the pronotum; more advanced vertex, with less distinct carina in top view; more projecting vertex, more retreating face-

and flatter crown in side view, with the excavation opposite the eyes shallow and rounded instead of sharply excised.

4 ♂, 1 ♀, 1 yg., St. Anthony Park, Minn. From Prof. Otto Lugger.

Nomotettix compressus, sp. (?) nov.

Very similar to *M. cristatus* Harris, resembling it in size and proportions of body, but differing as follows: Median carina of pronotum a little higher, especially opposite the shoulders, more smoothly arched on top, and distinctly compressed into a thin keel, which is about 1 mm. in height at the shoulders and so thin in section that the punctulations of its surface appear translucent when held to the light. Dorsal front margin of pronotum much advanced upon the head, projecting over it a distance nearly or quite equal to one-half the distance between the lateral carinae, with the sides strongly concave, — in *cristatus* projecting but one-fifth to one-third the above distance and with the sides less excavated.

	Length.	Pronotum.	Hind fem.	Antenna.
♂	8.4	7.8	5.—6.	2.5
♀	9.—9.5	8.5—8.8	5.—6.	2.8

Such are the characters presented by a series of 2 ♂, 5 ♀, probably from North Carolina, presented by Prof. G. F. Atkinson to Cornell University (lot 105).

While at first disposed to consider it a distinct species, subsequent examination of material from Indiana, Maryland, and Georgia seems to indicate that it may grade into the typical New England form of *cristatus*, the pronotum in some of these specimens having the carina less distinctly compressed and the anterior margin less produced. Additional specimens in suites, with observations on altitude, environment, etc., are necessary in order to settle the relation of the two forms satisfactorily, whether racial or specific.

Tettigidea acuta, sp. nov.

Very similar to northern specimens of *T. lateralis*, differing as follows: Anterior margin of pronotum produced into an acutely pointed process, reaching nearly to the mid-carina of vertex; the latter is less prominent opposite the lower part of eyes and higher on top of head, and the occiput is less protuberant. Dorsum of pronotum smoothly granulated, with very faint irregular rugulae; mid-carina distinct, but slight, especially at shoulders, where the pronotum is nearly convex in cross section, instead of tectiform. From *apiculata* it may be readily distinguished by the vertex.

Color brown to dark brownish fuscous, more or less of the top of pronotum straw-colored. Elytral pale spots rather larger than in *lateralis*.

	Length.	Pronotum.	Hind fem.	Pron. > Hind fem.	Wings > Pron.
♀	16.8—17.3	15.5—15.8	8.	1.5—2.5	1.—1.4

3 ♀, New York (Uhler, coll. S. H. Scudder). One specimen badly mutilated, but undoubtedly this species.

Tettigidea apiculata, sp. nov.

A slender species. Vertex considerably advanced in front of eyes, recalling *prorsa*, once-and-a-half (♂) or twice (♀) as wide as an eye, not protuberant above. Eyes about twice as long as wide, little protuberant, surrounded by a slight but distinct lip. Carina large, much elevated on top of vertex, stopping abruptly opposite anterior part of eyes; strongly sinuous on face, protuberant opposite eyes, sub-excavate below them. Pronotum cuspidate before, subulate behind, considerably passing the hind femora, the dorsum coarsely and distinctly rugulose except on a narrow band over the shoulders and the lateral lobes which are granulose. Median carina distinct, acute (except scarcely so in ♀ on aforesaid band). Anterior margin much produced over head (one-half the distance between lateral carinae), nearly rectangular, the sides sinuate, expanded next base and excavate next apex, terminating in a sharp, finely pointed and slightly deflected cusp, which reaches to the posterior end of the carina of the vertex. Wings passing the pronotum. Hind femora rather slender, elongate.

Dark reddish brown, paler on face and lower half of lateral lobes of pronotum, passing into luteous on hind tibiae.

Length.	Pronotum.	Hind fem.	Pron. > Hind fem.	Wings > Pron.
♂ 13.7	12.2	6.	1.8	1.4
♀ 18.	15.5	8.4	2.5	1.8

1 ♂, 1 ♀, New Orleans, La., (Akhurst, in coll. of S. H. Scudder).

Tettigidea prorsa elongata, var. nov.

This form is exactly like *prorsa* but with the pronotum and wings, or wings alone, extending beyond the hind femora.

Length.	Pronotum.	Pron. > Hind fem.	Wings > Pron.
♂ 10.8	8.6	.6	1.
♀ 13.2	10.5	(- .2), 2	2.

1 ♂, 1 ♀, Georgia (coll. S. H. Scudder). 1 ♂, Georgia (coll. S. Henshaw).

The University of California Entomological Society has undertaken a curious venture. It is issuing from Berkeley, Cal., a Californian journal of entomology, titled "The Entomologists Daily Post Card" at \$2.00 a year. A card of regulation size and color is printed on both sides in clear type, leaving a meagre space for an address.

Wm. B.

A COMBINATION OF TWO CLASSIFICATIONS OF LEPIDOPTERA.

By HARRISON G. DYAR, A. M.

The present article is the third in a series of papers on the classification of lepidopterous larvæ.* I believe that I have now brought out the characters exhibited by the larval tubercles sufficiently so that they may be considered to be known. The next thing in order is to combine the classification derived with this given set of characters with other classifications derived from other characters, in order to approximate to a natural classification. It so happens that the only classification sufficiently worked out for my purpose, is the old one founded upon the venation of the wings. That suggested by Mr. V. L. Kellogg on scale structure, as well as Prof. J. B. Smith's idea of using the general body structure or Dr. A. S. Packard's special head characters have never been completed, nor even well outlined with tangible points of contrast.

In the first place, I regard the suborders of the Lepidoptera, the Jugatæ and Frenatæ, to be established. All lines of research have tended to confirm this conclusion, with perhaps the exception of the pupal characters. But this is scarcely to be regarded as an insurmountable exception. In the following, then, we will confine our attention to the divisions of the Frenatæ.

The divisions which I propose to consider are of greater than family rank. The families of the Frenatæ are reasonably compact and well defined. A few intergrade, others are scarcely of family rank and again other genera may be entitled to a higher position than they now occupy. But these objections will right themselves as our knowledge of the complete life histories of all the species advances, for I believe the system of family classification and definition is not at fault.

To return to the higher divisions, the superfamilies or tribes. It is clearly the function of a natural classification, one founded by a synthesis of special classifications, to so expound the various characters used in the several classifications that they do not tend

* The first appeared in the *Annals of N. Y. Acad. Sciences*, Vol. VIII, p. 194 (1894); the second in *Transactions of N. Y. Acad. Sciences*, Vol. XIV, p. 49 (1895).

to produce conflicting results. It is scarcely possible in using one set of characters only, to adequately differentiate between the characters due to adaptation and those of real phylogenetic significance. Now it is hoped that the present attempt to combine two classifications founded on two very different sets of characters, may tend to show which of the characters in each set are reliable, or at least which are evidently unreliable; in other words parallel adaptations.

Before proceeding to the discussion, I will dispose of a few notes on larval tubercles, which extend my former observations to certain families not then examined.

Family ADELIDÆ.

On larval characters, the group represented by *Adela* must be given family rank. I have not studied the moth. I have examined the following species.

***Adela viridella*.**

A dorsal shield on each thoracic segment as in the Psychidæ. Setæ fine, pale, arising from large, diffuse, brown, corneous areas; i and ii remote, out of line; iii above the spiracle; iv and v from a single area close below and behind the spiracle (on joints 5 and 6 the areas of iii and iv+v are fused); vi subventral; vii without corneous area, represented by a very indistinct, small seta on the anterior outer side of the slight foot prominence. Feet represented by two transverse multiple rows of rudimentary hooks, grading off imperceptibly into the skin surface.

This is the most generalized larva of Frenatæ that I have seen. It should be placed at the bottom of the series and be followed by the Psychidæ.

Family TINEIDÆ.

Only a single dorsal (prothoracic) shield, rarely a mesothoracic one; abdominal feet more or less well developed, the crotchets in one or more circles or two transverse rows, but not grading off into the general surface; rarely entirely absent. The following species represent many of the "families" (= sub-families*) of the Tineidæ which I have not previously described. The descriptions are from beautifully prepared larvæ received from Staudinger & Haas, Blasewitz-Dresden, Germany.

***Simæthis pariana*.**

Cervical shield scarcely corneous, obscure. Setæ distinct, arising from large black areas, normal; i dorsad to ii; iv and v on a single area, consolidated; vi with

* Some of these may really be of family rank, but it is scarcely probable that they all are.

a small black area; vii without any black area, consisting of three setæ above base of foot; viii inside of base of foot next midventral line. Abdominal feet slender, well developed, the crotches in a single complete circle.

Gelechia rhombella.

A distinct corneous cervical shield. Setæ distinct, but without corneous areas; i dorsad to ii, remote; iv and v closely approximate, normal; feet moderate, the crotchets in a ring.

Endrosis lacteella.

Cervical shield well cornified, large; setæ long and fine, the tubercles scarcely perceptible; i dorsad to ii, iv and v closely approximate, all normal. Feet well developed, the crotchets in a single circle.

Plutella porrectella.

Cervical shield reduced to a series of dots. Setæ fine, short, but black and very distinct, arising from minute black tubercles; i dorsad to ii; iv and v in line, rather remote, entirely unconsolidated; other setæ normal; vii composed of three closely approximated setæ. Feet well developed, the crotchets in a circle but breaking down and incomplete on the outer side.

Hyponomeuta cognatellus.

Cervical shield distinct. Setæ fine but long, from minute obscure tubercles; ii slightly dorsad to i (compare *Psychidæ*), i being situated at the upper border of a subdorsal black patch; iii lateral; iv and v remote, iv being moved up out of line with v, almost on a level with lower border of spiracle; vi posteriorly subventral; vii of three setæ on base of leg, the upper one not closely approximated to the other two; viii next midventral line. Abdominal feet rather short, the crotchets three rows deep in a circle.

Acrolepia assectella.

Cervical shield sub-corneous. Setæ short, from minute tubercles surrounded by a diffuse sub-corneous area; i dorsad to ii, normal; iii close above the spiracle and slightly anterior; iv and v remote, iv moved up a little out of line; vi posteriorly subventral; vii of three setæ closely approximated; viii normal. Feet moderate, a single outer circle of crotchets and a second concentric inner row, represented only on the inner side of the foot (i. e. broadly broken outwardly).

Laverna phragmitella.

Cervical shield not distinguishable, the larval shape thicker than usual, slightly flattened approaching the shape of the *Anthrocerina*. Setæ fine, obscure, tubercles absent; i slightly dorsad to ii; iii above spiracle; iv and v greatly reduced, scarcely to be made out under a half-inch objective, apparently in line and rather remote; vi, vii and viii normal; feet well developed with a single circle of crotchets.

Tinea pellionella.

Cervical shield distinct. Setæ short, very fine, obscure, tubercles absent; dorsad to ii; iii lateral; iv and v not very closely approximate; iv dorsad to v, the

rest normal. Feet represented by a transverse ellipse of crotchets narrowly broken on the inner side.

Coleophora ochripennella.

Cervical shield (prothoracic) large, supplemented by a second (mesothoracic) one, small, widely bisected into two triangular halves. Setæ fine, short, greatly reduced, without tubercles; i small, dorsad to ii; iv and v apparently in line; v much shorter than iv, all very difficult to distinguish, and I cannot feel sure of their position. Feet nearly obsolete, represented by two transverse rows of very few crotchets.

Tischeria complanella.

Flattened, evidently a leaf miner; cervical shield sub-corneous. Setæ very obscure, rudimentary, no tubercles; iv and v appear on the lateral bulging outline of the segments, moderately approximate, iv a little dorsad to v. Legs absent, even the thoracic feet reduced to little rounded stumps.

Family ORNEODIIDÆ.

Orneodes hexadactyla.

Cervical shield not corneous, practically absent. Setæ moderately distinct, single, from minute tubercles; i and ii remote, i dorsad to ii; iii lateral; iv and v closely approximate, iv slightly dorsad to v; vi sub-ventral; vii of three setæ on base of leg; viii normal. Feet moderate with a single circle of crotchets. An arrangement perfectly typical for the Cossina.

Family HETEROGYNIDÆ.

Heterogynis paradoxa.

Body robust, thickened, head retractile, resembling the Anthrocerina; setæ single, fine but distinct; iv and v approximate, almost in line transversely; vi represented by two setæ; the rest normal for the Cossina. Crotchets of abdominal feet forming a dense semicircle on the inner half of the planta.

Family PTEROPHORIDÆ.

I am now able to give some details for this family.

Lioptilus scarodactylus.

Setæ simple, coarse and distinct, arising from small cup-shaped tubercles; i and ii nearly in line, scarcely approximate, being separated by one-third the length of the segment; iii above and a little before the spiracle; iv and v closely approximate, sub-stigmatal, iv slightly dorsad to v; vi sub-ventral; vii of three setæ; viii present but small. Feet slender, small with only two or three crotchets like little claws curved inward, representing an inner segment of a circle. No secondary hairs, though the body is thickly clothed with small, round, brown, corneous areas.

Lioptilus microdactylus.

Setæ as in the preceding species, but finer and less distinct; the upper of the three setæ of vii is longer than the others. The minute corneous areas on the skin

are less numerous than in *scarodactylus*, and are more confined to the dorsal area, being also slightly more pointed and tubercular. The small, slender abdominal feet have no crotchets.

Platyptilus rhododactylus.

Setæ distinct, rather coarse, single, arising from somewhat enlarged conical tubercles, supplemented by a number of short secondary hairs with enlarged tips; i dorsad to ii, not approximate; iv and v closely approximate, all normal. Feet slender, the crotchets in a single row forming a semicircle on the inner side of the planta.

Oedematophorus lithodactylus.

Tubercles converted into small warts, each bearing some ten to twelve setæ; i and ii in line, closely approximate but not consolidated; iii lateral, behind it a little secondary wart with one small seta; iv+v also with a little secondary wart with three setæ behind; vi and vii each a distinct wart; viii represented by rather numerous hairs on the base and inside of the leg. Legs slender, the crotchets in a half circle on the inner side.

Oxyptilus periscelidactylus.

Tubercles converted into moderate sized warts with six to twelve long hairs; body also rather sparsely covered with short secondary hairs with enlarged tips; i and ii entirely consolidated into a single wart, a single long seta behind iv+v; viii a single seta; other warts normal. Legs slender, the crotchets forming two-thirds of a circle on inner side.

Family DIOPTIDÆ.

Phryganidia californica.

Mr. T. G. O. Mueller has kindly obtained the larvæ of this species for me in its home in California. The larvæ are referable to the Noctuidæ.

Setæ small and inconspicuous, but normal; a slight development of smaller secondary setæ consisting of one above and caudad to iii, another below and caudad to iii close above the spiracle; iv and v remote, iv moderately well moved up; many setæ on the leg plate. Larva otherwise naked, noctuidiform; joint 12 enlarged and 13 small; anal feet slender, divergent and rather weaker than the others.

Family BREPHTIDÆ.

I have before me the larvæ of three European species of *Brephtos*. The setæ are greatly reduced, but the tubercles remain rather distinct, in the normal arrangement of the Noctuidæ, without secondary hairs. The interesting point is the structure of the legs. All the abdominal ones are present, but the three anterior pair are about half aborted. In the Geometridæ, these legs are

entirely aborted and in many Noctuidæ the first pair or first two pair are partly or completely aborted, so that the Brepheidæ stand intermediate between these two families, but somewhat on the side of the Geometridæ.

Family NOLIDÆ.

On larval characters the genus *Nola* is deserving of family rank. These larvæ have been a great puzzle to me, and will probably remain so till I have the opportunity of observing the first stage. I have before me the larvæ of five European species of *Nola*. They correspond in all structural respects exactly with the American species. The arrangement of the warts is exactly that of the Anthrocerina as represented by the genera *Anthrocera*, *Adscita*, *Aglaope* and *Harrisina*, and less perfectly by *Megalopyge*; but with the important exception that, while in these Anthrocerina wart vii is distinctly situated on the anterior side of the slender abdominal feet, in *Nola*, the hairs of vii are scattered over a distinct corneous leg plate on the outer side of the foot. This leg plate is a typical noctuine structure, and it appears probable that the Nolidæ belong among the Noctuina where the moths are at present placed. But I am at a loss to conjecture what has happened to the tubercles.

Family EUPTEROTIDÆ.

This family has its stronghold in India, but is represented in Europe by at least one genus (according to Hampson). I have before me the larvæ of four species of this interesting genus. Not only do the tubercles show the position of the Eupterotidæ to be among the Noctuina, but their structure throws an unexpected light on the condition found in the Lasiocampidæ, which has been far from clear to me before seeing these larvæ.

Cnethocampa (Thaumetopea, Kirby*) **herculeana**.

Tubercles converted into large warts with many bristly hairs, also supplemented by scattered short and feeble secondary hairs from the skin and a development of short, finely branched hairs in close tufts, arising from the dorsal area enclosed by tubercles i and ii on joints 5—12. Some bristly hairs arise from the posterior part of these areas as if tubercle i had been stretched out in a longitudinal direction and the fine hairs developed from its central part; warts otherwise normal; iv and v rather near together; iv dorsal to v, v smaller than iv, considerably reduced; vi rather large; a distinct corneous but small leg plate.

* It does not appear from Kirby's catalogue why he has seen fit to propose a new name for this genus.

The arrangement is close to that of the bombycoid noctuids but differs in that tubercle v tends to become small instead of iv, while in the Noctuidæ iv is moved much farther up than in these Eupterotidæ. There is also a considerable resemblance to the hairy Notodontians.

Cnethocampa pinivora.

Primary hairs less abundant than in *C. herculeana*, the warts smaller and more reduced. Wart i is indistinct on account of its modification for the dorsal tufts which seem to be, in this species, partially replaced by a raised, somewhat eversible (?) area of skin which the stiff hair borders before and behind. Wart v very small, almost obsolete on account of the general reduction of all the warts. Secondary hairs more abundant, longer and stiffer than in *C. herculeana*.

Cnethocampa processionea.

Hairs and warts about as in the preceding, the secondary hairs not so well developed. Dorsal areas not eversible, covered with dense, fine and short down, the posterior stiff hairs scarcely developed at all. Warts iv and v very nearly in line. iv the larger and a very little dorsad to v, which has only one or two hairs and is really absent on some of the segments.

Cnethocampa pityocampa.

Dorsal areas eversible (?), downy, surrounded by a ring of soft reddish hairs. Warts greatly reduced, the hairs rather few and no stronger than the secondary hairs which are well developed. Wart iii is rather distinct; the position of iv and v can just be distinguished with a lens, iv the more distinct and dorsad to v.

Family LASIOCAMPIDÆ.

In the larvæ of this family the primitive first stage has disappeared. The mature warts are greatly reduced and obscured by secondary hairs, so that I could not obtain sufficiently positive evidence of their arrangement. The series of eupterotids described above shows beautifully the course which has been pursued in the development of the lasiocampid larva as we see it to-day. Derived from a bombycoid-noctuid, or lymantriid stock, by the suppression of the warts and development of secondary hairs in a manner parallel to that seen in the Eupterotidæ, the typical lasiocampid form has been evolved. Tubercles iv and v appear to have dropped back nearly into line in the first larval stage, probably by degeneracy toward the original primitive arrangement.

Clisiocampa fragilis.

Stage I. Wart i large, sub-dorsal; ii minute, a little caudad and below i; iii small, lateral; iv and v approximately in line, sub-ventral, very obscure; no others seen; no secondary hairs.

Clisiocampa neustria.

Mature larva. Several coarse black hairs arise from an area representing i, and a single hair from ii; other warts obsolete. Secondary hairs fine and soft, quite abundant sub-ventrally. Body scarcely flattened, a slight noctuiform dorsal enlargement on joint 12.

Lasiocampa quercus.

Secondary hairs abundant, thick, forming broad bands of dense hair absent only at the edges of the segmental incisures but becoming short and thin laterally and sub-ventrally. Primary hairs absent, the position of i and ii indicated by a disturbance in the uniformity of the dorsal hairy coat. Just below the spiracle and behind it an area can be distinguished which represents iv, and before and below this, another smaller one, rather a colored spot than a structural area, represents v. The area corresponding to vi, is well clothed with hairs and projects a little.

Gastropacha quercifolia.

Greatly flattened with well developed sub-ventral "lappets" and an unpaired dorsal prominence on joint 12. Hair rather abundant, but not long, all secondary. Patches of vivid white, short, dense hairs occur between the legs sub-ventrally. Seen at a distance a series of blackish patches seem to represent tubercles i and ii, but under the lens nothing appears but patches of dark pigment; a black pigment spot behind the spiracle. Sub-ventral area in the region of tubercle vi produced in two rounded confluent and hairy processes, forming the lappet.

CONCLUSION.

As regards the characters of wing structure, I believe the following are be eliminated as unreliable.

1) *The frenulum.* This structure seems very flexible and readily subject to adaption. It is not reliable even for family definition in many cases. I have before me the European *Endromis versicolor* and the Australian *Chelepteryx collesi*. In all characters they approach each other very closely, even the peculiar pattern of maculation is identical, and they must belong to the same family (Endromidæ, Plötz 1885); yet the former is without frenulum with an expanded numeral lobe while the more primitive Australian form has a well developed frenulum. Other examples could easily be cited.

2) *The branches of cubital vein.* The apparent number of branches of the cubitus (three or four), which may be otherwise expressed as the direction of migration of 'vein 5', is insisted upon by Mr. G. F. Hampson as a character of super-family value. In comparison with the larval classification it is seen to be of family value only.

As regard the larval characters :

1) *The arrangement of crotchets on the feet.* The hooks on the abdominal feet are not very reliable characters, as their arrangement is quickly subject to modifications whenever the necessity arises for an exposed mode of life by the larva. The presence of the unmodified condition is of more value than its absence, inasmuch as no larva of the higher families possesses this typical structure even when returned to a concealed mode of life, whereas some of the lower ones may possess a considerably specialized foot structure.

2) *The tubercles.* The special modifications of the tubercles (warts, processes etc.) are not of more than family rank, often of only generic rank.

There remain, then, for primary divisions in the wing veins the presence of vein 1c; in the larvæ the approximation in position of tubercles iv and v. In the higher moths of the first division (Pyralidæ, the Saturnians above the Bombycidæ and a few others) there is a tendency, often complete, to the disappearance of vein 1c. In the larvæ of several genera of the lower families (Tineidæ) tubercles iv and v are scarcely approximated or even remote and out of line.* But taken together, the exceptions tend to eliminate themselves. As I am only combining two classifications, some gaps may occur.

In the second primary division vein 1c is absent from the wings and larval tubercles iv and v are remote. In some Dioptriidæ there is a partial development of vein 1c on hind wings, but the larval characters are normal.

First division. I have divided this into three super-families on larval characters but, as there appears to be no corresponding character in the venation, my Cossina and Anthrocerina must be united. Further, the Pterophoridaæ cannot be placed positively in the Cossina or Anthrocerina as different genera exhibit the characters of both divisions.

We have left, then, first, the Cossina (Microlepidoptera) with generalized wing veins and usually a frenulum, the larvæ with tubercle ii either present or disappearing by fusion with i; and,

* This is probably due to the generalized condition of these larvæ, which have retained the primitive arrangement of the setæ found also in stage I of the butterflies.

second, the Saturnia (Bombyces) with specialized wings, robust bodies and frenulum tending to disappear, the larvæ with tubercle ii disappearing by abortion by the first moult.

Second division. The super-families established on larval characters in this division seem to be quite corroborated by the imaginal ones.* It remains only to unite the Noctuidæ, Geometridæ, Arctiidæ and a few minor families under the term *Noctuina* to render the classifications identical. Indeed it will be seen that the only reason for giving such families as the Noctuidæ and Geometridæ greater than family rank has been the great number of species in each, and the consequent impression they have produced of a large and definite aggregation. Their differential characters do not warrant such a position.

We have then the super-families Noctuina, Sphingina and Rhopalocera, named in ascending order.

Antennæ filiform, pectinate, or rarely slightly thickened before the tip.

Larval tubercles iv dorsad to v except in a few instances when iv and v are in line.....**Noctuina.**

Antennæ fusiform, body robust, wings elongate, with distinct intercostal cell. Larval tubercles v dorsad to iv.....**Sphingina.**

Antennæ clubbed or knobbed at tip, or if simple, the anterior pair of feet partly aborted. Larval primary tubercles soon aborted, iv and v in line or iv dorsad to v when the mature armor is secondary.**Rhopalocera.**

I have not combined, as a third classification, Dr. T. A. Chapman's arrangement on pupal characters† because I have not undertaken to examine the subject personally and because I expect that Dr. Chapman will modify his arrangement somewhat before it is fully completed. As it stands, there are many things in correspondence with the views expressed here, but also many disagreements. I shall not attempt to analyze these at present.

* Contrary to the statement which I have formerly quoted from Weismann's "Studies in the Theory of Descent".

† Trans. Ent. Soc., London, 1893, pp. 97—119.

LIFE-HISTORY OF HETEROCAMPA OBLIQUA *Pack.*

By A. S. PACKARD.

The eggs of a female of this species which is of the form *brunnea*, were received from Providence, R. I., through the kindness of Mr. W. Dearden, July 13, and hatched at Brunswick, Me., July 20—21. It feeds on the oak. It was reared at Brunswick.

Egg.—Diameter, .9 mm. Of the usual hemispherical shape, moderately flattened above; shell under a lens seen to be finely pitted or shagreened; under $\frac{1}{2}$ inch, a eye-piece, marked with rather large hexagonal areas, with well marked, raised edges, but not distinctly beaded. The hole eaten in one side by the larva in escaping of the usual elongated kidney-shape.

Larva, Stage I.—Freshly hatched. Length, 3.5 mm. Head very large, much wider than the body, somewhat flattened in front; pitchy amber, smooth, unarmed, surface dull, not polished. On the 1st segment arising from a dark cervical plate is a pair of large branching horns with three large equal curved tines, which are pointed and densely spinose, the short stout spinules dark, quite different from *H. guttivitta*. One tine points forwards, one backwards and one laterally outwards. The body is purplish reddish, with no stripes or other marks, except a small pale yellowish transverse dorsal spot in front of the base of the 8th segment. No horns on the 2nd and 3rd thoracic segments. On the 1st abdominal segment is a pair of simple dark horns about as long as the segment is thick. On 2nd segment a pair of minute setæ; on 3rd a pair of blunt spines one-half as long and large as those on the 1st, and a slightly smaller pair on the last (10th) segment. End of body carried uplifted, and the two cylindrical anal legs blunt at the end and entirely dark. Thoracic legs blackish; the four pairs of middle abdominal legs dark livid. It molted July 27.

Stage II.—Length, 6 mm. Head reddish brown. Now all the horns have disappeared, those on the 1st thoracic segment only represented by two conical acute tubercles which are black at the tip and slightly forked, there being a small black supplementary spine on the inside of the main one. The two spines are wide apart and project out laterally. On 9th abdominal segment are

two twin minute black spinules situated close together. Body pale reddish, color of an oak twig, variegated with yellowish; a distinct linear dorsal line and a broad diffuse line on thoracic segments; an irregular series of large dorsal yellowish spots, those on abdominal segments 1—4, and 6, 7 and 9 being the largest. Anal legs moderately long, reddish.

Stage III.—It molted Aug. 1. Length, 8—9 mm. The head is now large, wider than the body, subtrapezoidal in front, rounded above, and slightly bilobed; pale in front, yellowish on the sides. An irregular pale reddish brown band on the vertex and on the sides enclosing in front four irregular reddish spots of the color of a dead leaf which may be called sere brown. Prothoracic spines now stout and pale reddish, ending in three black spinules. From each spine proceeds, a broad reddish brown band the color of a dead leaf, and enclosing a large oval yellowish spot which extends along the back of abdominal segments 1 to 4. This spot encloses two reddish lines which dilate four times enclosing a roundish white spot in each dilatation. On segments 5—7 is a long triangular whitish spot enclosing two short reddish lines which dilate twice, enclosing two narrow oval spaces. The back of segments 8 and 9 is reddish, the sides yellowish green, whitish; anal legs held up at rest; greenish with a red stripe within. The reddish portion of the body consists of irregular fine reddish and greenish-yellow lines, the former predominating.

Stage IV.—It molted Aug. 8, A.M., and ate up the cast skin before beginning to eat the oak leaves. Length, 12 mm. (Two days before this molt the lateral sere brown spots appeared as in this stage, but fainter.) By Aug. 12th it had become 20 mm. in length. The three prongs of the prothoracic spines as in stage III, reddish. Head a little broader and rounder than before, but with the same style of markings. The markings of the body as in stage III, but the greenish portion of the sides speckled with black. Dorsal spots as before; an irregular lateral sere brown spot just above the base of the 3rd thoracic legs, and still higher up on 1st abdominal segment is a contiguous spot, making an oblique band as in the other species. The reddish brown edging of the diamond shaped dorsal spot on abdominal segments 1 to 4 extends down to the base of the 1st pair of the abdominal legs. In this stage there is present a straw yellow infraspicular line, just touching the spiracles, and best marked on the abdominal segments, and above

on 2nd thoracic segment are similar yellow lines, not reaching the front edge of the prothoracic segment, nor extending behind the oblique sere brown band.

Stage I and last.—Described Aug. 29. Length, 40 mm. Now there are no prothoracic tubercles, but in place of each of them a very slight elongate flattened callosity. Head rounded, smooth, not so wide as the body; luteous, with a flesh-tint and slightly purplish; an ashy irregular band on each side of the head, above the ocelli, with scattered spots between. The body is thickest in the middle (much like Abbot's drawing) and pale flesh, marked with numerous irregular reddish pink wavy hair lines. The usual dorsal band is reddish, bordered with yellow, and enclosing a pale almost whitish band. From the prothoracic segments the two lines contract, dilating on the 3d thoracic segment, and becoming widest apart on the 2nd and 3rd abdominal segments and again widely separating on the 7th abdominal segment; the two lozenge-shaped spots thus formed enclose two parallel median pinkish lines. On the suranal plate the two lines unite to form a median pale sere brown band. Thoracic and abdominal legs pale, marked with red.

The freshly hatched larva differs from that of *H. guttivitta* in having no traces of tubercles or horns on abdominal segments 4 to 6; in the first pairs having tines of quite different shape, being thicker, and more spinose; these horns being dull chitinous, of the same hue as the head. The other dorsal tubercles are about one-quarter as long, not elbowed, and stouter in proportion, while those on the 8th segment are smaller.

EXPLANATION OF PLATE I.

- Fig. I. *Heterocampa obliqua* Pack.—Freshly hatched larva; *Ia*, dorsal view; *Ib*, spine on third, *Ic*, spine on eighth, *Id*, spine on ninth abdominal segment; *Ie*, prothoracic horns of stage I, enlarged.
- Fig. II. *Heterocampa obliqua* Pack.—Stage II; *Ila*, horns on first prothoracic segment.
- Fig. III. *Heterocampa guttivitta* Walk.—Horns in stage I; *a*, prothoracic horn; *b*, one on second abdominal, *c*, one on third to fifth, and *d*, on ninth abdominal segment.

A CLEW TO THE ORIGIN OF THE GEOMETRID MOTHS.

By A. S. PACKARD.

In examining the pupa of *Phryganidia californica*, and finding the more essential features to be as much like those of the Geometrid moths, as any other group, I came upon results entirely unexpected to myself, and which give a clew to the origin of this great group of moths. It has become evident that *Phryganidia* can neither be placed among the Zygaenidæ, or Syntomidæ, though possessing some pterogostic features like those of the latter group.

Another fact considered was that the larva of *Melanchroia* (*M. cephise* and *M. geometroides*), formerly associated with the Lithosiidæ, have been shown by Dewitz to be Geometrids. Another is the absence of a pair of legs in the Nolidæ, which I find must by their pupal and other characters be regarded as a distinct family from the Lithosiidæ. Still another fact is the conclusion I have arrived at that the Lithosiidæ have almost directly descended from the Tineidæ or an extinct group closely allied to them, and that from the Lithosiidæ have arisen not only the Dioptidæ (perhaps including *Phryganidia*), the Cyllopodidæ and Hypsidæ, but also the Syntomidæ and Nyctemeridæ, as well as the Arctiidæ.

On reexamining the larva, pupa and imago of *Phryganidia* (we have no knowledge of the transformations of the genuine Dioptidæ as at present limited); it has seemed to me that it has little of fundamental value to separate it from the Geometrid moths.

First as to the larva of *Phryganidia*: while in the shape of the head and the slender cylindrical body it differs little from the larva of *Melanchroia*, and of Geometrids in general; if the three anterior pairs of abdominal legs were atrophied, there would be no essential difference. That this is probable is seen in the larva of *Volva* which has but four pairs of abdominal legs, one pair being atrophied.

The end of the body (8th abdominal segment) is humped, but the larvæ of the East Indian *Eusemia* and *Hypsa* are also humped at the end of the body. *Phryganidia* only differs in being slenderer, and without hairs, and seems more closely allied to the larvæ of the Hypsidæ than to those of any of the allied groups. It does not spin a cocoon.

The pupa is obtected, and in its essential features more like that of Geometrids than Lithosiidæ or any Zygaenid or Syntomid

genera. It is naked and suspended by a remarkably long cremaster; the end of the abdomen is otherwise peculiar. The head presents no vestigial characters; there being no trace of maxillary palpi, of paraclypeal pieces, or apparently of labial palpi. With a complete knowledge of all its stages, it is still difficult to assign it a definite position. When we know more about the Dioptidæ, where it probably belongs, the problem may approach a solution, but that its affinities are closely with the Geometridæ is shown by comparing the pupa with that of *Cleora*. In the general shape of the head, of the eyes, of the front, and especially of the abdomen, the resemblance is close; the peculiar shape and markings of the last three abdominal segments are nearly identical in both genera, though the cremaster of *Cleora* is much shorter.

In this connection reference should be made to the striking resemblance between the pupæ of *Oeta aurea* and *Cleora pulcherrima*. To my great astonishment I find the pupa of *Cleora* has the same vestigial head-characters as *Oeta*; the general shape of the pupa is the same; the mode of dehiscence the same, the shape of the vertex and its mode of separating when the moth issues from the pupa case; also the shape of the eyes, of the peculiar clypeus and labrum, while the more pronounced vestigial characters are the labial palpi, forming a triangular area, and the large semi-detached paraclypeal pieces. *Cleora* shows that it is a more modern form in having no traces of a vestigial eye-collar (maxillary palpi) such as occur (though very slightly developed) in *Oeta*. The shape of the end of the body, with the cremaster, is much the same, the shorter cremaster of *Cleora* being an adaptation to its life in a slight open-work cocoon. In the peculiar markings of the 8th and 9th abdominal segments *Cleora* is more like *Phryganidia*.

Judging by the pupal characters, then, the Geometrids have directly descended from the Lithosiidæ, the latter, as I have satisfied myself, having directly originated from the generalized Tineina.

The imago of *Phryganidia* appear not to differ much from those of the Dioptidæ to which it has been referred by Butler. I am unable to see any important differences between the Dioptidæ and Cyllopodidæ, though my material is scanty. In the slender body, shape of the head, and proportions of the clypeus, shape of antennæ and palpi, both of these families do not essentially differ from *Melanchroia* which is now known to be a Geometrid, nor from the Geometrids themselves.

In its venation *Phryganidia* is nearly identical with that of a

Josia from Jalapa, Mexico, in my collection; the peculiarity is the origin of veins II₂ and III₃ from a common stem, in which *Phryganidia* apparently differs from some if not all other Dioptidæ. But the venation of the Dioptidæ (including *Phryganidia*) and of the Cyllopodidæ is nearly identical with that of *Melanchroia*, and the latter is a true Geometrid in its venation, and in the shape of its larva, being a looper; of its pupa we know nothing. The venation of the Geometrids is very persistent. Hence I conclude that the day-flying usually bright colored Dioptidæ and Cyllopodidæ, as well as the Hypsidæ, are direct off-shoots from the Lithosian stem, and their general resemblance to such Lithosians as *Crocota* and *Eudule*, as well as *Ameria*, is based on real affinity. The day-flying habits of some Geometrids is also well known. The larva of *Euphanessa* is a Geometrid, but its moth has been usually associated with the Lithosiidæ, though its venation is Geometrid. Riley describes the larva of *Octa aurea* as having "extremely small" anterior abdominal legs, the anal being much larger. Probably when we learn more of the transformations of the families we have mentioned it will be found that the presence or absence of certain abdominal legs will be found to be a secondary adaptational character. It is noticeable that the dull colored *Phryganidia* with only incipient clouds instead of bars and spots is a primitive form as regards markings.

After an examination of the pupal and imaginal characters of Geometrids, Dioptids, Hypsids and Syntomids it seems to me that all these groups represent more or less parallel lines of development which originated from the generalized Lithosiidæ, the latter, with the Zygænidæ, having sprung from generalized Tineina. The Nolidæ represent a side branch, which evolved from a Lithosian perhaps like *Clemensia*. The Arctiidæ have also apparently directly descended from the Lithosiidæ. The Syntomidæ and Nyctemeridæ which seem closely allied by larval characters have also directly descended along another line from the Lithosiidæ.

Finally it appears that the Geometridæ are a more primitive type, and have no relationship to the Noctuidæ, the latter having more or less directly descended from the Agaristidæ, the latter from the Hypsidæ or allied forms perhaps extinct. The fact that the young larvæ of many Noctuidæ have only two pairs of legs has no phylogenetic significance.

In this preliminary abstract space has prevented giving details and figures to prove the truth of the assertions and conclusions here presented.

DOMED BURROWS OF CICADA SEPTENDECIM.

By BENJAMIN LANDER.

In 1877 a remarkable phenomenon connected with the advent of the periodical Cicada -- the so-called seventeen-year "locust", (Fig. 1) was observed at Rahway, N. J. — On opening a cellar which had been closed up to the time that the pupæ (Fig. 2) issued from the ground, the floor was found to be studded with small, hollow, cone-like structures, built of mud, which had been constructed as extensions of Cicada burrows. The attention of Professor J. S. Newberry having been called to the circumstance he deemed it of such importance that he secured specimens, and obtained a detailed statement of the features of the case, signed by several leading citizens of Rahway, and published the account in the School of Mines Quarterly of Columbia College, Jan. 1886; and in a separate illustrated pamphlet. As the Professor made no mention of ever having seen like structures before, the inference is natural that he had not.* Indeed, so rare were they prior to the advent of the same brood in 1894, that few entomologists had seen them, and no accurate description existed. Last year, countless numbers of these hut-like domes were observed at various places.

On the fourth of May 1894, while in the woods on the summit of South Mountain, at Nyack, N. Y., I came upon a spot that had recently been burnt over. On this area I observed vast quantities of the Cicada structures, entirely closed, averaging about two and a half inches in height; the aggregation ending at the very edge of the burnt section. So thickly studded was the ground that often eight or ten would be found in the space of a square foot; in one case I counted twenty-three in such a space. Subsequent explorations showed that the Cicada city extended over an area of not less than sixty acres. Eight large aggregations were discovered by me on top of the Nyack hills and the Palisades, covering many acres, and one near a stone quarry at a lower elevation; none of them in a place subject to overflow. Later, when only the ruins of the domes remained, I visited two areas where large numbers had been found; one in ground thinly covering massive sandstone, and another hard by a quarry, where the top soil was thin. An account of the discovery was published in *The New York Times*, and in the *Scientific American* of Oct. 16th. I offered

* Previously described and figured by Walsh and Riley (see *Am. Ent.*, Vol. I, 1868, p. 65).
Wm. B.

an attempt at an explanation of the mystery; a criticism of my theory appeared in the issue of Nov. 10th, and my reply in that of Nov. 27th; to all of which the reader is referred.

Hitherto it has been supposed that the object of these domed extensions was to protect the burrows from overflow of water, and that when found on high ground they had been built by pupæ that had inherited the instinct from ancestors that had lived in "low, wet places". But this theory has been completely overthrown by the fact that millions of domed burrows were found on the summits of lofty elevations, not "subject to overflow", at Nyack, and many other places visited, and none of the vast army of builders chose "low, wet places"; notwithstanding that the lower levels swarmed with the insects, the ground in many places having been honey-combed with their open burrows. One salient fact is worth a volume of generalizations; but further proof that the theory is untenable will be offered hereinafter.

The explanation I have advanced as to the cause of the interesting phenomenon is based on the fact that in order to be revived so much in advance of pupæ which later emerged from open burrows, the dome-builders must have been near enough to the surface to feel the vivifying effects of abnormal, unseasonable warmth. Of course it must be remembered that our sensation of warmth as to degree and that of the insects are two entirely different things.

In the Rahway case the features of abnormally high temperature (compared to that outside,) and shallow burrows are self-evident. The excavation had reduced the depth of the pupæ from the surface. The heat of the sun on the exterior of the enclosure would reach the chamber by conduction and be stored up; making the temperature practically the same night and day, since the warmth could not be carried off by radiation. Thus we often see vegetables sprouting in cellars in the depth of a cold winter. It is altogether logical to suppose that sufficient warmth would obtain to reach the pupæ in their artificially shortened burrows and revive them. Having opened their shafts while undeveloped their reason impelled them to close the orifices, perhaps in an attempt to lessen the too rapidly developing warmth, and as a protection against mice and other vermin. The tubular form of the roof showing the "persistence of habit"; their seventeen-year underground work having been of that nature. The normal temperature out-

side, and the radiation carried off by the breeze, prevented an early revival of the unsheltered pupæ; which at their proper season emerged from open shafts.

A somewhat similar case is where domed burrows were observed near Washington at a former advent, in a thick pine grove. Here, the protection from the wind by the deep, overhanging curtains of the evergreens, would prevent, in a measure, a too rapid waste of the diffused warmth; while the constant radiation by night of absorbed heat stored up by day among the thick foliage would tend to offset the loss from the ground; rendering the temperature like that in the cellar, practically the same, day and night; doubtless raising it enough over that in the exposed places outside (where the wind would act as a fan,) to supply sufficient warmth to revive the pupæ: it may be only a week or two before those not thus protected. This, of course, is assuming that the domed burrows were shallow — the pupæ nearer the surface than those outside, which might have been the case for one or more of several reasons: the insects might not have burrowed much or any below their root-supplies, from which they obtain subsistence, or from other causes which will be referred to later.

If this theory of unusual warmth and shallow burrows is to hold, the temperature at the time the millions of domes were built on the Nyack hills and the Palisades must have been far above normal, and the localities must have had features that would prevent deep burrowing. It is susceptible of proof that these conditions existed. March of 1894 was unusually warm: the hottest March on the records of the New York weather Station, extending to 1870, and was 223 degrees in excess of normal. At Nyack it was even warmer, as shown by published records. Wild flowers blossomed a month ahead of their season. Even as far up as Poughkeepsie, where domed burrows were found, the recorded temperature was practically the same as at New York. A large part of the dome areas had been burnt over early in March. In these places the combined natural and accidental heat no doubt brought the pupæ speedily to the surface. Even where the leaves and underbrush had been burnt off the preceding Fall the heat of the sun would sooner penetrate the bare ground.

The Nyack hills and the Palisades are composed of massive rock; their summits ground off by glacial action. These heights are thinly covered with earth; the extreme elevations, more or

less level, are, naturally, less covered than elsewhere. It was in such places that the domes abounded; those found over quarries and elsewhere, previously alluded to, were, like those in higher areas, personally examined by me, and all were found to be in shallow earth. This feature furnishes the second condition of the theory; the first is a matter of indisputable record.

Among the places where domed burrows were found in thin soil were Nyack; Upper Nyack; South Nyack; Grandview and Piermont; and on top of the Palisades near Alpine; Closter; Demarest; Cresskill; Englewood; New Durham and Fort Lee. Several of these areas had been burnt over.

A correspondent writes me that in a dome area observed by him the structures were built after a fire, as shown by their containing burnt twigs. But this is just what would occur after a fire: The builders would come in contact with them in their work and they would be incorporated. I have many such specimens. A professional entomologist who visited the same spot writes that the case I reported from Nyack to the *New York Times* (wherein it was stated that the ground had been burnt over before the domes were built,) so fitted to the one observed by him that he was inclined to think it was an account of the one he had seen, and that the name of the locality had in some way been changed. It is not claimed that fire is necessary to revive the pupæ; but it is evident that in some cases it has been effectual; in others the abnormal heat of the sun was sufficient.

Professor John B. Smith reports that the structures were found near a quarry at Newark, N. J., and at Port Jefferson, in the same state. In the latter case vast numbers were observed by Dr. J. Howard Willets who possesses substantial proof that they were built five or six days after a forest fire; the domes close together, and ending abruptly at the edge of the burnt area.

It is not claimed that all the dome aggregations were in soil over rocks. The burrows might have been shallow from a variety of causes. In one case reported there was a sub-stratum of coarse sand, too incoherent for burrowing. In other places the sub-soil might have been wet, peaty, or gravelly. Even in deep soil some pupæ would be nearer the surface than others, and if near enough to be prematurely revived by the heat would erect their protective domes; among which the open burrows of the deeper pupæ would

later appear. Exactly such a case — open burrows among the domes, has been reported to me by a well known entomologist.

A unique illustration of the protective function of the dome is shown in a circumstance which occurred during a former advent of the Cicadas. A scientist and writer on entomology informs me that some laborers in cutting through a bank laid open the burrow of a pupa: Soon after, "upon the fresh, vertical cutting there appeared one of these 'huts' rising from the opening". Here was a *shallow burrow* (artificially so.) *prematurely opened*; the *undeveloped pupa* erecting a shield against the vicitudes of external temperature; which would also serve as a protection against outside enemies: a perfectly logical analogism.

Perhaps enough substantiating facts have been adduced, but two features of the cases observed by me are so significant that they lend extreme probability to the explanation I offer, and certainly disprove the heredity theory. First: No open holes occurred in the areas over the smooth glacial-worn rocks — there the soil was almost uniformly shallow; and it is beyond belief that what few "low ground" builders in the past that might have stolen horse-back rides to the mountain tops and the lofty Palisades, should have chosen just such prescribed places, and have utterly annihilated the open burrow builders — native to the soil. Second: A wide and deep gully (of course subject to overflow,) in the area of the largest Cicada city had no domed burrows, as there the earth was deep, from the alluvial deposits of ages, but later, when the great swarm arrived, this hollow was found to be honey-combed with open holes.

In conclusion, with reference to the causes and purposes of the domes, in view of what has been adduced it seems altogether likely that every one, no matter when or where observed, was erected by an undeveloped pupa that had prematurely opened its burrow from near the surface, and closed it as a protection while awaiting maturity.

Previous accounts erroneously state that these heretofore rare objects have an orifice at the surface of the ground. When the time for moulting arrives a hole is clawed through the roof (Fig. 3). A unique specimen in my collection shows the cast-off shell of a pupa firmly fixed in the opening: the hole had been made too small for entire emergence, but the little fellow had been able to escape from his horny armor. Many specimens show clear im-

pressions of leaves (Fig. 4); proving that the fine clay or forest mould, worked with a cement exuded by the insect, was quite plastic. It would seem that the thin claws of the pupa were too inadequate for carrying very soft material. It may be that the little miner and mason is his own hod-carrier; conveying his load of plaster to the walls of his building on his head: a conjecture that would seem fanciful indeed were it not for the fact that the intelligent creature when burrowing downward, does what amounts to practically the same thing. Having displaced a pellet he cleverly places it on his head, and by a turn of his body carries the pellet to the earth above and presses it in.

From personal observations I am inclined to think that the structures are built at night; the builders beginning work at twilight, for the same reason that they choose that time to emerge from their burrows to moult; as the absence of the sun's heat in one case would prevent the exuding cement from drying, and keep the rim of the dome moist for cohesion; in the other the wings would not dry too rapidly for full expansion. Hoping that I might see the pupæ at work I broke off the tops of several domes, but after long watching observed no attempt at repairs. All but two or three were finally roofed over, but on the inside, considerably below the rim (Fig. 5); probably on account of being damper there, or that the pupæ could more readily prepare the inner wall for the masonry by smearing it with the adhesive cement. Among the multitude of domes a few were found that had been left unfinished. Doubtless the builders had been captured by crows, or other foragers. They afford an interesting illustration of the manner of placing the pellets on the rim. (Fig. 6.)

The scope of this article is confined to a record of observations and analyses of salient facts. Much that might be considered of interest to entomologists must remain unwritten for want of space. But I trust some light has been thrown on what has been considered one of most marvelous of the phenomena connected with insect life. If the explanation offered is the true one, it would seem to render still more diaphanous the supposititious veil between "instinct" and reason, and emphasize our impressions of the long pathway that has been trodden by our little friends and predecessors.

LOCAL ENTOMOLOGICAL NOTES.

Members of the New York Entomological Society and all others, are solicited to contribute to this column, their rare captures, local lists and other items of interest relating to the insect fauna of New York city and vicinity.

THE ODONATA OF NEW YORK STATE.

By PHILIP P. CALVERT, Philadelphia, Pa.

The object of the present paper is to extend our knowledge of the distribution of the dragonflies in New York State, by recording collections made by several persons, and by bringing together such data as have been previously published.

The literature treating of the New York Odonata exclusively, consists, as far as the writer is aware, of the following articles.

E. Emmons: Agriculture of New York, etc., . . . together with descriptions of the more Common and Injurious Species of Insects. Vol. V, Albany: Printed by C. Van Benthuysen, 1854. (Being part of the Natural History of New York published by Authority). The Odonata are briefly referred to as the Libellulidæ on pp. 184—185, and illustrated in colors on plate 15. No explanation of these figures is given, other than that fig. 5 represents *Libellula pulchella* Drury, fig. *f* its larva and fig. 4 perhaps a variety. When I visited Cambridge in July, 1890, Dr. Hagen showed me a copy of this work in which he had identified these figures as follows. Fig. 1. *Cordulia* (*Somatochlora*) *Lintneri* Hag. ♂. Fig. 2. *Gomphus brevis* Hag. ♂. Fig. 3. *Anax junius* Dru. ♂. Fig. 4. *Plathemis trimaculata* De Geer ♂, Fig. 5 id. ♀.

W. Beutenmüller: in Dragonflies vs. Mosquitoes (The Lam-born Prize Essays), New York, D. Appleton & Co., 1890, gives on pp. 163—164, a Preliminary Catalogue of the Odonata found in the State of New York. It consists of only names of 50 species, those found in the vicinity of New York City being marked with an asterisk. This catalogue is referred to below as (Be).

N. Banks: The Odonata of Ithaca, N. Y., in the Canadian Entomologist, xxvi, pp. 76—78. March, 1894. Forty-eight species from Ithaca and other localities are mentioned, with brief notes. Quoted below as (B).

W. T. Davis: Two additions to the local list of dragonflies in

Proceedings of the Natural Science Association of Staten Island, iv, pp. 52—53. December 8, 1894. (D).

A number of species are recorded from New York in papers of a more general scope, as mentioned below.

For the collections which are now first recorded, the writer is indebted to —

Mr. J. Percy Moore, who gave specimens from Lake St. Regis, Franklin Co., and Hotel Champlain, taken in September, 1890, quoted below as (M);

Mrs. A. T. Slosson, who sent dragonflies from various localities, as indicated by (SI);

Mr. G. D. W. Williamson, who made collections at Dobb's Ferry in 1888 (W);

Mr. W. Sheraton, who collected in Keeseville, Essex Co., in 1894 (S).

A few specimens taken by the writer at Saratoga Lake in August, 1889, are included (C).

Finally, some data are derived from the collections of the American Entomological Society (A. E. S.)

Mr. Sheraton also sent some notes on the general character of the localities near Keeseville at which his collections were made, and which are here reproduced.

“As to the dragonflies, they were all obtained along a section, of the length of about a mile, of a small and rather sluggish brook flowing from Auger Lake by an extremely circuitous and tortuous course to the Au Sable river. The section in which the collecting was done includes, first a rough pasture field, the brook in this part being pretty thickly bordered on one side by alders, so that collecting was chiefly confined to the opposite bank, near which there were also several large holes from which clay for brick-making was formerly dug. These are now full of stagnant water, and abound in animal and plant life. All my collecting was done here (locality 1), except the last two days, which were devoted to the part of the brook below this. At the lower end of this first portion, the brook passes under a bridge into “locality 2”, where it is bordered by hay-fields at first, then by rough pasture land. One day [Aug. 10] was devoted to this portion, and one [Aug. 16] to “locality 3” which follows it, and is bordered entirely by hay-fields. Of these three divisions 2 and 3 are practically identical in character and in species observed, but

I found them to differ considerably from "locality 1", 1st, in the much greater abundance of the form marked No. 31 [*Heterina americana*], and 2nd, in the absence of many forms found in locality 1, especially of the larger forms as No. 14 [*Libellula pulchella*]. The difference, I imagine, was chiefly, if not entirely, due to the presence in locality 1 of the clay-holes. Had my health been better than it was this summer, and the weather less intensely hot, I might have visited a number of other localities, and obtained, I think, a better collection. One thing that struck me rather forcibly was the fact that in the summer of 1893, when I was around the brook to some extent for other purposes, a large dragonfly with body of a brilliant metallic green was very numerous and conspicuous along the whole length at least of locality 1, while this year, with the exception of a single specimen which I think I saw one day when out driving, they were absolutely lacking wherever I went. Another thing that I noticed is that the larger dragonflies seldom make their appearance as early in the morning as the smaller forms, these latter being quite numerous between 9 and 10 of a bright morning, while the big ones, or at least those marked 12 and 14 [*Libellula pulchella*], seldom appeared until near 11 in the part where I was collecting. I was unable to procure any immature forms".

The list of species derived from all the sources above mentioned comprises 85, if not 86, species. The aim has been to give the precise locality in each case. Where this is not possible, and merely the State can be quoted, the place of original record has been given. Species not previously mentioned as from this State in the above cited papers, or in the catalogues of American Odonata of Hagen 1875 and of Banks 1893, are marked by an asterisk (*). The arrangement of the species is the same as in the writer's Catalogue of the Odonata of the vicinity of Philadelphia (Trans. Am. Ent. Soc. xx, pp. 219—272, 1893), in which the majority of the following species are described.

Subfamily CALOPTERYGINÆ.

1 **Calopteryx maculata** *Beauvois*.

One male, Keeseville, June 9, 1894. "Seemed very rare. The only specimen I obtained was picked out of the grass by the brook, in a limp condition, when the grass was wet. I never again saw this form, except a few times in June, flying about the grounds of

'Clawbonny'. when no net was at hand" (S). Westchester Co., New York (Be). Ithaca, common about streams in spring and summer (B).

*2. **Calopteryx æquabilis** Say.

Keeseville, one female, Aug. 4, 1894.

3. **Calopteryx dimidiata** Burm., race **apicalis** Burm.

Westchester Co., New York (Be).

*4. **Calopteryx amata** Hagen.

One male, Keene Valley, Essex Co., July 4, 1890, N. Y. St. Coll., sent to me for identification by Dr. Lintner, apparently belongs here, but differs from Hagen's description (*Psyche*, v, p. 244) as follows: General color brassy green instead of brassy blue; the small yellow band on the side of the thorax is on the second instead of the first suture; wings 7 mm. wide at nodus, instead of 9 mm; 7-8 quadrilaterals.

5. **Hetærina americana** Fabr.

Keeseville, three males, six females, Aug. 10, 16, 1894 (S). Ithaca, one specimen (B).

Subfamily AGRIONINÆ.

6. **Lestes eurina** Say.

Dobb's Ferry, three males, July 7, 10, 23, 1888 (W).

7. **Lestes congener** Hagen.

Lake St. Regis, one male, two females, Sept. 22, 1890 (M).

8. **Lestes unguiculata** Hagen.

Westchester Co., New York (Be).

9. **Lestes uncata** Kirby (*forcipata* HAGEN 1861, *hamati* SELYS 1862).

Keeseville, one female, July 26, 1894. Ithaca, uncommon, August (B).

10. **Lestes disjuncta** Selys.

Lake St. Regis, one male, Sept. 22, 1890 (M). Keeseville, six males, eight females, July 26—August 4, 1894 (S). Ithaca, uncommon, August (B).

11. **Lestes forcipata** Rambur (*hamata* HAGEN, 1861).
New York City (Be). Ithaca, not comon, June (B).
12. **Lestes rectangularis** Say.
Dobb's Ferry, three males, one female, July 10, 23, 1888 (W).
New York City (Calverley—Hagen 1861). Ithaca, common during
July and August (B). Saratoga Lake, Aug. 15, 1889 (C).
13. **Argia putrida** Hagen.
Niagara, one male (Sl). Ithaca, common, summer (B).
14. **Argia violacea** Hagen.
Keeseville, eleven males, July 6, Aug. 1, 4, 1894 (S). Dobb's
Ferry, July 7 to Aug. 15, 1888 (W). Ithaca, common, July (B).
15. **Argia bipunctulata** Hagen.
"New York", Banks, Trans. Am. Ent. Soc., Vol. xix, p. 349.
16. **Erythromma conditum** Hagen.
Ithaca, one specimen (B).
17. **Nehalennia irene** Hagen.
Ithaca, uncommon, July (B). No specimens of *N. posita*
appear to have been recorded from his State, although it most
probably occurs.
18. **Amphiagrion saucium** Burm.
Westchester Co., New York (Be). Ithaca, one specimen (B).
19. **Enallagma cyathigerum** Charp., var. **annexum** Hag.
Keeseville, one male, June 12, 1894. Ithaca, two specimens,
August (B).
20. **Enallagma civile** Hagen.
Saratoga Lake, eight males, two females, Aug. 15, 1889 (C),
see. Trans. Am. Ent. Soc., Vol. xx, p. 237.
21. **Enallagma** sp. n.
Niagara, two males, one female (Sl).
22. **Enallagma ebrium** Hagen.
Keeseville, thirteen males, eight females, June 9 to July 31,
1894 (S). Ithaca, two specimens (B). Catskill Mts., one male
(A.E.S.).

23. **Enallagma Hageni** *Walsh*.
 "A specimen in the Cornell Univ. collection is probably this species" (B).
24. **Enallagma traviatum** *Selys*.
 Long Island, one specimen (B).
25. **Enallagma aspersum** *Hagen*.
 Dobb's Ferry, four males, July 7, 10, 1888 (W). New York (Be).
26. **Enallagma divagans** *Selys*.
 Long Island (B).
27. **Enallagma exsulans** *Hagen*.
 Keeseville, abundant, June 12—Aug. 10, 1894 (S). Saratoga Lake, Aug. 15, 1889 (C). Ithaca, quite common, July, August (B).
28. **Enallagma signatum** *Hagen*.
 "New York", Banks, Trans. Am. Ent. Soc., Vol. xix, p. 350.
29. **Ischnura verticalis** *Say* (*Ramburii* HAGEN, 1861).
 Niagara (Sl.). Keeseville, abundant, June 9—Aug. 10, 1894 (S). Dobb's Ferry, July 7, 10, 1888 (W). Saratoga Lake, Aug. 15, 1889 (C). New York (Be). Ithaca, common, July, August (B).
30. **Ischnura Ramburii** *Selys*. (*iners* HAGEN, 1861).
 "New York" (Hagen, 1861).
31. **Anomalagrion hastatum** *Say*.
 Keeseville, one *black* female, July 31, 1894 (S). New York (Be).

Subfamily GOMPHINÆ.

32. **Tachopteryx Thoreyi**
 "Environs de New York" (Selys, Mon. Gomph., p. 375).
33. **Hagenius brevistylus** *Selys*.
 "New York — Dr. Asa Fitch" (Hagen, 1861). A specimen in the Cornell Univ. collection (B). Westchester Co. (Be).
34. **Ophiogomphus rupinsulensis** *Walsh*.
 Ithaca, two specimen (B).
35. **Gomphus parvulus** *Selys*.
 Ithaca, one specimen (B).

36. **Gomphus brevis** *Hagen*.

"Schoharie, le male pris par M. Lintner" (Selys, Bull. Ac. Belg. — 2 — xlvi, p. 464, 1878). Emmons, *l. c. supra*, pl. 15, f. 2.

37. **Gomphus exilis** *Selys*.

Keeseville, one male, June 6, 1894 (S). Ithaca, quite common in June and July (B).

38. **Gomphus spicata** *Hagen*.

"Un male pris à New-York par M. Schaum" (Selys Mon. Gomph., p. 155, 1858). "New York, d'après un male adulte envoyé par M. Asa Fitch" (id., p. 414).

39. **Gomphus fraternus** *Say*.

Ithaca, one specimen (B).

40. **Gomphus adelphus** *Selys*.

Bethlehem, Albany Co., June 17 (Selys, Bull. Ac. Belg. — 2 — xlvi, p. 457).

41. **Gomphus villosipes** *Selys*.

Ithaca, not uncommon (B).

42. **Gomphus vastus** *Walsh*.

"New York" (Hagen 1875). Banks also mentions a female in the Cornell Univ. collection, of a species of *Gomphus* unknown to him.

43. **Dromogomphus spinosus** *Selys*.

Ithaca (probably), Baldwinsville by Mr. R. H. Pettit (B).

Subfamily CORDULEGASTERINÆ.

*44. **Cordulegaster diastatops** *Selys*.

"New York", three males (A. E. S.)

Sub-family AESCHNINÆ.

45. **Epiæschna heros** *Fabr.*

Dobb's Ferry, one female, Aug. 10, 1888 (W). New York, common (Be). Ithaca, in Cornell Univ. collection, June (B).

46. **Fonscolombia vinosa** *Say*.

Keeseville, one female, July 30, 1894, kitchen at 'Clawbonny' (S). Ithaca, one specimen, July 29 (B). Westchester Co. (Be).

*47. **Basiaeschna janata** *Say*.

Keeseville, one male, June 9, 1894 (S).

48. **Aeschna juncea** *L.*, var. **verticalis** *Hagen*.

"New York (Be).

49. **Aeschna clepsydra** Say.

Lake St. Regis, Sept. 5 to 22, 1890, abundant (M). Ithaca, uncommon, August (B). Catskill Mts., two males, Aug. 28, by E. M. Aaron (A. E. S.)

50. **Aeschna constricta** Say.

Hotel Champlain, one male, Sept. 21, 1890 (M). Watkin's Glen, one male (Sl.). Dobb's Ferry, Aug. 24, Sept. 14, 1888 (W). New York City (Be). Ithaca, common during July and August (B). Catskill Mts., one male, one female, Aug. 28, by E. M. Aaron (A. E. S.).

51. **Anax junius** Drury.

Ithaca, common during summer (B). Emmons, pl. 15, f. 3. Vicinity of N. Y. City, common (Be).

Subfamily CORDULINÆ.

52. **Didymops transversa** Say.

Keeseville, one male, June 9, 1894 (S). Ithaca, uncommon, June, July (B).

53. **Epicordulia princeps** Hagen.

Ithaca, in Cornell Univ. collection, June (B).

54. **Tetragoneuria cynosura** Say.

Ithaca, common in the spring (B). Lake George, one male (A. E. S.).

55. **Tetragoneuria semiaquea** Burm.

Ithaca (probably), Baldwinsville by Mr. Pettit (B).

56. **Neurocordulia Uhleri** Selys.

"New York" (Be).

57. **Somatochlora elongata** Scudder.

Ithaca, one specimen in Cornell Univ. collection, June (B).

58. **Somatochlora tenebrosa** Say.

"New York" (Be).

*59. **Somatochlora libera** Selys.

Catskill Mts., two females (A. E. S.).

60. **Somatochlora lepida** Selys.

Albany (Selys, Bull. Ac. Belg. — 2 — xxxi, p. 265, 1871).

61. **Somatochlora Lintneri** Hagen.

Center, four males, four females, May 27, 21 by Mr. J. A. Lintner (Hagen, Psyche, Vol. v, p. 373, 1890). Emmons, pl. 15, f. 1.

Subfamily LIBELLULINÆ.

62. **Tramea carolina** *Linn.*
Vicinity of New York City (Be). Not common.
63. **Tramea lacerata** *Hagen.*
Freeville, two specimens, May 31, 1889 (B)
64. **Libellula basalis** *Say.*
Dobb's Ferry, July 13, 1888 (W). Ithaca, uncommon, Aug. (B).
65. **Libellula auripennis** *Burm.*
Vicinity of New York City (Be).
66. **Libellula plumbea** *Uhler.*
Westchester Co., New York (Be).
67. **Libellula cyanea** *Fabr. (quadrupta SAY.)*
Vicinity of New York City (Be).
68. **Libellula axillena** *Westw., form vibrans (Fab.?) Kirby.*
Staten Island (D), Westchester Co. (Be).
- *69. **Libellula exusta** *Say.*
Lake George, one male (A. E. S.).
70. **Libellula quadrimaculata** *Linn.*
Vicinity of New York City (Be). Ithaca, a few specimens in the Cornell Univ. collection (B).
71. **Libellula semifasciata** *Burm.*
Dobb's Ferry, July 13, 1888 (W). Vicinity of New York (Be). Common.
72. **Libellula pulchella** *Drury.*
Keeseville, three males, two females, July 4—Aug. 4, 1894, very difficult to catch though numerous (S). Dobb's Ferry, June, July 7 (W). New York City (Be). Ithaca, common during spring and summer (B).
73. **Plathemis trimaculata** *De Geer.*
Dobb's Ferry, June (W). New York City and vicinity (Be). Ithaca, common during spring and summer (B). Emmons, pl. 15, f. 4 (♂), 5 (♀), f (larva).
74. **Micrathyria berenice** *Drury.*
Thousand Isles, one male (Sl). Vicinity of New York City (Be). Common.

75. **Nannothemis bella** *Uhler*.
Westchester Co., New York City (Be).
76. **Celithemis elisa** *Hagen*.
Long Island, New York (Be). Ithaca, one specimen by Prof. Morgan (B).
Celithemis ornata RAMBUR is to be looked for.
77. **Celithemis eponina** *Drury*.
Westchester Co., New York (Be). Not common.
78. **Leucorhinia intacta** *Hagen*.
Keeseville, ten males, July 4, 31, 1894 (S). Ithaca, not uncommon in the spring (B). Westchester Co. (Be).
79. **Diplax rubicundula** *Say*.
Lake St. Regis, two females, Sept. 14, 1890 (M). Keeseville, one male, July 4, one female, July 26, 1894 (S). Dobbs Ferry, July 13, 1888 (W). Vicinity of New York City (Be). Ithaca, common during spring and summer (B).
Diplax obtrusa HAGEN probably lives in New York.
80. **Diplax semicineta** *Say*.
Ithaca, uncommon, August (B). Staten Island (D), Westchester Co. (Be).
81. **Diplax costifera** *Hagen*.
"New York" (Hagen, 1875).
82. **Diplax vicina** *Hagen*.
Lake St. Regis, six males, five females, Sept. 17, 22, 1890 (M). Keeseville, three males, four females, July 26—Aug. 4, 1894 (S). Saratoga Lake, Aug. 15, 1889 (C). Vicinity of New York (Be). Ithaca, not uncommon, July, August (B). Dobb's Ferry, Nov. 8, 1892 (W). Catskill Mts., one male, Aug. 28, by E. M. Aaron (A. E. S.).
83. **Perithemis domitia** *Drury*.
Westchester Co., New York (Be).
84. **Mesothemis simplicicollis** *Say*.
New York City, Westchester Co. (Be). Ithaca, one specimen by Mr. O. Takahashi (B).
85. **Pachydiplax longipennis** *Burm.*
Dobb's Ferry, July 7, 1888 (W). New York City, Westchester Co. (Be). Ithaca, common during spring and summer (B).

JOURNAL

OF THE

New York Entomological Society.

Vol. III.

JUNE, 1895.

No. 2.

NOTES AND DESCRIPTIONS OF TACHINIDÆ.

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The forms referred to in the present paper belong to the Tachinidæ in which the apical cell terminates at or near the tip of the wing, the fourth vein is entire, eyes bare, the proboscis beyond its basal articulation shorter than height of head, palpi well developed, abdomen bearing true macrochaetæ.

The genera mentioned below separate as follows:

First vein bristly.

Fifth vein also bristly **Gymnopareia** *B. and B.*

Fifth vein bare

Face perpendicular, third vein bristly over half way to the small crossvein

Lasioneura n. gen.

Face strongly retreating, third vein bearing only two or three bristles near the base..... **Chaetophleps** n. gen.

First vein bare.

Palpi flattened, unusually dilated, wider than the proboscis, over one-third as broad as long. **Lispidea** n. gen.

Palpi cylindrical, sub-clavate, less than one-fourth as broad as long.

Antennæ only half as long as the face. **Clytiomya** *Rond.*

Antennæ nearly or quite as long as the face.

Third vein bristly at least two-thirds of the distance to the small crossvein **Thryptocera** *Macq.*

Third vein at most bristly on its basal third.

Facial ridges bristly on more than the lower half.

Sides of face bristly above lower end of eyes. **Admontia** *B. and B.*

Sides of face bare. **Pseudomyothyria** *Town.*

Facial ridges never bristly to the middle.

Penultimate joint of arista over twice as long as broad,

Clausicella *Rond.*

Penultimate joint scarcely or not longer than broad.

Sides of face pilose, each nearly half as wide as the median depression **Crytomeigenia** *B. and B.*

Sides of face bare, each less than one-fourth as wide as the median depression **Hypostena** *Meig.*

Gymnopareia *B. and B.* To this genus belongs *Thryptocera americana* Town.

Lasioneura, n. gen.

Front at vertex one-fourth wider than either eye, frontal bristles descending about to base of second antennal joints, two pairs of orbital bristles in both sexes; face perpendicular, lower part of head slightly longer than at base of antennæ, sides of face bare, each about one-fourth as wide as the median depression, the latter not carinate in the middle; ridges nearly straight, moderately diverging, their lower ends widely separated; vibrissæ stout, inserted near the oral margin, only two or three small bristles above each; cheeks from one-fourth to one-third as broad as height of eyes. Antennæ nearly as long as the face, the third joint three or four times as long as the second; arista pubescent, the penultimate joint about as long as broad. Eyes bare. Proboscis beyond the basal articulation shorter than height of head; palpi well developed, sub-clavate. Abdomen oval, of four segments which are sub-equal in length, macrochætæ only marginal; genitalia slightly protruding in the male, hidden in the female. Hind tibiæ not ciliate. First vein partly or wholly bristly, third bristly over half way to the small crossvein, the others bare; apical cell open at tip of wing, hind crossvein about midway between the small crossvein and the bend, the latter arcuate, last section of fifth vein about one-fifth as long as the preceding section. Type:

Lasioneura johnsoni, sp. nov.

♂—Front and face yellow, vitta next the antennæ four times as wide as either side of front. Proboscis black, palpi yellow. Antennæ black, the first two joints yellow; arista thickened on the basal three-fifths. Thorax black, gray pollinose, marked with two brown vittæ, three post sutural bristles; scutellum black, two pairs of long marginal macrochætæ. Abdomen black, the broad lateral margins of the first two segments and front angles of the third, yellow; shining excepting the gray pollinose bases of the last three segments; first segment destitute of dorsal macrochætæ, second with a marginal pair, third and fourth each with a marginal row of six. Femora yellow, tibia and tarsi brown, claws and pulvilli very small; a slender black spine at apex of each hind coxa. Wings hyaline, first vein bristly over its entire length, the third bristly three-fourths of the distance to the small crossvein.

♀ Differs from the ♂ in having yellow of abdomen confined to the first segment and front angles of the second. Length 5 mm.

Washington. Two specimens from Prof. O. B. Johnson, after whom the species is named.

Lasioneura palloris, sp. nov.

♀—Differs from *johnsoni* as follows: Wholly yellow, abdomen shining, the base semi-transparent, the apex sometimes tinged with brown; tarsi brownish. Frontal vitta next the antennæ twice as wide as either side of front. Arista of antennæ thickened on the basal two-fifths. Thorax gray pollinose, destitute of brown vittæ; four post-sutural macrochætæ; scutellum bearing three long marginal and a

very short apical pair of macrochaete. Ten macrochaete in the marginal row on the third abdominal segment. Coxæ destitute of spines. Wings grayish hyaline, first vein bristly on its apical third, the third bristly on nearly its entire length. Length 5 mm.

New Hampshire. Four specimens in the National Museum.

Chætophleps, gen. nov.

Front of female at vertex slightly wider than, in the male as wide as, either eye, frontal bristles descending about to tip of second antennal joint, two pairs of orbital bristles in both sexes; face strongly receding, sides bare, each about one-tenth as wide as the median depression, the latter with a low carina in the middle-ridges strongly diverging, their lower ends widely separated, vibrissæ strong, inserted near the oral margin, ridges bristly on slightly over their lower half, cheeks less than one-fifth as broad as the eye-height. Eyes bare. Antennæ about as long as the face, the third joint over four times as long as the second; arista pubescent, thickened to the middle, the penultimate joint scarcely longer than broad. Proboscis beyond the basal articulation shorter than height of head, palpi clavate, well developed. Abdomen elongate oval, its four segments in the female sub-equal in length, in the male with a fifth segment half as long as the fourth, macrochaete of second and third segments discal and marginal in the female, only marginal in the male. First vein bristly at least on its apical half, the third bearing a few bristles at its base, the others bare; apical cell open or short petiolate, terminating near the wing-tip; hind crossvein nearly perpendicular, about midway between the small crossvein and the bend, the latter arcuate. Hind tibiæ not ciliate. Type:

Chætophleps setosa, nov. sp.

♂, ♀ —Head black, frontal vitta next the antennæ sub-equal in width to either side of the front. Antennæ and proboscis black, palpi yellow, third antennal joint of nearly an equal width, four times as long as wide. Thorax black, the sides and a median vitta in front of the suture, whitish pollinose, three post-sutural macrochaete; scutellum black, bearing three long marginal pairs of macrochaete. Abdomen shining black, bases of the segments except the first narrowly whitish pollinose; first segment in the female bearing a marginal pair, the second with a discal and a marginal pair, the third with a discal pair and a marginal row of ten, fourth with a discal pair, a discal lateral and a marginal row of six macrochaete; in the male the discal macrochaete are wanting. Legs black, wings hyaline, calypteres whitish. Length 4 mm.

Maryland. One pair captured by the writer in June.

Lispidea, gen. nov.

Front of female at the vertex about one-half wider than either eye, frontal bristles descending about to middle of second antennal joint, two pairs of orbital bristles in the female, face perpendicular, lower part of head nearly as long as at the base of antennæ; sides of face bare, each about one-ninth as wide as the median depression; vibrissæ inserted near the oral margin, ridges bristly on the lower fourth,

cheeks nearly one-third as wide as the eye-height. Antennæ as long as the face, the third joint two and one-half times as long as the second; arista thickened to the middle, the penultimate joint nearly half as long as the last one. Eyes bare. Proboscis beyond the basal articulation shorter than height of head; palpi flattened, unusually broad, widening from the broad base to the first third, then of nearly an equal width, scarcely over twice as long as wide, broader than the proboscis. Abdomen oval of four segments which are sub-equal in length, macrochæte only marginal. Hind tibiae not ciliate. Third vein with a few bristles at its base, the others bare; apical cell open at the wing-tip, hind crossvein nearly perpendicular, about midway between the small crossvein and the bend, the latter arcuate, last section of fifth vein about one-fourth as long as the preceding. Type:

Lispidea palpigera, sp. nov.

♀—Head black, frontal vitta next the antennæ sub-equal in width to either side of the front, face in profile evenly concave. Antennæ and proboscis black, labella large, yellowish, palpi yellow; third antennal joint slightly widening to the tip, twice as long as broad. Thorax black, gray pollinose, marked with four dark gray vitta, three post-sutural macrochæte; scutellum black, bearing two long and a shorter lateral, also a very small apical pair of macrochæte. Abdomen black, basal half or more of the last three segments gray pollinose; first segment without, the second with a marginal pair, the third with a marginal row of eight, the fourth with a marginal row of six macrochæte. Legs black, claws and pulvilli shorter than the last tarsal joint, front tarsi not dilated. Wings hyaline, calypteres whitish. Length 4 to 5 mm.

Illinois. Five specimens from Dr. W. A. Nason.

Clytiomyia Rond.

Rondani has called attention to the fact that *Clytia* Desv. (1830) is preoccupied by Lamarck in the *Polyps* (1812), and by Huebner in the *Lepidoptera* (1816), and proposes the above name for the present genus (*Dipt. Ital. Prod.*, IV., 9).

Clytiomyia punctata, sp. nov.

♀—Wholly yellow, excepting the eyes, bristles, a black dot near base of costa and a small black cloud on the small crossvein. Front at vertex two-thirds as wide as either eye, frontal bristles descending to base of second antennal joint, vitta next antennæ four times as wide as either side of the front, two pairs of orbital bristles; face in profile concave, vibrissæ stout, inserted at lowest fourth of the face, two or three bristles above each; cheeks less than one-fourth as broad as height of eyes. Antennæ half as long as the face, the third joint one and one-half times as long as the second, nearly twice as long as broad; arista thickened on the basal fifth, the penultimate joint broader than long. Proboscis beyond the basal articulation half as long as height of head, labella large, palpi slightly clavate. Thorax with three post-sutural bristles, scutellum bearing three long marginal pairs. Abdomen destitute of dorsal macrochæte on the first two segments, the third with a marginal, the fourth

with a discal row of ten. Claws and pulvilli much shorter than the last tarsal joint; front tarsi not dilated. Wings hyaline, costal and marginal cells, except base of the latter, yellow, a small deep black cloud on the small crossvein; third vein bearing four bristles at its base, the others bare; apical cell open slightly before the wing-tip, hind crossvein somewhat oblique, nearly midway between the small crossvein and the bend, the latter angular, apical crossvein strongly curved inward, small crossvein distinctly beyond apex of first vein; calypteres whitish. Length 5.5 mm.

Florida. A single specimen from Mrs. A. T. Slosson.

Clytiomyia exile, sp. nov.

♂—Differs from above description of *punctata* as follows: Occiput, thorax, scutellum and abdomen, except sometimes the sides of the first two segments, black; no black spot near base of costa nor on the small crossvein. Front at vertex less than one-third as wide as either eye, frontal bristles descending only to base of antennæ, vitta next the antennæ sub-equal in width to either side of the front, no orbital bristles; vibrissæ inserted at lowest third of face, not stouter than the bristles below them, cheeks one-half as broad as the eye-height. Antennæ having the third joint one-fourth longer than the second, one-third longer than broad. Thorax gray pollinose, marked with four blackish vittæ. Abdomen gray pollinose, macrochaete of fourth segment in a marginal row of eight; genitalia protruding half the length of the fourth segment. Wings hyaline, tinged with yellowish, bend of fourth vein arcuate; hind calypteres yellowish. Length 6 to 8 mm.

New Hampshire (Mrs. Slosson) and Maryland. Two specimens.

Clytiomyia atrata, sp. nov.

♂—Differs from the description of *punctata* as follows: Wholly black except the palpi; no black spot near base of costa nor on the small crossvein. Eyes almost contiguous, vitta next the antennæ sub-equal in width to either side of the front, cheeks one-third as broad as the eye height, no orbital bristles; vibrissæ not stouter than the bristles below them, inserted at lowest third of the face. Third joint of antennæ one-fourth longer than the second, one-third longer than broad. Proboscis slender, the last section three-fourths as long as height of head, labella small. Thorax grayish pollinose, with four blackish vittæ. Abdomen whitish pollinose, macrochaete of fourth segment in a marginal row of eight, genitalia slightly protruding. Wings pure hyaline, extreme base yellowish, only a single bristle at base of the third vein, fourth vein arcuate at the bend. Length 7 mm.

Washington. A single specimen from Prof. O. B. Johnson.

Thryptocera *Macq.*

In their work on the Muscidæ Calypterata (Zweif. Kais. Museums Wien, iv., p. 102, and vi., p. 150). Brauer and Bergenstamm erroneously credit this genus to Meigen: it was first described by Macquart (Hist. Nat. Dipt., II., pp. 87-88, 1835). Meigen's re-description appeared three years later (Syst. Besch., VII., p. 242, 1838), and he cor-

rectly credits the genus to Macquart. Brauer and Bergenstamm commit another error in giving as the type of this genus the *Tachina latifrons* Meigen, a species neither described nor mentioned by Macquart at the time of establishing this genus, and hence cannot by any possibility be regarded as the type of this genus. Macquart accompanied his description with a figure of *Tachina bicolor* Meigen, and expressly refers to it at the end of the description; this species, therefore, must be the true type of *Thryptocera*. In accordance with these facts I have given this genus the place it occupies in the above table, and refer the following species to it:

Thryptocera dunningii, sp. nov.

♀—Head black, front at vertex broader than either eye, vitta next the antennæ sub-equal in width to either side of the front, frontal bristles descending nearly to tip of second antennal joint, two pairs of orbital bristles; sides of face bare, each one-ninth as wide as the median depression; vibrissæ inserted near the oral margin, ridges bristly on lowest third, cheeks one-seventh as broad as height of eyes. Antennæ black, as long as the face, third joint three times as long as the second; arista thickened on the basal third, the penultimate joint slightly longer than wide. Proboscis black, the last section much shorter than height of head, labella and palpi yellow. Thorax and scutellum black, lightly blueish white pollinose, three post-sutural macrochaete; scutellum bearing three long lateral and a scarcely smaller apical pair. Abdomen shining black, base of the third segment white pollinose; first segment destitute of dorsal macrochaete, second with a marginal pair, third with a marginal row of eight, fourth with a marginal row of six; genitalia sub-cylindrical, sometimes protruding three-fourths of the length of the fourth abdominal segment. Legs black, claws and pulvilli much shorter than the last tarsal joint. Wings hyaline, third vein bristly almost or quite to the small crossvein, the others bare, apical cell open slightly before the wing-tip, hind crossvein near last third of the distance between the small crossvein and the bend, the latter arcuate. Length 5 mm.

Illinois (Dr. Nason) and Connecticut. Six specimens. Those from Connecticut were received from Mr. Ralph Dunning, for whom the species is named.

Admontia pergandei, sp. nov.

♀—Wholly black, including the palpi. Front at vertex nearly twice as wide as either eye, vitta next the antennæ sub-equal in width to either side of the front, frontal bristles descending to tip of second antennal joint, two pairs of orbital bristles; face in profile slightly convex, each side one-third as wide as the median depression, covered on the upper part nearly as far as the lower end of eyes with short black bristly hairs, ridges bristly on the basal two-thirds, cheeks slightly over half as broad as the eye-height. Antennæ nearly as long as the face, third joint five times as long as the second, of nearly an equal width, about six times as long as broad; arista thickened to slightly beyond the middle, the penultimate joint scarcely longer than

broad. Thorax gray pollinose, marked with four black vittæ, three post sutural macrochæte; scutellum bearing three long lateral and a minute apical pair. Abdomen shining, narrow bases of last three segments white pollinose; first segment with a marginal pair of macrochæte, second with a discal and marginal pair, third with a discal pair and a marginal row of ten, the fourth with a discal and sub-marginal row of eight each. Hind tibiæ sub-ciliate, claws and pulvilli much shorter than the last tarsal joint, front tarsi noticeably broader than the middle ones. Wings grayish hyaline, third vein bearing a few bristles at the base, the others bare, apical cell open or closed in the margin almost at the wing-tip, hind crossvein nearly midway between the small crossvein and the bend, the latter arcuate.

♂ Same as the ♀ with these exceptions: Third joint of antennæ seven times as long as the second, arista thickened on the basal four-fifths, the penultimate joint over twice as long as broad, front tarsi only slightly wider than the middle ones. Length 5 to 8 mm.

Dist. Columbia. One male and five females, two of which were collected by Mr. Th. Pergande, for whom the species is named.

Admontia nasoni, sp. nov.

♀ — Differs from the above description of *pergandei* only as follows: Palpi, basal half of arista and extreme base of third antennal joint, yellowish. Front at vertex one-half broader than either eye, frontal bristles descending only to base of second antennal joint. Wings whitish at base, dark brown beyond the small crossvein, the portion behind the fifth vein, and behind the last section of the fourth vein, hyaline, a hyaline spot in apices of submarginal, first posterior and of the discal cell; only one bristle at base of third vein. Length 7 mm.

Illinois. A single specimen from Dr. W. A. Nason, after whom this handsome species is named.

Pseudomythyria tortricis, sp. nov.

♀ — Head black, front at vertex one-third broader than either eye, vitta next the antennæ three-fourths as wide as either side of front, frontal bristles descending to base of third antennal joint, two pairs of orbital bristles; face in profile slightly convex, the sides bare; ridges bristly to slightly above the middle, cheeks one-third as broad as the eye-height. Antennæ black, nearly as long as the face, third joint slightly over three times as long as the second, slightly widening to the apex; arista thickened on basal third, penultimate joint shorter than broad. Proboscis black, last section not half as long as height of head, palpi yellow. Thorax and scutellum black, whitish pollinose, thorax with indications of four black vittæ, three post sutural macrochæte; scutellum bearing three long lateral and a very small apical pair of macrochæte. Abdomens shining black, bases of last three segments white pollinose; first segment destitute of dorsal macrochæte, second with a discal and marginal pair, third with a discal pair and a marginal row of ten, the fourth with a discal row of ten and a sub-marginal row of six. Legs black, claws and pulvilli shorter than the last tarsal joint. Wings hyaline, third vein with a few bristles at base, the others bare, petiole of apical cell nearly half as long as the hind crossvein. Length 5.5 mm.

Southern California. A single specimen bred August 15, 1890, from a Tortricid (?) larva that lives in a nest formed by fastening several leaves together, on *Solanum douglassi*.

Clausicella tarsalis, sp. nov.

♀—Head black, front at vertex one-half wider than either eye, vitta next the antennæ subequal in width to either side of the front, frontal bristles descending about to middle of second antennal joint, two pairs of orbital bristles; face perpendicular, in profile evenly concave, the sides bare, each one-ninth as wide as the median depression, ridges bristly on the lower fourth; cheeks nearly one-third as broad as the eye-height. Antennæ black, as long as the face, the third joint two and one-half times as long as the second, twice as long as broad; arista thickened to slightly beyond the middle, the penultimate joint nearly half as long as the last one. Proboscis black, the last section three-fourths as long as height of head, palpi black, sub-clavate. Thorax black, gray pollinose, with four dark vittæ, three post-sutural macrochæte; scutellum black, bearing two long and a short lateral, also a very small apical pair of macrochæte. Abdomen shining black, bases of the last three segments white pollinose; first segment without dorsal macrochæte, second with a marginal pair, third with a marginal row of eight, the fourth with a marginal row of six. Legs black, claws and pulvilli shorter than the last tarsal joint, front tarsi much wider than the middle ones. Wings hyaline, third vein with a few bristles at the base, the others bare, apical cell open at the wing-tip, hind crossvein nearly perpendicular, about midway between the small crossvein and the bend, the latter arcuate. Length 3 mm.

Illinois. A single specimen from Dr. W. A. Nason.

Clausicella antennalis, sp. nov.

♂—Differs from the above description of *tarsalis* only as follows: Third joint of antennæ five times as long as the second, greatly broadening to the apex which is truncated, three-fourths as broad as long; arista thickened on the basal three-fourths, the penultimate joint nearly as long as the last one. Front tarsi not dilated. Length 3 mm.

Southern California. A single specimen, in February.

Emphanopteryx theutis Walk. Syn. *Emphanopteryx eumythyroides* Town.

The latter description was founded on a female, not male, as the author supposed. Both sexes are before me from the same locality as Townsend's type (Ithaca, N. Y., from Mr. F. H. Chittenden). The male has no orbital bristles and the femora are more or less black, as Walker describes them. I have also examined three specimens from Franconia, N. H. (Mrs. A. T. Slosson), and ten from Illinois (Dr. W. A. Nason).

Hypostena variabilis, sp. nov.

♀—Head black, front at vertex slightly broader than either eye, vitta next the antennæ sub-equal in width to either side of the front, frontal bristles descending to tip of second antennal joint, two pairs of orbital bristles; face in profile strongly convex, the sides bare, ridges bristly on lower two-fifths or less, vibrissæ inserted at the oral margin; cheeks one-fourth as broad as the eye-height. Antennæ black, nearly as long as the face, the third joint about four times as long as the second, nearly four times as long as broad; arista thickened on the basal third, the penultimate joint broader than long. Proboscis black, the portion beyond the basal articulation much shorter than height of head, labella yellowish; palpi clavate, yellow. Thorax black, gray or yellowish pollinose, with four black vittæ, three post-sutural macrochaetæ; scutellum black, with three pairs of long marginal macrochaetæ and sometimes a very small apical pair. Abdomen black, bases of last three segments grayish pollinose; first segment with a marginal pair of macrochaetæ, second with a marginal and usually a discal pair, third with a marginal row of eight and usually a discal pair, fourth with a discal row of eight and a sub-marginal row of six. Legs black, claws and pulvilli much shorter than the last tarsal joint. Wings hyaline, third vein bearing a few bristles at the base, the others bare; apical cell ending slightly before the wing-tip, open or closed in the margin, hind crossvein nearly midway between the small crossvein and the bend, the latter arcuate, small crossvein slightly beyond the middle of the discal cell.

♂—Differs from the ♀ having the front only as broad as either eye, no orbital bristles, and the claws and pulvilli of front tarsi as long as the last tarsal joint. Length 4.5 to 6.5 mm.

Illinois (Dr. Nason). New Hampshire (Mrs Slosson) and Maryland. One male and fourteen females, June to September.

Hypostena barbata, sp. nov.

♂—Same as the above description of *variabilis* with these exceptions: Front equal to either eye, vitta next the antennæ one-fourth wider than either side of front, face in profile convex on upper part, concave below, ridges bristly almost to the middle. Palpi black. Discal pair of macrochaetæ on the second and third abdominal segments always present.

♀—Differs from the ♂ as follows: Front scarcely over half as wide as either eye, vitta not wider than either side of front, no orbital bristles, face evenly concave, claws and pulvilli as long as the last tarsal joint. Length 5 mm.

New Hampshire and Southern California. Two males from the former locality, received from Mrs. Slosson, and two females from the latter locality, taken by the writer in March.

Hypostena ænea, sp. nov.

♀—Differs from the above description of *variabilis* as follows: Face in profile strongly concave, only one or two bristles above each vibrissæ. Third joint of antennæ only three times as long as broad, greatly widening to the apex; arista thick-

ened on the basal three-fourths, the penultimate joint slightly longer than broad. Palpi black. Scutellum bearing only two pairs of long marginal macrochaete. Abdomen shining black with a bronze luster, bases of second and third segments narrowly white pollinose; first segment destitute of dorsal macrochaete, the second and third destitute of discal ones. Apical cell open at the wing-tip. Length 4 mm.

Southern California. A single specimen, in March.

Hypostena pusilla, sp. nov.

♀—Differs from *variabilis* as follows: Front two-thirds as wide as either eye, face slightly concave. Third joint of antennae nearly three times as long as the second, only twice as long as broad. Palpi black. Apical cell open at the wing-tip. Length 3 to 4 mm.

Illinois (Dr. Nason) and Southern California. Three specimens.

Hypostena degeerioides, sp. nov.

♀—Same as *variabilis* with these exceptions: A row of short, black, bristly hairs extends just outside the facial ridges, from frontal bristles to lower end of eyes; cheeks nearly half as broad as the eye-height. Third joint of antennae nearly six times as long as broad; arista thickened nearly to the middle, the penultimate joint slightly longer than broad. Palpi black. Thorax shining except the whitish pollinose sides and a median vitta in front of the suture. The discal pair of macrochaete present on the second and third abdominal segments, the discal row absent on the fourth. Front tarsi nearly twice as broad as the middle ones, the last joint shorter than the preceding. Wings grayish in front of the third vein, small crossvein at middle of discal cell. Length 6 mm.

Illinois (Dr. Nason) and District Columbia. Two specimens.

**A VARIETY OF THE LARVA OF SPHINX
PLEBEIUS.**

BY WM. BEUTENMULLER.

Head olive pink with numerous flesh-colored, elevated dots. Body olive pink with the oblique bands on each side olive, and a stripe of the same color along the subdorsum, broken posteriorly by the oblique bands. Anal horn bluish gray, rather dark above, with elevated black dots. Body covered with numerous, minute, flesh-colored dots, placed in transverse rows; body at sides olivaceous. Underside wholly olivaceous with a pinkish tinge. Length 65 mm. Found July 23d. Food plant trumpet vine (*Tecoma*).

NOTES ON TWO CALLIMORPHAS.

By HARRISON G. DYAR.

Last Summer Dr. Lintner obtained eggs from some ♂ Callimorphas at Keene Valley in the Adirondacks, and gave them to me to raise. There proved to be two species, *lecontei* and *confusa*.

Haploa lecontei *Guerin.*

Egg.—Resembling the eggs of *confusa* but very pale yellow, and scarcely shining. Reticulations small, close, evident and rounded, casting shadows in the depressions; they differ chiefly from those of *confusa* in being deeper and smaller. Diameter .7 mm. The eggs failed to hatch, though the embryos advanced nearly to the point of biting the shell.

Haploa confusa *Lyman.*

Mr. Lyman has given descriptions of about four stages in Can. Ent., Vol. XIX., p. 186.

Egg.—Spherical with the base a little flattened, adherent; smooth, shining rather dark yellow; reticulations obscure, but becoming evident in certain lights, very narrow, linear, irregular, the meshes moderately large. Diameter .7 mm. Mr. Lyman does not mention the reticulations.

First Stage.—Head shining black over the apices of the lobes, but the whole clypeus pale yellowish; mouth brown; width .35 mm. Body yellowish, the cervical shield black, bisected; warts very large, shining black, each with a single long seta. The arrangement is not exactly that of the mature larva as Mr. Lyman states, because wart vi is lacking. Wart iv is situated directly behind the spiracle, as near to iii as to v. A long seta on the leg-plate.

Second Stage.—Head, cervical shield, anal plate, warts and legs shining black; body whitish with a broad brown dorsal band, extending to wart iii, but paler centrally so as to be almost reduced to two subdorsal bands. Hair black and white mixed, short, bristly; four or more hairs from each wart; wart vi present, elongate, as distinct as the others. Width of head .5 mm. Later, dorsally and laterally whitish, with a yellowish segmental mark just above wart iv; subdorsal bands slaty brown, connecting dorsally in the incisures.

Third Stage (interpolated stage?).—Head black, width .6 mm. A broad, irregular grayish white dorsal line; a blackish subdorsal

band between ii and iii, rather irregular; a broad pale band over iv, marked with yellowish above each wart (iv); a grayish subventral shade over v. Warts and feet black; hair short, stiff, not very abundant, black and white mixed.

Fourth Stage (normal third?).—Head shining black; width .7 mm. Warts black; body brown black; a broad white dorsal line and very narrow subdorsal one (ii); a bright yellow stigmatal line indented a little by iii and iv, between which it runs. Hair short, bristly, inconspicuous, black and white mixed. Feet blackish; venter white in a broad stripe between the feet, interrupted only by black at wart viii on joints 5 and 6.

Fifth Stage (normal fourth?).—Head shining black, width 1.05 mm. Black, a rather broad dorsal line, straight, sordid white, becoming yellowish between warts ii; very narrow subdorsal and subventral, pale, obsolescent lines; a bright yellow stigmatal line, transversely streaked on the folds. Feet black, a broad, defined, pale ventral band, nearly white. Hair short, bristly.

Sixth Stage (interpolated stage).—Black; width of head 1.2 mm. A distinct yellow dorsal and stigmatal line, the latter the broader and composed of transverse streaks on the annulets; traces of a subventral band, whitish; warts large, hair very short but abundant, bristly, black. No subdorsal line, or the merest trace of one. Claspers of abdominal feet pale; venter white.

Seventh Stage (interpolated stage).—Head 1.3 mm. Black, head and warts shining, hair short, bristly. Dorsal line yellow, distinct; stigmatal line broken into four dots on each segment, the anterior and two posterior transverse and yellow, the second longitudinal and white; a few subventral pale yellow dots. Feet black, venter nearly white.

The larvæ showed a disposition to hibernate, but as they had been transferred to the warmer climate of New York they were unable to do so, and after passing two more molts than normal (?) finally died. The calculated widths of head are: .35, .50, (.59), .73, 1.05, (1.24), ((1.36)), 1.5, 2.1 mm.; ratio .70 for the normal series, .84 for the first interpolated stages, one parenthesis, and .91 for the secondary interpolated stage enclosed in two parentheses. Under the most favorable conditions, this larva should have six stages and hibernate in the fourth.

ON THE FOOD HABITS OF CERTAIN DUNG AND CARRION BEETLES.

By CHARLES UPSON CLARK.

It is not generally known, I believe, that many of the beetles frequenting carrion and dung, feed to a greater or less extent on the maggots—fly larvæ—which they find therein. My attention was first called to this habit two summers ago. While collecting from a dead woodchuck which teemed with specimens of *Silpha surinamensis*, I saw a fly seized by one of the beetles, held up in the air and sucked dry. Looking more closely, I discovered that the *Silphas* were feeding on maggots, not as I had always supposed, on decaying matter. By careful observations made since then at Charlemont, Mass., on beetles found on dead squirrels and woodchucks and in dung, I have come to the conclusion that these beetles may be roughly separated into three divisions, according to the character of their food.

In the first division—those which feed on the dung or carrion wholly—I would place the Scarabæidæ, *Copris*, *Trox*, *Geotrupes*, *Aphodius*, the *Trichopteryx* grade and *Cercyon* and allied genera. It is possible, of course, that these latter small beetles, some very minute, feed on microscopic larvæ, but they seemed to be feeding on the dung or carrion.

Then come those which feed on the maggots to a limited extent. Such are *Silpha americana* and *S. noveboracensis*, *Necrophorus*, *orbicollis*, *tomentosus* and *americanus*.

The third division comprises those which feed almost exclusively on larvæ. Here belong *Necrophorus marginatus*, *Silpha lapponica*, *S. surinamensis*, *Hister immunitus*, *fædatus*, *furtivus* and *depurator*, *Saprinus patruelis*, *Creophilus villosus*, *Listrotrophus cingulatus*, *Staphylinus mysticus*, *fossator* and *Philonthus* sp. I have no doubt that the smaller Staphylinidæ so abundant in such situations are also animal feeders, though I could not take them in the act. *Clerus quadriguttatus* I have frequently taken devouring Scolytid larvæ, and I feel sure that *Necrobia*, *Thaneroclerus*, etc., will be found to feed on maggots.

I hope that collectors in other localities will send the JOURNAL their observations on this subject. I cannot believe that the habit has not been noticed before; but I can find no mention of it in the books I have consulted, and I believe that collectors generally have gone on the supposition that these beetles feed on the substances in which they are found.

NOTES ON A COLLECTING TOUR IN CONNECTICUT.

By R. L. DITMARS.

The Naugatuck River district of Connecticut is a collecting ground so rich in material that it seems queer to me, of it's not being mentioned more by our local collectors. For the last four years I have made short trips to the Capitol, Hartford, and hearing so much about the beautiful Naugatuck Valley, determined to spend my vacation in that district.

Last July found me in the heart of the Naugatuck Hills, at the little village of Greystone, about four miles from Waterbury. Here the hills are about 900 to 1,000 feet high, covered with a rich vegetation, and probably offer some northern forms in the line of Lepidoptera.

Besides being interested in entomology, I am also interested in herpetology, and was highly delighted when informed that the rattlesnake was found in this district, and it is a fact that where the deadly *Crotalus* is found, collecting is apt to be very good, as it shows that few have been in that locality. My first specimen taken in this district was a fine fresh specimen of *Smerinthus myops*, which flew into my window on the night I arrived.

The first few days were devoted to collecting in the valley, and here I noticed the larvæ of *Limenitis disippus* feeding on the willow. *Papilio asterias* and *troilus* were abundant, *turnus* more rare, only one variety *glaucus* was seen; *P. cresphontes* was rare; *Pieris rapæ* was not seen at all; *Argynnis cybele* was very abundant, *idalia* rather scarce, *myrina* abundant, both in the valley and on the mountain side: *Satyrus alope* and *nephele* were rather common. *Debis portlandia* seemed very scarce, only one battered specimen was seen during my stay. Heterocera were well represented; it was on a very warm day at noon that I happened to be passing along an unused road, and in stepping into the shade to rest noticed across from me a little dell in which the milk-weed was flowering; seeing something dart past and enter, I followed and found it to be a specimen of *Hemaris diffinis*. In half an hour ten good specimens were bottled, after which I could see no more; so after taking some very large *Argynnis cybele*, left the place, intending to return next day; the next day I did return and for an hour looked for *Hemaris* and caught only one, the last one taken during my entire stay, although the weather continued much the same and I hunted diligently.

One day, while making my way up a little stream on a raft, I noticed that most of the *Hygrotrachus* were spotted with red, and seeing one of a bright vermilion color, dart off, determined at once to investigate, thinking that it might be a new insect. After capturing the insect, was very much surprised to find it covered with the larvæ of *Trombidium*. It is a common occurrence to find the *Trombidium* larvæ on numerous Orthoptera and Diptera, but to find them on an aquatic insect seemed truly remarkable, and especially so in this case, as the *Hygrotrachus* never leave the water to go on shore, and how the *Trombidium* larvæ became transfixed to such lively insects is a mystery.



SCENE ON MT. TOBY.

Orthoptera were exceedingly numerous; all day could be heard the sharp song of the *Orchelimum*; the Katy-did (*Platyphyllum concavum*) was absent, however, seeming to prefer the more level farm lands in the lower part of the state.

It was at Greystone that I first became acquainted with that remarkable and beautiful grasshopper, *Spharagemon saxatile*. It was on a trip up Mt. Toby, the highest of the hills. Ascending by way of an old logging path; occasionally a *Cicindela sexguttata* would run ahead a short distance and alight in the path again, only to repeat the performance on my coming up to him; when passing the clearings *Vanessa*

milbertii would be seen, and offered a hard chase over the rough rocks. A beautiful species of *Eristalis* (*E. bastardi*), would occasionally be seen on the cardinal flowers, looking exactly like a brightly colored bee. On passing a pit of clay baked dry by the sun, I indifferently kicked over a loose piece, and underneath was a fine specimen of *Cychnus elevatus*; it surprised me to find a *Cychnus* in such a place, as there was no vegetation in the pit, which was very dry and offered no food for snails.

On up the mountain side an occasional *Thecla* and *Argynnis* would be seen. *Cicada canicularis* was making the woods ring with its sharp notes. When nearing the summit, on rather barren ground, a species of grasshopper, *Circotettix verruculatus*, was very abundant, rising by the dozen, and making a sharp crackling noise as it flew. Here an old rotten log which I stopped to investigate yielded 130 specimens of *Phenolia grossa*, and were at once named "turtle bugs" by the country boy with me.

At last on the summit, and there on the lichen-covered rocks was looking into the valley below and enjoying a magnificent view of the surrounding country. Hill after hill rose in wild confusion, covered with dense growth of fir and other trees. The enormous rock on which I stood sloped downwards in a dangerous incline to a ledge about four feet wide, from which was a precipice of fully three hundred feet, at the bottom of which began the thick woods of the mountain side.

Happening to glance at the ledge, there to my joy was the long looked for *Crotalus*. It lay tightly coiled with its long string of rattles elevated in the centre of its folds, the beautiful sulphur tints of its velvety scales showing vividly in the sunlight. Slowly and carefully I made my way down toward him, assisted by the handle of my butterfly net, which also served as a snake stick, but when half way down the wily snake saw me coming, and, preferring security rather than combat, retreated into a hole in the cliff totally inaccessible to me. Slowly making my way up, and when near the top, I saw in front what appeared to be a slight bump on the rock; but on coming up to it there was a flash of yellow wings and it flew off. After a perilous chase the insect was captured and it proved to be *Spharagemon saxatile*. So exactly did it mimic the lichen-covered rock that I would surely have passed it had it not moved. Mr. Beutenmüller, of the American Museum of Natural History, informs me that the insect has only recently been discovered. It seemed to be rare, for in my entire stay only one more was seen, and that in the same locality, on the rocks at an elevation.

A rather peculiar incident occurred while out after a woodchuck one day. Not seeing the animal after an hour's hunt, I took a shot at a passing swallow, and as it fell in front of me on level ground it disgorged what seemed to be a large berry, but on examining more closely, found it to be a ball of insects most of which were alive. It was composed of nearly a dozen winged ants, some gnats, two specimens of a small *Agrion*, five specimens of Chysomelidæ of three species, two *Casnonia* and some small Hemiptera. As some of the insects were good they were soon in my collecting bottle. Thinking that this might be an exception, I shot two more swallows, and both had the ball of insects in the mouth. The time was 6:30 p. m. This is the first time that I ever hunted insects with a gun.

When back in the city about two weeks, I noticed that one of the snakes caught during my vacation seemed to have an obstruction in the throat, and, on examining him, found the throat infested with what looked like dipterous larvæ of large size. Wishing to keep the snake alive, I removed them all with a pair of forceps and preserved them. The snake was *Heterodon platyrhinos*, popularly termed the "hog-nose," or "blowing adder," was nearly a yard long and at the thickest part of the body one and a quarter inches in diameter. This is the first time that I have heard of a dipterous parasite on Ophidia.

During my stay in Plymouth County I made several trips to adjacent towns, Reynold's Bridge offering good collecting, especially at an elevation. At Plymouth, high up among the hills, was a collector from Brooklyn; he informed me that he was doing good work in the Lepidoptera, particularly the Heterocera, and had some good Coleoptera on hand.

As a great deal of my time in this region was devoted to collecting venomous Ophidia, I had not the time to gather any large quantity of insects, but what work I accomplished in the entomological line showed the nature of this rich collecting ground.

To a collector having ample time to stay in any one place, the Naugatuck Valley offers fine collecting for the summer. Here along the Naugatuck River he may find both hill and valley collecting, and also stretches of pine growth.

The region is easily accessible from New York City by the N. Y., N. H. & H. R. R. to Bridgeport, thence by the Naugatuck Division.

TWO CALIFORNIA PHALANGIDS.

By NATHAN BANKS.

Eurybunus spinosus, sp. nov.

Length 7 mm.; femur I 3 mm. Grayish brown above, a blackish mark on each side of base of abdomen outlining a paler central stripe; sides and venter gray, minutely dotted with silvery; eye tubercle with a white stripe above; femora I and III brown, with a pale ring on middle; tibiæ I and III brown, mottled with pale; femora and tibiæ II and IV whitish, with irregular brown spots; all metatarsi pale, tarsi ringed with brown at false articulations; palpi pale, spotted with brown, black at tips. Eye-tubercle low, smooth; two small elevations on anterior margin of cephalothorax, but bearing no spinules; a transverse row of small spinules behind eye-tubercle; about eight transverse rows of spinules on the abdomen; femora and patellæ tipped with some spinules; legs and palpi clothed with short stiff black bristles; no false articulation in metatarsus I, one in tibia II; last joint of palpus straight, once and one-half as long as preceding joint, palpal claw without teeth.

Habitat: Los Angeles, California.

Mitopus californicus, sp. nov.

Length 7 mm.; femur I, 4 mm. Grayish above, indistinctly mottled with white and brown; vase-mark not distinct; femora and tibiæ with brown bands near base and tip. Some spinules grouped in front, and some on each side of cephalothorax eye-tubercle about its diameter from anterior margin, two rows of spinules above; basal joints of legs with five rows of prominent spinules; and a row on each segment of the body; palpi short, last joint slightly curved, longer than three plus four, palpal claw smooth; no false articulations in any tibiæ, one in metatarsus I; tibia II much longer than metatarsus II.

Habitat: Los Angeles, California.

Similar to the eastern *M. montanus* Banks, but not so strikingly marked, and tibia II is much longer than metatarsus II (a trifle shorter in *M. montanus*).

NOTES ON DREPANID LARVÆ.

By HARRISON G. DYAR, A. M.

We have four genera of this interesting little family in North America, and each is represented by probably but a single species; at least there seem to be only four different larvæ.* The moths greatly resemble Geometrids in appearance and habits, but differ in venation. The larvæ differ from all their allies in the absence of the last pair of

*See Proc. Boston Soc. Nat. Hist. XXIV, 492, where Dr. Packard quotes the observations of Mr. S. L. Elliot, that the larvæ of *O. rosea* and *O. irrorata* are alike.

feet and the presence of a longer or shorter tail-like process at the end of the last segment. The crotchets of the abdominal feet are peculiar, as they are arranged in a complete circle, such as is found in the Microlepidoptera, except that the crotchets on the outer half of the foot differ from those on the inner half. This seems to show that the structure is a case of secondary adaptation.

The eggs are indistinguishable from Geometrid eggs.

Oreta rosea *Walker.*

This is the most specialized larva. It is curious that the moth should belong to a genus found in India, yet there seems no essential structural difference.

The little larvæ may be found not uncommonly on all the species of viburnum. When newly hatched, the setæ can be made out, arranged in the normal manner of the Noctuid, iv behind the spiracle, vi absent. There are no secondary hairs, though the body is minutely roughened. The setæ are very short with enlarged tips. After the first moult the primary setæ become obscured by secondary ones, and later the larva is much roughened and its surface greatly modified. The larva lives freely exposed.

Platypteryx arcuata *Walker.*

As regards the length of "tail" this larva comes next, though in other characters it is more generalized than the following species. It has been fully described by Dr. Packard, but I believe the organ with which it produces its scratching sound has not been mentioned. The larva curls up the edge of a leaf of birch or alder by drawing threads over it, and covers the exposed upper part with a coarse netting. When disturbed, it contracts its body repeatedly, producing a scratching sound. The sound is caused by the friction on the leaf of two stiff shovel-shaped setæ, situated at the end of the last segment below the tail-like process. The primary setæ are distinct in the last stage, though supplemented by secondary ones.

Falcaria bilineata *Packard.*

This larva lives freely exposed on the leaves or stem of the white birch. The "tail" is short and upturned. The setæ are as in the preceding. I have recently described it.

Eudeilinea herminiata *Guenée.*

These curious little larvæ are common on the bushy species of dogwood (*Cornus stolonifera*, *C. paniculata*). They live singly, spin-

ning two leaves together, within which they remain concealed. The leaves are in no wise folded, but two naturally overlapping ones are united by several short, stout cross-bands of silk. The larvæ feed only on the undermost leaves, and on account of these habits there is no sign of their presence on the bushes, unless one attempts to separate the apparently simply overlapping leaves.

Egg.—Laid two to seven together on the under side of a leaf; elliptical, much flattened above and below, reticulations narrow, regular, somewhat rounded, with short pile at the angles. The surface of the cells between seems smooth. Color pale whitish green, shining. Size .7x .5x .4 mm.

Larva.—Head bilobed, rounded, clypeus large, shining, shagreened; color whitish, jaws and a shade below apex of each lobe in front yellow brown; two transverse bands connected by a strong band on the side of the head behind ocelli; lower band from base of jaw to ocelli, upper above clypeus, but obsolete centrally in the yellow cloud below apex. Body flattened, thoracic feet small, colorless, hairy below; abdominal feet on joints 7-10, normal as to the crotchets on the inside of the planta, but about six occur also on the outside; the inner row is dense, the hooks of different lengths, while those on the outside are single and remote; no anal feet, the fleshy plate produced into a short conic process. Setæ fine, short and very obscure, except at the extremities. Body smooth, translucent whitish with a green shade dorsally especially in the dorsal vessel; tracheal line evident by transparency, white; cervical shield hemispherical, whitish, shining, a gray shade at the lateral corners. Above and before the spiracle on joint 2 is a shining black elliptical spot, bearing two setæ, suggesting a parasitic attack to which this insect is subject.

Pupa.—Formed between leaves on the ground, with a few silken threads. When leaving the bushes to pupate the larvæ become suffused with reddish pink on the back. The pupa is dark brown, a little blackish tinged on the more exposed parts and especially on the veins of the wing-cases; a patch of white bloom on the collar and vertex of head. Three movable incisures. Length 10 mm.

Found commonly in the Adirondacks, White Mountains and in Western Maine.

Eudcilinea is the most generalized form of our Drepanids, and if we adopt Prof. Comstock's family Auzatidæ, in which he places this genus, we may use its characters to define the family from the larva. The Auzatidæ then agree with the Drepanidæ in all essential respects,

except in the absence of the definite secondary setæ of the latter. The difference is mainly one of degree. In *Eudeilina* the setæ have the normal arrangement for the Noctuina, but there are no secondary hairs anywhere above the base of the leg. The seta associated with iii in *Platypteryx* and *Falcaria* is therefore wanting here.

ON THE LARVÆ OF THE HEPIALIDÆ.

PLATES III AND IV.

By A. S. PACKARD.

Of the form and structure of the larvæ of this family very little is known. A brief notice of the egg of *Hepialus argenteomaculatus*, by P. H. Gosse, appeared in his "Canadian Naturalist" (p. 248, 1840). In 1888 Prof. D. S. Kellicott published in *Entomologica Americana* (iv. p. 153) notes on the larva, which he obtained in abundance in Central New York, from the roots and stems of *Alnus^s incana*, and showed that the larva probably requires three years to complete its growth. He received the pupa, which disclosed the moth June 2d. In commenting on his paper, Prof. J. B. Smith stated his belief that it lived in the oak, willow and poplar.

In the following year Prof. Kellicott described the mature larva and the pupa, adding further details as to its habits. The eggs are laid the first week in June; the caterpillars live for two years in the roots, and as the third year advances they work upward more or less into the stems; in the spring of the third year they bore out to the surface, partially or loosely plug the opening with chips and transform; pupation occurs about May 1 (in Oswego County, N. Y.), the moths emerging a month later. Mr. Kellicott writes me that he did not preserve either the larva or pupa, of which good figures are much needed. The eggs were not described.

In his note on the habits of *Hepialus thule* (*Can. Ent.* Vol. xxv, Dec. 1893, p. 297), Mr. H. H. Lyman describes its eggs, of which the enormous number of 2,151 were laid, and this seems to be the first account which we have of any eggs of this family, the works of European authors being apparently defective as regards the habits and life-history of the species of this group. The eggs are said to be "even, oval, slightly flattened on the lower side, perfectly smooth, but dull,

like unglazed porcelain. Color a pale honey-yellow when laid, soon turning black.

Our common *Hepialus*, *H. mustelinus*, is not uncommon at Brunswick, Maine, resting on the trunks of spruce trees in July. The trees are thickly placed and ferns grow under them. I suspect that they live in the spruce, rather than in the roots of ferns, but have no reason for this opinion. I captured a female in my stable, situated among the spruces, boxed her, and a day after, on the 26th of July, she was kind enough to lay several hundred eggs which I did not count. They were fortunately fertilized, and the young hatched out from them a week or two later; I did not make a note of the exact date.

Egg.—The eggs are very peculiar in appearance, quite different from those of any other moth. They are small, black, shining like seeds. They are about one-half a millimeter in length, the diameter a little less, as the eggs are cylindrical-spherical, slightly pointed at each end. The shell is jet black, highly polished, and under a half-inch objective shows no traces of ornamentation.

Freshly-hatched larva.—(Pl. III, Fig. 1.) Length 1.3 mm. Head large, broad and flattened, somewhat wider than the body and very pale chitinous. Prothoracic segment as wide as the head and with a large dorsal chitinous plate of the same color as the head. The 2d and 3d thoracic segments have no plates. The body is moderately wide, a little flattened and pale whitish, with no markings, and gradually and slightly tapers toward the end. The spinneret is unusually large and long, and the maxillæ are rather large. The thoracic legs are testaceous (chitinous), of the same hue as the head. The abdominal legs are rather long, pale. The hairs are arranged as in Pl. III, Fig. 1 to (A, part of the head, and the succeeding four segments; and B, the last four abdominal segments) in the same way as in normal Tineid and Tortricid larvæ; the four dorsal hairs arising from minute warts arranged in a low or short trapezoid; the terminal segment bearing six setæ. The hairs or setæ are about as long as the segments are broad, becoming longer in proportion on the last segment. They taper towards the end, not assuming the shape of the glandular hairs of the more modern Lepidoptera.

In the fully grown *Hepialus* larva the setæ are much reduced in size and length. It may be of interest to state that some eggs of the Australian *Oncopera intricata* Walk., kindly sent me by Mr. G. Lyell, jr., are the same in size and appearance. The freshly hatched larvæ are also very similar to those of *Hepialus mustelinus*, the hairs and shape and size of the body being nearly identical.

In the absence of any figure of a native form, I insert camera drawings of two common European species* to show that while they do not differ much in shape, they vary much in the size of the flattened tubercles or chitinous plates from which the setæ arise.

Pl. IV, Fig. 1, represents a dorsal view of the European *Hepialus humuli*.

Pl. IV, Fig. 2, A side view of the same specimen. It will be seen that the prothoracic plate is rather large, while the setiferous tubercles on the second thoracic segment are of the same size as those of the abdominal segments, but those of the second row on the third thoracic segment are about twice as large. This seems a simpler form than the next species figured, as the flattened tubercles give rise to but a single hair.

In the second species, *Hepialus hectus* (Pl. IV, Figs. 3 and 4), there is a considerable amount of divergence from the simple, primitive form of *H. humuli*. On the second and third thoracic plate there is a medium dorsal plate bearing four setæ, and behind on each side a large sub-dorsal plate bearing three short setæ. On the abdominal segments 1-8 are four dorsal setæ and three lateral setæ, arranged as represented in the figure, one being situated above the small spiracle and two behind. The segments are subdivided into four wrinkles, more or less indistinct in the blown specimens which are stretched out abnormally.

Pl. III, Fig. 4. I also add a figure of the front of the head of the pupa of *Hepialus humuli*, which with that of *Cœnetus virescens* from New Zealand, I owe to the kindness of Dr. T. Algernon Chapman. The structure of the head is very peculiar. On the vertex are prominent callosities, giving strength to the head in breaking out of the cell. The eye is large, divided by a distinct line, the outer side of the eye more or less corrugated. Directly under the eye are the large triangular maxillary palpi (*mx p*). The maxillæ themselves are short, but not shown in the figure. The clypeal region is narrow, with tubercles and rugosities; the labrum is scarcely differentiated from the front edge of the clypeus, but is slightly bilobate on the base. On each side are what I call the paraclypeal pieces or sclerites (*p*), of the homology of which I am not sure, unless they are identical with the tubercles seen in most Lepidoptera on each side of the labrum, and formerly re-

* For blown specimens of these and other lepidopterous larvæ, as well as pupæ and cocoons, I am indebted to the generosity of my friend, Dr. Otto Staulinger, of Blasewitz, Dresden, Germany, who kindly selected them from his immense collection of blown larvæ and other Lepidoptera.

garded as the mandibles. It is present, though small and reduced in *Hepialus*. The labial palpi ($mx' p$) are large and wide, and divided at the end.

Pl. III, Fig. 3, represents the head of *Ænetus virescens* Doubleday. The paraclypeal pieces are not differentiated; while the labrum appears to be slightly distinct from the clypeus, and excavated in the middle of the front edge, the labial palpi ($mx' p$) are very short; the maxillary palpi are as in *Hepialus*.

The under side of the end of the body of this pupa, including abdominal segments 8 to 10, is represented by Pl. III, Fig. 2; on the eighth segment is the well developed toothed ridge, while each side of the segment is irregularly dentate. On the ninth segment (IX) are the rudiments of the male genital opening of the moth, a longitudinal scar situated between the usual two tubercles, while the vestiges of the anal legs of the larva (*a. l.*) are represented by the longitudinal flattened tubercles enclosing the scar or vestige of the anus.

Dr. Chapman (Trans. Ent. Soc. London, March, 1893), has from the pupal characters shown that the Hepialidæ should be associated with the Tineina in his division of *Pupæ incomplete*; shortly after, in the same year, Prof. Comstock (Evolution and Taxonomy) concluded from a study of the venation that the group should be placed at the very bottom of the Lepidopterous series, and Mr. Dyar (Ann. N. Y. Acad. Sc. VIII, 1894, p. 197) agreed with Comstock's view from the examination of a sketch of an European larva (*H. lupulinus*). From a somewhat extended study of the larval, pupal, and also the imaginal characters (thorax and head), including the pupa of *Phassus*, I think there is little doubt but that the Hepialidæ are colossal Tineoids, with the essential features of Tinea and its allies, but yet somewhat modified in adaptation to their boring life. They do not seem to be the most generalized Tineina, being more specialized and later to appear than the Micropterygidæ, and also the Eriocephalidæ.

EXPLANATION OF PLATES.

PLATE III.

- Fig. 1. *Hepialus mustelinus*.—Freshly hatched larva; A, thoracic segments; B, terminal abdominal segments.
- Fig. 2. *Hepialus humuli*.—End of body of pupa; *a. l.* anal legs; IX, male genital organs.
- Fig. 3. *Ænetus virescens*.—Head of pupa; $mx p$, maxillary palpi; $mx' p$, labial palpi.

Fig. 4. *Hepialus humuli*.—Head of pupa; *mx*[♂], maxillary palpi; *mx*[♂], labial palpi; *♂*, paraclypeal piece.

PLATE IV.

- Fig. 1. *Hepialus humuli*.—Side view of larva.
 Fig. 2. *Hepialus humul*.—Dorsal view of larva.
 Fig. 3. *Hepialus hectus*.—Side view of larva.
 Fig. 4. *Hepialus hectus*.—Dorsal view of larva.

PRELIMINARY HAND-BOOK OF THE COLEOPTERA
 OF NORTH EASTERN AMERICA.

BY CHARLES W. LENG AND WM. BEUTENMULLER.

(Continued from Vol. II, p. 190.)

HARPALINÆ.

The members of this sub-family have the middle coxal cavities entirely closed by the central pieces of the meso and metasternum, the epimera not attaining the coxa. Head with setigerous puncture over the eyes. Thorax with setigerous puncture at the side and posterior angle, very rarely without the latter and still more rarely without either. Anterior tibiæ always either obliquely sinuate or deeply emarginate within, the inner spur remote from the apex. They may be divided into two sections, Harpalinæ bisetosæ, head with two-supra-orbital setigerous punctures, and Harpalinæ unisetosæ, which have the head with one supra-orbital setigerous puncture. The former contain all the genera from *Panagæus* to *Helluomorpha* inclusive, and the latter from *Brachynus* to *Anisodactylus* inclusive.

Panagæus Lat.

Head more or less constricted behind the eyes and dilated to a semi-globular neck; clypeus prolonged beyond the base of mandibles, which are scissor-like; antennæ arising from under a distinct frontal ridge, three basal joints glabrous; terminal joint of maxillary palpi arising obliquely from the preceding joint; sides of elytra narrowly inflexed; thorax globular, abruptly constricted behind. Found under stones during May and June.

Synopsis of Species.

- Elytra black with two large red spots extending from the margin to the first or second striae,.....**crucigerus**
 Elytra red with a transverse black band behind the middle and another at the tip,**fasciatus**

P. crucigerus Say.—Hirsute; head and thorax black; elytra with four large red spots; thorax with numerous deeply punctures, globular, abruptly constricted behind, angles acute; elytral striæ and punctures deep. Length .45 inch = 11 mm.

Habitat: N. Y., N. J. and southward.

P. fasciatus Say.—Pl. V, Fig. 1—Hirsute; head and thorax ferrugineous, the latter deeply punctured and abruptly constricted behind; elytra red with a transverse black band behind the middle and at the tip, striæ and punctured deep and distinct. Length .32 inch = 8 mm.

Habitat: N. Y., N. J. and southward.

Nomius Lap.

Antennæ somewhat moniliform, arising from a distinct frontal ridge; head stout, oval, neck broad; eyes prominent: labrum short, broadly emarginate; mandibles arcuate, with a feeble tooth on the inner edge at middle, and a setigerous puncture outside; body pedunculate, scutellum not visible between the elytra; elytra slightly margined at base near the hind angles; tarsi not dilated.

Occur under stones in moist places.

N. pygmæus—*Dej.* Piceous elytra elongate, sides parallel, striated, punctured; legs rufous, thorax broader in front than behind. Convex, slightly rounded anteriorly at sides; anterior angles obtusely rounded, hind angles straight. Length .28 inch = 7 mm.

Habitat: N. J., Can., Lake Sup., southward and westward to California, also Europe.

Patrobus Dej.

Medium size: Head more or less constricted behind the eyes or transversely impressed; elytra not margined at base; terminal joint of the palpi more or less cylindrical and obtuse at the tip, that of the labial palpi as long as the preceding; elytra elongate sides sub-parallel.

The members of this genus superficially resemble *Nebria*. Live under stones in damp places.

Synopsis of Species.

Disc of thorax convex, hind angles with a rather deep fossa; head behind the eyes constricted.

Last two joints of maxillary palpi equal, **longicornis**

Last two joints unequal, terminal longer, **septentrionis**

Disc of thorax flat, subquadrate, hind angles depressed without fossa; terminal joints of maxillary palpi equal.

Hind trochanter of male and female one-third the length of the thigh, **rugicollis**

P. longicornis *Say*.—Pl. V., Fig. 2.—Black above, piceus beneath; antennæ rufous; feet testaceous; mouth parts rufous; thorax somewhat broader than long, convex, sinuate behind, angles rectangular, dorsal line deep, basal impression rounded and punctured; elytra with sides sub-parallel, striæ deep and distinctly punctured, intervals convex on the disc, flattened at the sides; antennæ half as long as the body. Length .52 inch = 13 mm.

Habitat: Northeast America.

P. septentrionis *Dej.*—Shining black; thorax subcordate, rounded anteriorly, sub-sinuate behind, hind angles rectangular, sub-carinate, dorsal line distinctly impressed; elytra, elongate-ovate, striæ with punctures, third interval with three deep punctures; antennæ rufo-piceous; legs ferruginous. Length .40 inch = 10 mm.

Habitat: New Hampshire to Labrador, westward to Alaska; also Siberia and Europe.

P. rugicollis *Rand.*—Black, body elongate, femora and tibiæ black; knees and tarsi piceus; head with a few transverse wrinkles; thorax transversely rugose, much flattened, especially at the sides, median line profound; basal region punctured, with the posterior impressions very rugose; elytra much depressed, striæ punctured, intervals flattened. Length .45 = 11.25 mm.

Habitat: New York, Pennsylvania, Massachusetts and northward.

Pogonus *Dej.*

Size small: Head not constricted behind the eyes; elytra margined at the base; mentum tooth deeply notched; ligula with a single bristle at the top; epilobes of mentum acutely toothed.

The general appearance of this genus is that of *Bradycellus*.

P. texanus *Chd.*—Body short, robust, convex, and of metallic blackish green color; hind angles of thorax rectangular and the base each side with two feeble foveæ; elytral striæ faint, only the inner ones being distinct, and distinctly punctured in front and only finely so behind, the marginal and sub-marginal striæ are confluent in front, the latter is almost obsolete, except towards tip, where it is deep; body beneath, blackish brown; legs testaceous. Length, .28-.32 inch = 7-8 mm.

Habitat: N. J. (Atlantic City), Texas.

Trechus *Clair.*

Size small: Elytra almost twice as wide as long or oblong oval;

anterior tibiæ slightly broader to tip, the emargination extending nearly to the middle of the tibiæ; terminal joint of palpi slender, acute at tip, that of the labial palpi shorter than the preceding.

Synopsis of Species.

Elytra oblong, nearly twice as broad as long, with five or six impressed striæ,

rubens.

Elytra oblong oval, humeri distinct, with four or five striæ, the outer two very feebly impressed **chalybæus.**

T. rubens *Fabr.*—Rufo-piceus; thorax subquadrate, at each side of base foveolate; hind angles obtuse; elytra oblong oval, with four distinct dorsal striæ, the outer ones obsolete; antennæ and legs rufo-testaceous. Length .20 inch = 5 mm.

Habitat: Nova Scotia, also Europe.

T. chalybæus *Def.*—Apterous, jet black, with a bluish gloss; thorax, subquadrate, foveolate at each side behind, posterior angles nearly straight; elytra oval, with four or five dorsal striæ, the outer two very feeble; antennæ and legs rufous. Length, .20 inch = 5 mm.

Habitat: New Hampshire, Lake Superior, westward to Alaska.

(*To be continued.*)

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LOCAL ENTOMOLOGICAL NOTES.

Members of the New York Entomological Society and all others are solicited to contribute to this column their notes on rare captures, local lists and other items of interest relating to the insect fauna of New York City and vicinity.

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A LIST OF THE SPIDERS OF LONG ISLAND, N. Y.,
WITH DESCRIPTIONS OF NEW SPECIES.

BY NATHAN BANKS.

Nearly all the spiders in the following list have been collected by myself at or within a few miles of Sea Cliff. Collections in other portions of the island would doubtless extend the list somewhat; mostly in the line of micro-therididæ. About two hundred and forty-four species are recorded; distributed in sixteen families. The Therididæ is, of course, the largest, with about seventy-two species; the Epeiridæ next with thirty-six; and the Attidæ third with thirty-one species. The Attidæ are very well represented, and the Clubionidæ and Drassidæ

present a good showing. Long Island represents the northern limit of quite a number of southern spiders; such as *Mahadeva verrucosa*, *Epeira scutulata*, *Theridium glaucescens*, *Oxyptila monroensis*, *Gnaphosa sericata*, *Aulonia funerea*, *Oxyopes scalaris*, *Hyctia pikei* and *Zygoballus sexpunctatus*. Several other forms extend a little ways into New England, as the genus *Acrosoma*, *Vixia infumata*, *Epeira foliata*, *Theridula sphaerula*, *Argyrodes cancellatus*, *Romphaea fictilium* and *Lathroedectes mactans*. It is, as far as known, the southern limit of a few sub-boreal forms which extend across the northern part of the country; for example, *Ergane borealis*, *Agræca ornata* and *Drassus robustus*. Being an island, it lacks some forms (perhaps not yet discovered) which inhabit the mainland. This is most strikingly shown by the fact that I have observed but two specimens of *Epeira displicata*, a species widely spread and common on the mainland.

SCYTODIDÆ.

Scytodes thoracica Latr.—Not uncommon in houses.

PHOLCIDÆ.

Pholcus phalangoides Fuessl.—Recorded, I believe, from Brooklyn.

Spermophora meridionalis Hentz.—A few specimens under furniture in the house.

OONOPIDÆ.

Orchestina saltitans Banks.—One specimen in the house. July.

DYSDERIDÆ.

Ariadne bicolor Hentz.—Not uncommon under bark and sweeping herbage.

DRASSIDÆ.

Micaria agilis Banks.—Running on the sand near sea-shore. July.

Micaria montana Em.—One male, on the ground in a field.

Drassus robustus Em.—One specimen under a stone. September.

Prothesima atra Hentz.—Common, under stones, dead leaves, etc.

Prothesima ecclesiastica Hentz.—Quite common, hibernates under loose bark.

Prothesima depressa Em.—A few specimens, under dead leaves.

Prothesima frigida Banks.—Two specimens in an old cemetery. September.

Prothesima rufula Banks.—A few specimens in an old field. October.

Prothesima insularis, sp. nov.

Length ♀ 8.5 mm.; ceph. 2.8 mm. long, 2.1 mm. wide; patella plus tibia IV, 2.8 mm. Cephalothorax, mandibles, legs, palpi and sternum dark red brown, the latter darker on edges; the legs paler on the tarsi; abdomen gray above and below, with black hairs; spinnerets yellow. Posterior row of eyes straight, barely longer than the anterior row, P. M. E. oval, more than their diameter apart, and about as near to P. S. E. as to each other; A. M. E. larger, about half their diameter apart and less than this distance from the smaller A. S. E. Legs short and stout, the scopulas are very thin, no spines under tibia I, one above on tibiae III and IV; sternum broad; the epigynum consists of a very long cavity nearly filled by a corneous projection, more than twice as long as wide.

One female, Sea Cliff, Long Island, N. Y.

This is about half way between *Drassus* and *Prothesima* but the posterior row of eyes being straight, and but little longer than the anterior row, gives it more affinity with *Prothesima*.

Prothesima nova, sp. nov.

Length ♂ 6 mm. Cephalothorax yellow brown, blackish on the margin; legs pale, sometimes with a faint tinge of greenish; sternum yellowish; abdomen dull black with a basal reddish shield. Cephalothorax quite broad, head narrow; eye-rows short, posterior a little procurved, not longer than anterior one, the P. M. E. large, oval, not half their diameter apart, not quite their diameter from the slightly smaller S. E. Legs moderate, stout, especially the femora and tibiae of the anterior pair; no spine above on tibia IV, none below on tibia I, femur I with two spines above; abdomen depressed, about as long and no broader than the cephalothorax; some stiff black hairs, and a triangular horny shield at base; sternum quite long and pointed behind. The male palpus is similar to *P. depressa*, but broader and more complicated; the tibial hook is long but not turned out at tip, and there is a long slender tube projecting beyond the cavity of the tarsus.

Two males under leaves in damp woods. June.

Related to *P. depressa*, but differs in larger size, paler color, broader cephalothorax, etc.

Callilepis imbecilla Keys.—Quite common in some sandy localities. August.

Gnaphosa sericata Koch. (*Herpyllus bicolor* HENTZ, Preoccupied.)—A few specimens in dry sandy field. July.

Pæcilochroa variegata Hentz.—Under dead leaves in sandy places, rare. August.

Cesonia bilineata *Hentz.*—Under dead leaves, not uncommon. September.

CLUBIONIDÆ.

Clubiona pallens *Hentz.*—(Quite common, under bark, among dead leaves. October, December.

Clubiona riparia *Koch.* (*C. ornata* EM., Preoccupied. *C. Americana* BANKS.)—Not common, under bark. December.

Clubiona minuta *Em.* (*C. pygmaea* BANKS.)—A few specimens, swept from bushes. July.

Clubiona abbotti *Koch.*—Common, hiding in leaves or crevices of bark. July, August.

Clubiona tibialis *Em.*—Recorded by Emerton from Long Island.

Clubiona littoralis, sp. nov.

Length 6-9 mm. Cephalothorax red brown gradually growing paler behind; mandibles, maxillæ and lip dark red brown; legs pale yellowish; sternum yellowish, darker in front; abdomen yellowish; frequently blackened near the tip, sometimes indications of a basal spear-mark, abdomen and legs black haired. Cephalothorax very broad in front, a little more than once and a half as long as broad, eye-rows fully two-thirds as broad as head, the posterior broader than the anterior and pro-curved; the P. M. E. further from each other than from the P. S. E.; the anterior row almost on the margin, the A. M. E. larger than the other eyes and less than their diameter apart. The mandibles are large, very convex above and projecting forward, the ridge at base on outside quite short; sternum narrow, bluntly pointed behind; legs moderate, slender, fourth pair much the longest, at least two spines beneath on all the tibiæ; abdomen about twice as long as broad, in the ♂ not much longer than the cephalothorax. The epigynum projects behind in an emarginate lobe, the surface above is transversely striate and shows beneath on each side two oval bodies, one reddish and one nearly black. The male palpi are small, the patella is as long as the tibia and has a distinct tooth at its apex on the inner side; the tibia has a broad, curved, plate-like projection which is notched on the outside, it does not extend over the tarsus, and is truncate at tip and with a rounded tooth toward the inner side; the tarsus is about twice as long as wide, seen from the side there is near the tip a prominent projection with two teeth on the upper side, the tube is stout and curved around the tip of the palpal organ.

Many specimens from salt-marshes near Sea Cliff, N. Y. June.

Koch has described a *Clubiona maritima* from St. Thomas, but it has no special relation to this species.

Clubiona crassipalpis *Kays.*—Rare, under damp leaves near Sea Cliff, and in Black Swamp, Roslyn. December.

Clubiona pusilla *Em.*—One specimen, probably this species. October.

- Anyphæna gracilis** *Hentz.* (*A. rubra* EM.)—Not common. October. Hibernates under loose bark.
- Gayenna fraterna** *Banks.*—One male, Harbor Hill, Roslyn, swept from grass. May.
- Gayenna celer** *Hentz.* (*Anyphæna incerta* KEYS.)—Common in fields, and under leaves. September. October.
- Gayenna calcarata** *Em.*—Only one male.
- Gayenna saltabunda** *Hentz.*—Not common, in old fields. September.
- Thargalia descriptus** *Hentz.*—A few specimens. July.
- Thargalia longipalpis** *Hentz.*—Under dead leaves in dry places. August.
- Thargalia trilineata** *Hentz.*—In sandy places. under dead leaves. July, August.
- Thargalia bivittata** *Keys.*—One young specimen, under leaves in woods. May.
- Agroæca pratensis** *Em.*—Common in fields, under leaves in woods, etc. September. October.
- Agroæca ornata** *Banks.* (*A. repens* EM.)—One female, under leaves. May.
- Agroæca minuta**, sp. nov.

Length ♀ 3.8 mm. Cephalothorax pale yellowish, sides above with blackish markings almost forming a stripe, marginal seam distinctly black, mandibles slightly greenish, sternum yellowish, anterior femora, patellæ and tibiæ greenish, rest paler, posterior femora greenish, tibiæ and metatarsi with not very distinct brown bands at bases and tips. Abdomen pale, with a large brown herring bone mark above, sides thickly spotted with brown, three rows of brown spots on venter meeting in front of spinnerets. Cephalothorax as usual, perhaps a little broader than in the other species; P. M. E. fully their diameter apart, the eyes of anterior row plainly smaller than those of the posterior row, and the A. M. E. close together and smaller than the A. S. E. Femur I with two spines above and one in front, tibia and metatarsus each with but two pairs beneath. Sternum and abdomen of the usual form. The epigynum is divided by a slender median piece which is contracted in the middle and expanded somewhat before tip; the tip rests in a short furrow, each side of the median piece is a curved reddish body.

Two specimens under leaves in a damp woods near Sea Cliff, N. Y., May.

Easily separated from either of the other forms by its small size. banded posterior legs and peculiar epigynum.

Phrurolithus alarius *Hentz.*—Under dead leaves in woods, under stones, etc. Common.

Phrurolithus similis, sp. nov.

Length 2 mm. The cephalothorax is brown, with a black spot behind eye region sending three fine lines forward and several to the sides; the palpi are dark brown the legs pale yellow, each femur with a black stripe on the anterior and one on the posterior side; on the anterior femur they almost cover the joint; a black line under the posterior tibiae and metatarsi; the sternum light brown, broad, triangular; the venter pale brown at base, whitish in middle and black toward spinnerets, black above, shining, sometimes a pair of indistinct pale spots at extreme base. The male palpi are short, the femur with a prominent projection near base tipped with stiff hairs; the tibial hook is very broad at base, with a long curved outer projection and an inner very short truncate one; the bulb has a very stout tube.

In old fields; September and October. This species has much resemblance to *P. pugnatus*, but is much darker, the legs lined with black, the inner projection of the tibial hook very short (long in *P. pugnatus*), while the outer one is more curved than in that species.

Phrurolithus formica, sp. nov.

Length 2.1 mm. Cephalothorax red brown, with a black spot behind head; legs dark yellow brown, the femora sometimes showing traces of a darker stripe; sternum yellowish, margined with black; venter brown at base, pale in middle, black at lip; shining black above. The male palpi short; the projection of the femur is at the middle of joint (not nearer base), with some stiff black hairs projecting toward the apex of femur; tibial hook very much swollen on inner side and crenate, the outer projection stout comparatively short and very taper pointed; the tube of bulb very slender.

Heavier than the preceding species, and the palpus twice as large, without an inner projection to tibial hook. Quite common in the nests of some black ants. December.

Trachelas tranquilla *Hentz.*—Very common. August, September, October.

Meriola, gen. nov.

Related to *Trachelas*, but the posterior row of eyes is barely recurved, and scarcely longer than the anterior row. The cephalothorax is not quite as much narrowed in front as in *Trachelas*. The mandibles are large and stout, with two teeth below on posterior margin. The legs are like *Trachelas* and without spines, but scantily clothed on the underside of metatarsus and tarsus with serrated hairs. The cephalothorax is shining like *Trachelas*.

Meriola decepta, sp. nov.

Length 4 mm. Cephalothorax, mandibles and sternum dark red brown, like *Trachelas tranquilla*; legs pale yellowish, anterior pairs reddish toward base. Abdomen pale, black on sides; a narrow median black stripe above, connected behind

to the side stripes; two blackish stripes on venter. Cephalothorax about as long as tibia plus patella I, as broad as length of tibia I, but little narrowed in front. Eyes about equal, posterior row barely recurved and hardly longer than anterior row, the M. E. a little closer to each other than to the S. E., and scarcely more separated than are the A. M. E. The mandibles are stout and slightly porrect. Sternum nearly oval, as in *Trachelas*. Legs without spines, many simple hairs, and serrate ones under tarsi and metatarsi. Abdomen elliptical, spinnerets short. The epigynum has a dark spot on each side, and in the lower corner of each a still darker dot connected to the posterior margin by a dark line; two oval cavities are indicated in front.

Five females from Sea Cliff; in an old meadow, on ground. October, September. The young have a pale cephalothorax, like the young of *Trachelas*. It has much resemblance, at first sight, to *Grammonota pictilis* Cb.

AGALENIDÆ.

Agalena nævia *Hentz.*—Abundant everywhere.

Tegenaria derhami *Scop.*—Common around buildings.

Cœlotes medicinalis *Em.*—Two specimens, one under stone, near beach, with a round cocoon covered with grains of sand. July.

Cœlotes nigriceps, sp. nov.

Length 9.5 mm.; ceph. 4 mm. long, 2.4 mm. wide, leg I 10 mm., leg IV 12 mm. Cephalothorax pale yellow brown, blackened on head, three black marks each side in the furrows; mandibles black; legs yellow brown, darker on tibiae and metatarsi; sternum yellow brown; abdomen dark gray, thickly spotted with black in the usual pattern. Head quite broad; A. M. E. much smaller than A. S. E., the other eyes subequal; mandibles very large, strongly geniculate at base; legs short, black haired, spined as in *C. longitarsis*; sternum broad, barely narrowed in front, pointed behind, distinctly broader than in *C. longitarsis*; epigynum large, semicircular, traversed by a narrow septum.

Two females from a deep swamp near Roslyn, L. I., N. Y., October. Related to *C. longitarsis* Em., but larger, darker colored, the mandibles quite black.

Cicurina arcuata *Kcys.*—Under leaves in woods, uncommon. October, December.

Cicurina creber *Banks.*—A few specimens from Black Swamp, Roslyn, in October.

Hahnia agilis *Kcys.*—Not uncommon, under leaves in dry places. October, November.

DICTYNIDÆ.

Amaurobius bennetti *Blackwall.*—Not very common, under loose stumps, dead leaves, etc. November, December.

- Amaurobius ferox** Koch.—In woodpile, not common. September.
- Titanœca americana** Em.—One specimen, under a board at Bayville. August.
- Dictyna sublata** Hentz. (*D. muraria* Em.)—Common, sweeping grass and weeds. Summer.
- Dictyna volucripes** Keys.—A few specimens, sweeping grass. Summer.
- Dictyna foliacea** Hentz. (*D. volupis* KEYS.)—Common in grass, bushes and on trees. Summer.
- Dictyna frondea** Em. (*D. vittata* KEYS. Preoccupied.)—Several specimens, sweeping grass. August.
- Dictyna minuta** Em.—One male, sweeping an old field. September.
- Neophanes pallidus** Marx.—A few specimens on ground, under dead leaves. July.

ULOBORIDÆ.

- Uloborus plumipes** Luc.—Not uncommon, webs in fences, dead branches, etc. August.
- Hyptiotes cavaticus** Hentz.—Not very common, dead branches, shrubs, etc. September, October.

MIMETIDÆ.

- Mimetus interfactor** Hentz.—Not rare, on bushes and trees. August.
- Ero thoracia** Reuss.—Two specimens in an old field, on ground. September.

THERIDIDÆ.

- Argyrodes trigonum** Hentz.—Quite common, usually in web of some other spider. July.
- Argyrodes cancellatus** Hentz.—But one specimen.
- Romphæa fictilum** Hentz.—Not uncommon, in old fields, on grass. September, October.
- Theridium tepidariorum** Koch.—Abundant, everywhere, most common in houses.
- Theridium kentuckyense** Keys.—Not uncommon, in cedars and on fences. July.
- Theridium murarium** Em.—Not common, in cedars.
- Theridium spirale** Em.—A few specimens from trees, mostly cedars. September.
- Theridium differens** Em.—Quite common, weeds and shrubs.

Theridium glaucescens *Becker*.—Three specimens, sweeping. July.

Theridium frondeum *Hentz*.—Very common, on weeds, etc. July, August.

Theridium albidum, sp. nov.

Length 2.2 mm. The cephalothorax is pale yellowish, with a single median line which does not reach the eye region, this is indistinct in the ♀; the ♂ abdomen is gray with four black spots above and a median white stripe; the ♀ abdomen is white above and gray below without black spots; the legs are white or pale yellow, in one ♂ slightly darker at ends of femora and tibiae. There is a little projection at the base of the mandibles as in *T. frondeum*; the abdomen is not as spherical as in that species. The ♂ palpus is about one-half the size of that of *T. frondeum*, the bifid hook is proportionately much larger and more prominent, the tube that lies in the hyaline sheath is much shorter and stouter than in *T. frondeum*.

Sea Cliff, N. Y., a few specimens. Shreveport, La.

Theridium unimaculatum *Em.*—Common, often near evergreens. September, October.

Lathrodictes mactans *Koch*.—One specimen from Woodhaven, L. I., collected by R. L. Ditmars.

Steatoda borealis *Hentz*.—Common, usually in houses.

Enoplognatha marmorata *Hentz*.—One specimen.

Lithyphantes corollatus *Linn.*—Two males, under stones; one Glen Cove, October; the other Bayville. January.

Asagena americana *Em.*—Not common, running on dry ground. May, June.

Dipœna nigra *Em.*—A few specimens, sweeping.

Theridula sphærulea *Hentz*.—Not common, sweeping. August.

Euryopsis funebris *Hentz*.—Infrequent, in old fields, under leaves in woods. September, December.

Microdipœ gen. nov.

In group of *Thonax*. Anterior row of eyes equal, the A. M. E. farther from each other than from the S. E. The P. M. E. are a little nearer to each other than to the P. S. E., and a little larger than them; the S. E. are touching, the quadrangle of the M. E. is wider in front than behind, and wider in front than long. P. M. E. slightly oval. The posterior row a little recurved in the male, that of female straight. The male head is greatly elevated, nearly as high as the cephalothorax is long; the clypeus is concave; the female head of moderate height. The legs are very hairy, but are destitute of spines, except there is in the male a large curved spine on the inner tip of tibia I, and another curved one under the middle of metatarsus I. The tarsi are plainly longer than the metatarsi; the sternum convex, triangular, broadly rounded behind, about as broad in front as long.

Microdipœna guttata, sp. nov.

Length .8 to 1 mm. Cephalothorax pale yellowish, with a blackish spot in middle and a black margin; sternum pale, dark on margin; legs pale, ringed with blackish; abdomen dark gray, paler above spinnerets, with about twelve small silvery spots above, sides indistinctly mottled, a short silvery stripe on lower side just above spinnerets, on venter two transverse black bands between spinnerets and base of abdomen. Cephalothorax short and broad, in the ♂ greatly elevated at head, the clypeus very concave; mandibles small; legs of moderate length and not very slender, first pair longest, femur I about as long as cephalothorax. The abdomen is globose, smooth, the spinnerets quite prominent. The ♂ palpus is large, the tarsus very small, barely noticed, the bulb large, ovoid, and pale-colored; a dark ring around the middle, and a short curved black tube at tip.

Six specimens of this tiny little spider were found in June and October. Under dead leaves in a dry woods.

Ulesanis americana Em.—Two specimens, sweeping in an old field. October.

Ancylorrhaniis hirsuta Em.—Two specimens, under dead cedar branch on ground. October.

Idionella formosa Banks.—One specimen in moss.

Ceratinella emertoni Cambr.—Common, sweeping in fields. August.

Ceratinella fissiceps Cambr.—Common, sweeping. August, September.

Ceratinella similis Banks.—Quite common, sweeping. September.

Ceratinella melanocnemis Fox.—Several specimens, sweeping.

Ceratinella pygmæa Em.—A few specimens, under dead leaves in woods.

Ceratinella lætabilis Cambr.—Two specimens, on ground in woods.

Ceratinella brunnea Em.—Two specimens, under dead leaves. May, March.

Ceratinella micropalpis Em.—A few specimens, sweeping weeds.

Ceratinella? annulipes Bks.—One specimen, under bark. March.

Ceratinopsis nigripalpis Em.—Not uncommon, in cedar trees. September, October.

Ceratinopsis laticeps Em. (*Erigone zanthippe* KEYS.)—I have two females from Sea Cliff, which are Keyserling's species; Emerton's male is, I believe, this species.

Cornicularia brevicornis Em.—Several specimens which I consider this species.

Cornicularia minuta Em.—One male, undoubtedly this species, in moss. July.

Cornicularia indirecta Cambr.—One female, probably this species.

Cornicularia communis Em.—One female, under leaves.

Spiropalpus spiralis Em.—Not common, under leaves in woods. May, June.

Grammonota ornata Cambr.—Under or near evergreens. September, October.

Grammonota inornata Em.—Three specimens, under leaves in woods. May, June.

Grammonota trivittata, sp. nov.

Length 2.8 mm. Cephalothorax pale yellowish brown, sides darker yellow brown, eyes with black rings; mandibles reddish; sternum reddish, darker on the margins; legs pale yellowish; abdomen pale gray, with a narrow black central stripe, and a much broader one on each side, these stripes are not connected except at extreme tip, venter blackish each side of a pale elongated central area. Cephalothorax low, but little elevated behind the eye-region, quite broad in front and longer than tibia plus patella I; eyes about as usual, the A. M. E. smaller than the others and close together, the P. M. E. nearer to each other than to the P. S. E.; sternum truncate in front, tapering behind, a little narrower than in *G. pictilis*; legs moderate, anterior pair about as long as body, all with many stiff bristles; abdomen broadest a little beyond the middle, pointed at tip. Epigynum has a notch on the posterior margin, disclosing a somewhat triangular projection, each side is an oblong dark body, the notch is narrower than in *G. pictilis*.

Many females from salt marshes near Sea Cliff, N. Y., November, December. This species has some resemblance to *G. pictilis*, but the stripes are not connected and the cephalothorax is more yellow.

Grammonota pallipes, sp. nov.

Length 2.6 mm. Cephalothorax yellowish, dark brown on head and mandibles; sternum yellow brown, darker on edges; legs and palpi pale yellowish; abdomen pale gray, darker on sides, a median black herring-bone stripe above. A little more slender than in *G. ornata* or *G. pictilis*. Head ♂ highest at eye-region; posterior row of eyes slightly procurved, the eyes about equal and equal distances apart; A. M. E. closer to each other than to the larger P. S. E. Legs with numerous stiff bristles. Epigynum dark brown, showing a semicircular cavity, broadly open behind, with a pale stripe at bottom. The ♂ palpus much on plan of *G. ornata*, but no prominent projection to tibia, the tarsal hook as usual, the tube coiled like *G. ornata*, but more slender, a hyaline oval plate on the outer side, and a dark stripe along the inner side.

Two specimens, in an old field, October. Readily distinguished by its dark brown head.

- Lophocarenum crenatum** *Em.*—Quite common on ground. July, August.
- Lophocarenum rostratum** *Em.*—Under leaves in a dry woods. December.
- Lophocarenum florens** *Cambr.*—Under rubbish in swamp at Mill Neck. April.
- Tmeticus trilobatus** *Em.*—Three specimens, probably this species.
- Tmeticus terrestris** *Em.*—Several specimens, Black Swamp. October.
- Tmeticus probatus** *Em.*—Not common, under dead leaves. October, November.
- Tmeticus concavus** *Em.*—Quite common, Black Swamp. October.
- Erigone persimilis** *Cambr.*—One male.
- Erigone dentigera** *Cambr.*—Not common, Black Swamp. June.
- Erigone autumnalis** *Em.*—Quite common, under leaves. October, November.
- Linyphia marginata** *Koch.*—Not common. September.
- Linyphia phrygiana** *Koch.*—Only a few specimens, in woods. October, April.
- Linyphia conferta** *Hentz.*—Very common, under dead leaves. October.
- Linyphia mandibulata** *Em.*—One male.
- Floronia clathrata** *Koch.*—In old fields, under dead leaves. October, November, December.
- Tapinopa bilineata** *Banks.*—Not common, under dead leaves. July.
- Stemonyphantes bucculentus** *Linn.*—Common in old fields. October, November.
- Drapetisca socialis** *Blk.*—On the bark of trees. October.
- Lepthyphantes minuta** *Blk.*—In piles of cut wood. August.
- Diplostyla concolor** *Reuss.*—Very common, on ground under leaves. August, September, October.
- Diplostyla nigrina** *Westr.*—One specimen, Black Swamp. October.
- Bathyphantes nebulosus** *Blk.*—In houses, quite common. September, November.
- Bathyphantes zygia** *Krys.*—Often under stones. October.

- Bathyphantes formica** *Em.*—Common on the ground. July, August.
- Bathyphantes micaria** *Em.*—A few specimens swept from evergreen shrubbery. July.
- Bathyphantes zebra** *Em.*—Not very common, under leaves in woods. September.
- Bathyphantes decorata** *Bks.*—Several specimens under dead leaves.
- Bathyphantes unimaculata** *Bks.*—Under dead leaves. September, October.
- Bathyphantes angulata** *Em.*—Several specimens. July.
- Microneta cornupalpis** *Em.*—In Black Swamp. October, under leaves.
- Microneta longibulbus** *Em.*—One male, probably this species.

EPEIRIDÆ.

- Acrosoma rugosa** *Hentz.*—Quite common in woods. August, September.
- Acrosoma spinea** *Hentz.*—Common on shrubbery. July, August
- Acrosoma mitrata** *Hentz.*—Moderately common in woods. August, September.
- Mahadeva verrucosa** *Hentz.*—Not uncommon in woods, webs quite high up. August.
- Ordgarius bisaccatus** *Em.*—An adult male only 1.8 mm. long, on a post. September.
- Plectana stellata** *Hentz.*—Not very common, sweeping fields.
- Epeira scutulata** *Hentz.*—A few specimens from evergreen trees. July.
- Epeira strix** *Hentz.*—Common. September, October.
- Epeira insularis** *Hentz.*—Common. September, October.
- Epeira trifolium** *Hentz.*—Common. September, October.
- Epeira domiciliorum** *Hentz.*—Quite common. October.
- Epeira trivittata** *Keys.*—Common. July, August, September.
- Epeira globosa** *Keys.*—Common around houses. September.
- Epeira thaddeus** *Hentz.*—Not very common. July.
- Epeira labyrinthea** *Hentz.*—Common on dead branches. August, September.

Epeira prompta *Hentz.* (*E. parvula* KEYS.)—Common, sweeping meadows, evergreen trees, etc.

Epeira foliata *Hentz.*—Not common, on trees. September.

Epeira displicata *Hentz.*—Rare, only two specimens on oak. October.

Epeira juniperi *Em.*—A few specimens from evergreens.

Epeira gibberosa *Hentz.*—Common in herbage.

Epeira maculata *Keys.*—Rare, sweeping.

Epeira placida *Hentz.*—Not uncommon in old fields.

Vixia infumata *Hentz.*—A few young specimens, sweeping.

Singa variabilis *Em.*—Two specimens swept from old field. October.

Singa maculata *Em.*—A few specimens swept from meadow.

Theridiosoma gemmosa *Koch.*—Swept from low herbage, in woods. June.

Cyclosa conica *Pallas.*—Common. September, October.

Argiope riparia *Hentz.*—Not very common. August, September.

Argiope transversa *Em.*—More common than the preceding. August, September.

Argyropeira hortorum *Hentz.*—Common. in herbage. July, August.

Tetragnatha grallator *Hentz.*—Quite common, usually near water. July.

Tetragnatha laboriosa *Hentz.*—Abundant, sweeping. Summer

Eugnatha vermiformis *Em.*—A few specimens in woods. July.

Pachygnatha brevis *Keys.*—One specimen, under leaves. October.

Pachygnatha autumnalis *Em.*—Not uncommon, under leaves.

Pachygnatha tristriata *Keys.*—Recorded by Keyserling from Long Island.

THOMISIDÆ.

Xysticus gulosus *Keys.*—Common; hibernates in adult state.

Xysticus stomachosus *Keys.*—Moderately common, sweeping.

Xysticus triguttatus *Keys.*—Common in meadows. There is a variety of the male which is larger than usual, and marked like the female.

Xysticus gramineus *Em.*—A few specimens, under leaves.

Xysticus nervosus *Bks.*—Quite common in fields. August, September.

Xysticus 4-lineatus *Kcys.*—One specimen in an old field. December.

Xysticus fraternus, sp. nov.

Length ♂ 4 mm. Cephalothorax pale brownish, thickly mottled on sides with dark brown; anterior femora and patellæ almost wholly covered with brown spots, tibiæ and metatarsi also sometimes mottled; posterior legs with brown rings at ends of femora and tibiæ and some scattered brown spots; sternum and coxæ mottled with brown; abdomen quite thickly mottled with brown and white, several more prominent spots behind. Cephalothorax quite broad, narrowed in front, depressed; three rows of prominent spines, one median and one on each side of the pale central area; M. E. equal; legs short and stout, anterior femora shorter than cephalothorax, metatarsus I no longer than tibia I, four pairs of spines under tibia I, three pairs under metatarsus I. The male palpus has the tube start at base and go around the bulb to the projection on the other side, but it does not make a bend at tip; on the outer side of the bulb (instead of on middle as in most species) there are two hoods lying in the same plane and curved toward each other; on the opposite or inner side, near the base, there arises a long plate like piece projecting straight across the bulb toward the top of the palpus, it is enlarged and emarginate at tip (no such structure have I seen in any other species); across the basal portion of the bulb there extends obliquely a slender brown piece. The tibia has two projections as in *X. stomachosus*.

One male and several young, under dead leaves. May.

Oxyptila monroensis *Kcys.*—Under leaves near seashore, several females and one male only 1.9 mm. long.

Oxyptila conspurcata *Thor.*—One specimen under leaves in Black Swamp. October.

Coriarachne versicolor *Kcys.*—A few specimens under bark. November, March.

Runcinia aleatoria *Hentz.*—Not uncommon, on heads of flowers. August.

Misumena vatia *Clerk.*—Common, sweeping. May, June, October.

Misumena rosea *Kcys.*—Common, sweeping. Summer.

Misumena oblonga *Kcys.*—One male, swept from meadow. July.

Tmarsus caudatus *Hentz.*—On dead branches. July.

Tibellus duttoni *Hentz.*—A few specimens, sweeping. July.

Thanatus rubicundus *Kcys.*—Quite common on ground, in old fields. October.

Philodromus areolus *Clerk.*—Not very common. July.

Philodromus rufus *Walk.*—Common, sweeping. Summer.

Philodromus vulgaris Hentz.—Common in houses, under bark, etc.
October, December.

Philodromus placidus Bks.—Not uncommon on cedar and other trees. July.

Ebo latithorax Kcys.—In old fields and near seashore. October, September.

LYCOSIDÆ.

Lycosa babingtoni Blk.—One specimen.

Lycosa frondicola Em.—Among leaves in woods. Spring.

Lycosa arenicola Scudd.—Bayville, making nests in the sand. August, September.

Lycosa pratensis Em.—Common in fields. Summer.

Lycosa erratica Hentz.—Common, often under stones. September.

Lycosa scutulata Hentz.—Not common in fields. September.

Lycosa punctulata Hentz.—Not so common as preceding. October.

Lycosa rufiventris Bks.—Two specimens under dead underbrush; Bayville. December.

Pardosa minima Meys.—Quite common on ground.

Pardosa flavipes Kcys.—Not uncommon in old fields, under leaves, etc.

Pardosa bilineata Em.—A few specimens in grass, Harbor Hill. July.

Aulonia aurantica Em.—Under dead leaves in damp woods. October, December.

Aulonia? funerea Hentz.—A few specimens under leaves.

Pirata insularis Em.—Uncommon, in fields.

Pirata piratica Clerk.—Under leaves in swamps.

Pirata exigua Bks.—Not common, under leaves.

Trochosa cinerea Fabr.—Common on seashore. July.

Trochosa rubicunda Kcys.—One male. October, in an old field.

Pisaura undata Hentz.—Quite common, on large herbs.

Dolomedes tenebrosus Hentz.—A few young specimens.

Dolomedes urinator Hentz.—One male, on log near a stream.
April.

OXYOPIIDÆ.

Oxyopes scalaris Hentz.—Several specimens from an old field.
October.

ATTID.E.

- Phidippus audax** *Hentz.*—Abundant, sweeping.
- Phidippus rufus** *Hentz.*—Quite common, sweeping.
- Dendryphantes militaris** *Hentz.*—Abundant.
- Dendryphantes octavus** *Hentz.*—Abundant, sweeping. Summer.
- Dendryphantes ornatus** *Bks.*—Occasional, sweeping. September.
- Attus sylvestris** *Em.*—A few specimens near seashore.
- Icius palmarum** *Hentz.*—Not very common, a small form. July.
- Icius mitratus** *Hentz.*—Quite common in evergreens. July.
- Icius elegans** *Hentz.*—Not rare in fields. August.
- Icius formicarius** *Em.*—Two specimens, on a fence. July.
- Icius lineatus** *Koch.*—A few specimens under leaves on ground.
- Icius harti** *Em.*—One female, on a board. August.
- Astia vittata** *Hentz.*—Common, the variety *niger* seen once.
- Epiblemum scenicum** *Clerk.*—Common on buildings. June.
- Marptusa familiaris** *Hentz.*—A few specimens under bark. July.
- Admestina wheeleri** *Peck.*—Several specimens, quite high on trees. July.
- Hycitia pikei** *Peck.*—One specimen from salt-grass. July.
- Saitis pulex** *Hentz.*—Common in woods. September.
- Ergane borealis** *Blk.*—(*E. teniata* KEYS., *Hasarius hoyi* PECK., *Habrocestum latens* BKS.)—Not uncommon, sweeping in fields. Summer.
- Habrocestum cœcatum** *Hentz.*—Not very common, sometimes on seashore.
- Habrocestum peregrinum** *Peck.*—A few specimens, sweeping.
- Neon nelli** *Peck.*—Common on ground under leaves.
- Ballus youngi** *Peck.*—One specimen, under bark. August.
- Zygoballus bettini** *Peck.*—A few specimens, under leaves, Black Swamp. October.
- Zygoballus sex-punctatus** *Hentz.*—Swept from grass. August.
- Zygoballus terrestris** *Em.*—A few specimens on the ground.
- Homalattus cyaneus** *Hentz.*—Two specimens, swept from an old field. October.

Synemosyna formica *Hentz.*—Not very common, beating shrubs.

Salticus albocinctus *Koch.*—One young specimen.

Synageles picata *Hentz.*—A few specimens, sweeping. September.

Synageles scorpiona *Hentz.*—Quite common, on small trees. July, August.



PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF JANUARY 2, 1895.

Held at the German American School.

President Beutenmüller in the chair. Ten members present.

On motion the reports of officers were postponed to the next meeting.

Mr. Dietz, the Chairman of Committee on Nominations for Officers for 1895, reported as follows:

For President, Rev. J. L. Zabriskie; Vice President, Chas. Palm; Recording Secretary, L. H. Joutel; Corresponding Secretary, R. L. Ditmars; Treasurer, C. F. Groth; Executive Committee, G. W. J. Angell, G. Beyer, R. Ottolengui and C. Schaeffer.

On motion the Recording Secretary was instructed to cast an affirmative ballot, upon which the President declared the officers elected.

The retiring President then made a few remarks on the growth of the Society and its work during the previous year.

The following members also addressed the meeting: Messrs. Zabriskie, Groth, Dietz and Palm.

Adjournment.

MEETING OF JANUARY 15, 1895.

Held at the American Museum of Natural History.

Mr. Beutenmüller, Chairman *pro. tem.*, presiding. Ten members present.

The annual reports for 1894 of Treasurer and Recording Secretary were presented and approved, the former being referred to the Auditing Committee for action.

The Auction Committee reported that Mrs. Bradford donated about 1000 specimens.

Mr. Beutenmüller reported that Mrs. Bradford had sent a letter containing a check for \$50, in memory of her son, G. D. Bradford. On motion a vote of thanks was extended to Mrs. Bradford.

Mr. Henry C. Bennett was proposed for membership by Mr. Beutenmüller.

Mr. R. L. Ditmars read a paper on a collecting tour in the Naugatuck Valley, Conn., and noted the discovery of a dipterous larva in the throat of a snake.

Adjournment.

MEETING OF FEBRUARY 19, 1895.

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

The Committee on Constitution and By-Laws reported progress. Mr. Daecke, Chairman of Publication Committee, reported the following regulations for the JOURNAL: That a certain number of pages of each issue be devoted to popular notes; that a sum not exceeding \$50 be used for plates and illustrations for the year 1895; that all bills relating to the publications of the Society shall be certified by the Chairman of the Publication Committee and Editor before being paid by the Treasurer; that all complete volumes of Vol. I. shall be sold only as volumes and not by single numbers; that abstracts of the proceedings of the Society be published in the JOURNAL.

On motion the foregoing regulations were accepted.

Mr. H. C. Bennett was elected an active member.

Mr. Ditmars proposed James Burchell for membership.

The death of Dr. R. H. Lamborn and B. Neumoegen were announced.

On motion Messrs. Beutenmüller and Palm were appointed to draft resolutions of regret and convey them to the families of the deceased.

On motion the Publication Committee was placed in charge of the programmes of the Society.

The President appointed Messrs. Beutenmüller and Groth to serve as representatives of the Society in the Scientific Alliance for 1895.

Adjournment.

MEETING OF MARCH 5, 1895.

Held at the American Museum of National History, President Zabriskie in the chair. Eighteen members present.

A communication from the Scientific Alliance, asking for power to incorporate the Council of the Alliance, was read. On motion the

Society approved of the measure outlined in the proposed act of incorporation as presented by the Council of the Scientific Alliance of New York.

Mr. J. Burchell was elected an active member.

On motion it was decided that a new Committee on By-Laws, consisting of five, be appointed. Messrs. Groth, Palm, Beutenmüller, Munch and Ditmars were appointed on this committee.

The President appointed Messrs. Daecke, Rabe, Joutel and Beutenmüller as members of the Publication Committee.

Mr. Daecke read a paper entitled "Remarks on the Expediency of Coöperation of the Members of the Society." After discussion.

Adjournment.

MEETING OF MARCH 19, 1895.

Held at the American Museum National History, Vice-President Palm in the chair. Twelve members present.

The following resolutions on the death of Mr. Neumoegen were read and approved.

"WHEREAS, The New York Entomological Society has heard with regret of the death of Mr. Berthold Neumoegen, which occurred January 2, 1895.

It is hereby :

Resolved, That in the death of Mr. Berthold Neumoegen this Society has lost one of its most prominent and energetic members, and whose loss will be deeply felt by all who knew him, and that in his death the world of science has lost one of its most eminent students and collectors of Lepidoptera, whose untiring zeal for the advancement of science has been recognized by his long list of papers which appeared in the various entomological publications of this country, and by the magnificent collection of Butterflies and Moths which has been garnered by him through conscientious efforts and carefulness."

Resolved, That a copy of this record be sent to the family of the deceased with our sincere condolence in their bereavement.

CHAS. PALM,

WM. BEUTENMÜLLER,

Committee.

On motion it was decided that an auction sale of insects for the benefit of the JOURNAL be held.

Mr. Beutenmüller read a paper entitled, "Notes on a Collecting Trip to Salt Lake, Utah," by the late Harry Edward.

Adjournment.

MEETING OF APRIL 2, 1895.

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

Mr. Dyar spoke on the arrangement of tubercles and setæ of Lepidopterous larvæ and their value in classification, in which he explained with the aid of diagrams how by means of modification of the number and shapes it was possible to classify Lepidoptera.

Mr. Beutenmüller spoke on the rearing of Lepidoptera.

Adjournment.

MEETING OF APRIL 16, 1895.

Held at the American Museum of Natural History, President Zabriskie in the chair. Ten members present.

On motion it was decided that \$25 from the funds of the Society be appropriated toward the expenses of the JOURNAL for 1895.

Mr. Beutenmüller spoke on collecting insects at night. Discussed by Messrs. Dyar, Palm and Daecke.

Adjournment.

MEETING OF MAY 7, 1895.

Held at the American Museum of National History, President Zabriskie in the chair. Ten members present.

The Treasurer's report was read and accepted.

Mr. Münch reported on a field meeting held at Snake Hill, N. J.

Mr. Ditmars read a paper entitled "Mites parasitic on Snakes." He stated that he had found a species of *Ixodes* on *Boa constrictor* and that a species of *Ixodes*, one inch in length, is found on the large tropical snakes and turtles; also that a mite belonging to the family Gamasidæ is found on snakes as well as Coleoptera.

The President exhibited some beetles infested by mites.

Adjournment.



JOURNAL

OF THE

New York Entomological Society.

Vol. III.

SEPTEMBER, 1895.

No. 3.

NEW GENERA AND SPECIES OF TACHINIDÆ.

By D. W. COQUILLET, Washington, D. C.

The genera referred to in the present paper may be distinguished as follows :

First vein bristly; sides of face bearing a row of macrochæte.

Apical cell open **Chætoplagia**, gen. nov.

Apical cell closed and long petiolate **Metachæta**, gen. nov.

First vein bare.

Sides of face bearing macrochæte or bristly hairs 1.

Sides of face bare 6.

1. Antennæ scarcely half as long as the face.

Cheeks almost as broad as the eye-height **Phyto** Desv.

Cheeks half as broad as the eye-height **Amobia** Desv.

Antennæ at least three-fourths as long as the face.

Eyes distinctly pilose 2.

Eyes bare or microscopically sparsely pilose 3.

2. Posterior end of hind crossvein nearer the wing margin than to the small crossvein **Gædiopsis** B. B.

Posterior end of hind crossvein twice as far from the wing margin as from the small crossvein **Cyrtophleba** Rond.

3. Sides of face bearing a row of macrochæte 4.

Sides of face destitute of macrochæte, bearing only bristly hairs 5.

4. Lower end of hind crossvein almost opposite the small crossvein.

Paraplagia B. B.

Lower end of hind crossvein midway between the small crossvein and the wing margin **Opsidia**, gen. nov.

5. Last section of fifth vein nearly as long as the penultimate section.

Metaplagia, gen. nov.

Last section less than half as long as the penultimate section.

(*Gymnoprosope* Town.) **Araba** Desv.

6. Eyes distinctly pilose **Nemoræa** Desv.

Eyes bare or microscopically sparsely pilose 7.

7. Facial ridges bristly at least on their lower two-thirds **Degeeria** Meig.

Facial ridges never bristly on more than the lower third 8

8. Cheeks nearly as broad as the eye-height **Paraphyto**, gen. nov.
 Cheeks less than half as broad as the eye-height 9.
 9. Apical cell ending close to the extreme wing-tip **Myiobia** *Desv.*
 Apical cell ending far in front of the wing-tip 10.
 10. Hind tibiae outwardly rather densely ciliate with short bristles of nearly an equal
 length **Argyrophylax** *B. B.*
 Hind tibiae unequally bristly, not ciliate **Gymnoprosope** *Town.*

Chætoplagia, gen. nov.

First, third and fifth veins bristly; hind cross-vein slightly beyond the middle between the small and the bend, the latter rectangular and appendiculate; posterior end of hind crossvein midway between the small and the tip of the fifth vein; apical cell open, ending midway between the second vein and extreme tip of wing. Frontal bristles in a single row, descending on sides of face nearly to the cheeks; anterior ocellar bristles directed obliquely forward; antennæ as long as the face, the third joint five times as long as the second; arista bare, the penultimate joint not longer than broad; face in profile slightly convex, each side at narrowest point about one-eighth as wide as the median depression, sparsely covered with bristly hairs; ridges straight, widely diverging below; vibrissæ widely separated, inserted on the oral margin, only two or three bristles above each; cheeks one-sixth as wide as the eye-height; eyes bare; proboscis fleshy, the portion beyond the basal articulation shorter than height of head; labella large; palpi well-developed, subclavate. Abdomen subcylindrical of four segments. Hind tibiae not ciliate. Type, the following species:

Chætoplagia atripennis, sp. nov.

♀—Black, the second antennal joint and palpi brownish yellow. Front at vertex twice as wide as either eye, sides of front and face silvery pollinose; frontal bristles curving more or less backward, those below the arista directed downward; arista thickened on the basal two-thirds. Thorax lightly grayish pollinose, the front end marked with four black vittæ; three post-sutural and three sternoplural macrochaete, the scutellum bearing a long marginal and shorter basal and apical pair. Abdomen shining, bases of the last three segments whitish pollinose; first segment destitute of dorsal macrochaete, the second bearing a marginal pair, third with a marginal row, the fourth with a discal and a marginal row. Wings blackish, hind margin gray, middle of the submarginal, apical and discal cells, grayish, a subhyaline streak above the third vein near its base; first vein bristly nearly its entire length, the third bristly to beyond apex of discal cell, fifth vein bristly to last fourth of this cell; calypteres white. Length 7 mm.

Westville, N. J., July 2, 1892 (C. W. Johnson); and Dist. Columbia, July, 1894, captured by the writer. Two specimens.

Metachæta, gen. nov.

First and third veins bristly, the others bare; apical cell closed and petiolate, the petiole more than half as long as the hind cross-vein, the latter perpendicular, midway between the small cross vein and the bend which is rectangular; posterior end of hind

crossvein nearly midway between the wing-margin and the small crossvein; third vein terminates midway between the second and the wing-tip. Antennæ nearly as long as the face, the third joint nearly three times as long as the second; arista bare, the penultimate joint slightly longer than broad; anterior ocellar bristles directed forward, frontal bristles in a single row descending to the lower end of the eyes; sides of face otherwise bare, each at narrowest point hardly one-sixth as wide as the median depression; face strongly retreating below, in profile concave, ridges strongly diverging below, vibrissæ inserted on the oral margin, widely separated, only one or two bristles above each; eyes bare; cheeks nearly half as broad as the eye-height; proboscis fleshy, the portion beyond the basal articulation scarcely half as long as height of head, labella large; palpi rather small, clavate. Abdomen long-ovate, of four segments. Hind tibiæ not ciliate. Type, the following species:

***Metachæta atra*, sp. nov.**

♀—Black, the palpi and tip of proboscis yellow. Front at vertex one and one-half times as wide as either eye, three frontal bristles in each row curving backward, two pairs of orbital bristles; arista thickened on slightly more than the basal half. Body wholly shining, not pollinose; three postsutural and two sternoplural macrochætæ, scutellum bearing three rather long marginal pairs and two short discal pairs; second and third abdominal segments each with a discal and a marginal pair of macrochæte, the fourth with a discal pair and scattered ones on the apical third. Wings blackish along the costa and crossveins, elsewhere gray; first vein bristly on nearly its entire length, the third bristly to slightly beyond the small crossvein; calypteres white. Front tarsi considerably dilated, claws and pulvilli less than half as long as the last tarsal joint. Length 4 to 5 mm.

Franconia, N. H. (Mrs. A. T. Slosson); and Northern Illinois (Dr. W. A. Nason). Seven specimens.

***Phyto setosa*, sp. nov.**

♀—Black, including the palpi, face largely reddish brown. Front at vertex as wide as either eye, only one frontal bristle in each row curving backward, two pairs of orbital bristles, frontals descending to base of second antennal joint; antennæ less than half as long as the face, the second and third joints subequal in length, arista thickened on its basal fourth; sides of face bearing a row of macrochætæ, each side at narrowest part over one-third as wide as the median depression, the latter distinctly carinate; vibrissæ inserted the length of the second antennal joint above the oral margin, ridges bare; cheeks nearly as broad as the eye-height; proboscis short, fleshy, palpi clavate. Thorax grayish pollinose, marked with four black vittæ; three postsutural and three sternoplural macrochæte, scutellum bearing three long marginal pairs. Abdomen grayish pollinose; first segment with a marginal pair of macrochætæ, second with a discal and a marginal pair, third and fourth each with a discal pair and a marginal row. Wings subhyaline, third vein bristly nearly halfway to the small crossvein, the others bare; costal spine longer than the small crossvein, apical cell closed in the margin at two-thirds the distance from the second vein to the wing-tip; calypteres white. Length 6 mm.

Northern Illinois (Dr. W. A. Nason). A single specimen.

Amobia *Desv.* (1830).—Both Schiner (*Fauna Aust.* I, 502) and Brauer and Bergenstamm (*Zweifel. Kais. Museums Wien*, VI, 226) state that this genus is equivalent to *Macronychia* Rond. (1859), the first mentioned author alleging that the same species served as the type of both. *Amobia*, being much the older term, must be retained for this genus. Brauer and Bergenstamm incorrectly spell it *Ammobia*, a term previously employed in the Hymenoptera by Billberg (*Enumeratio Insectorum*, 105, 1820).

Amobia californica, sp. nov.

♀—Black, the palpi yellow, lower part of face tinged with reddish yellow. Front at vertex as broad as either eye, frontal bristles descending slightly below base of antennæ, the uppermost in each row curving backward, the next outward; others inward, two pairs of orbital bristles; antennæ half as long as the face, the third joint not longer than the second; arista thickened to the middle, the penultimate joint slightly longer than broad; sides of face covered with short bristly hairs, each side nearly half as wide as the median depression; vibrissæ inserted half the length of the second antennal joint above the oral margin, two or three bristles above each; cheeks over one-third as broad as the eye-height; proboscis rigid, the portion beyond the basal articulation nearly as long as height of head, labella very small, palpi clavate. Thorax gray pollinose, marked with four black vittæ; three postsutural and three sternoplural macrochaete, scutellum bearing two long marginal pairs and a short apical one. Abdomen subshining, thinly gray pollinose, first and second segments each with a marginal pair of macrochaete, third with a marginal row, the fourth with a subapical row. Wings subhyaline, third vein bearing three or four bristles at the base, the others bare, costal spine minute; calypteres white. Length 9 to 11 mm.

Los Angeles Co., Cal. Two specimens in April.

Gædiopsis flavipes, sp. nov.

♂—Black, the first two antennal joints, face, palpi, apex of scutellum, femora and tibiæ, yellow. Front at vertex slightly wider than either eye, frontal bristles descending to base of third antennal joint, three in each row curving backward; two pairs of orbital bristles; sides of front and face golden pollinose; antennæ six-sevenths as long as the face, third joint nearly three times as long as the second; arista thickened on the basal two-thirds, the penultimate joint nearly three times as long as broad; sides of face bearing a few short bristles, and below the middle with two short macrochaete; ridges bristly on the lower three-fifths; cheeks one-third as broad as the eye-height; eyes rather sparsely short but distinctly pilose; proboscis fleshy, the portion beyond the basal articulation scarcely half as long as height of head, palpi clavate. Thorax gray pollinose, marked with four black vittæ; four postsutural and four sternoplural macrochaete, the scutellum bearing three long marginal pairs and a short apical one. Abdomen gray pollinose, second segment with a marginal pair of macrochaete, third with a marginal row, the fourth with a discal and a marginal row. Hind tibiæ rather evenly ciliate outwardly. Wings hyaline,

tinged with gray at the base and along the costa, third vein bearing two or three bristles at the base, the others bare, costal spine minute, bend of fourth vein not appendiculate. Length 7.5 mm.

Mobile, Alabama (C. W. Johnson). A single specimen taken October 22, 1894, in Mr. Johnson's collection.

***Cyrtophleba horrida*, sp. nov.**

♀—Black, the palpi yellow, the first two joints of antennæ yellowish brown. Front at vertex as broad as either eye, frontal bristles descending nearly to tip of second antennal joint, four or five in each row curving backward; two pairs of orbital bristles, a shorter one between them and a row of six macrochæte in front of them, extending on the face nearly to lower end of eyes, a few bristly hairs among them; antennæ about three-fourths as long as the face, the third joint one and one-third times as long as the second; arista thickened to the middle, the penultimate joint slightly longer than broad; cheeks one-fourth as wide as the eye-height; vibrissæ inserted on the oral margin, two or three bristles above each; proboscis very short and fleshy, palpi clavate; eyes rather thinly but quite long pilose. Thorax gray pollinose, marked with four black vittæ; three postsutural and three sternopleural macrochæte, scutellum bearing four marginal pairs, a widely separated backwardly directed discal pair and with two pairs of erect ones between them. Abdomen with a brassy tinge, thinly grayish pollinose; second segment bearing a discal and a marginal pair of macrochæte, third with a discal pair and marginal row, fourth with a discal pair, a median and a marginal row. Wings hyaline, tinged with gray at base and along the costa; third vein bristly almost to the small crossvein, the others bare; hind crossvein nearly midway between the small and the bend, the latter with a long appendage; posterior end of hind crossvein less than one-third of distance from the small to the wing-margin; calypteres white. Front pulvilli two-thirds as long as the last tarsal joint.

♂—Differs from the ♀ as follows: Antennæ four-fifths as long as the face, fourth abdominal segment destitute of the discal pair of macrochæte, front pulvilli longer than the last tarsal joint. Length 7.5 mm.

New Bedford, Mass. (Dr. G. de N. Hough); Ithaca, N. Y., April 25, (F. H. Chittenden); and Northern Illinois, June 2, 1894 (Dr. W. A. Nason). Two males and two females.

***Paraplagia cinerea*, sp. nov.**

♀—Differs from above description of *Cyrtophleba horrida* as follows: Front nearly twice as wide as either eye, frontal bristles descending to lowest fourth of third antennal joint, sides of face otherwise bare, no row of macrochæte in front of orbital bristles; antennæ four-fifths as long as the face; arista thickened on the basal three-fourths, the penultimate joint twice as long as wide; eyes bare. Scutellum bearing only three pairs of marginal macrochæte. Abdomen destitute of a brassy tinge, fourth segment with an irregular discal and marginal row of macrochæte. Third vein bristly to beyond the discal cell, posterior end of hind crossvein nearly opposite the small.

♂—Same as the ♀ except that the front pulvilli are as long as the last tarsal joint. Hypopygium projecting one-third the length of the fourth abdominal segment beyond the latter. Length 6 to 8 mm.

Northern Illinois (Dr. W. A. Nason), and Dist. Columbia in July, taken by the writer. One male and two females.

Opsidia, gen. nov.

Head swollen, frontal bristles continuous from the occiput, in single rows, descending to base of second antennal joint, two backwardly curving macrochaete on vertex outside of each row, the anterior ones slightly in advance of the anterior ocellus; anterior ocellar bristles curving obliquely forward, sides of front and of face covered with short bristly hairs, the latter also bearing a row of short macrochaete outside of the ridges which are almost parallel; face in profile straight, greatly retreating below, the sides at narrowest part each as wide as the median depression; vibrissae inserted almost on the oral margin, two or three short bristles above each; antennae six-sevenths as long as the face, the third joint five times as long as the second; arista bare, the penultimate joint not longer than broad; eyes bare; cheeks one-fourth as wide as the eye-height; proboscis rather slender, the portion beyond the basal articulation less than half as long as height of head; palpi well-developed, clavate. Third vein bearing four bristles at the base, the others bare; hind crossvein near last third of distance between the small and the bend, the latter with a long appendage; posterior end of hind crossvein nearly midway between the small and tip of fifth; apical cell open, ending midway between the second vein and the extreme tip of wing. Type, the following species:

Opsidia gonioides, sp. nov.

♀—Black, the first two antennal joints largely, and the palpi, yellow. Front at vertex twice as wide as either eye, two pairs of orbital bristles, arista thickened on the basal five-sixths. Thorax gray pollinose, marked with four black vittae; three postsutural and two sternopleural macrochaetae, scutellum bearing three long marginal pairs. Abdomen gray pollinose, second segment with a marginal pair, the third and fourth each with a marginal row of short macrochaete. Wings hyaline, costal spine minute, calypteres white. Front claws and pulvilli scarcely half as long as the last tarsal joint. Length 9 mm.

Atlantic City, N. J., July 15, 1894 (C. W. Johnson). A single specimen.

Metaplagia, gen. nov.

Frontal bristles in single rows, descending to base of the third antennal joint, anterior ocellar bristles directed obliquely forward, face in profile slightly convex, greatly retreating below, the sides covered with short bristly hairs, each side at narrowest point nearly half as wide as the median depression, ridges widely diverging below, vibrissae inserted close to the oral margin, three or four bristles above each, antennae five-sixths as long as the face, the third joint six times as long as the second; arista bare, the penultimate joint not longer than broad; eyes bare; cheeks nearly one-third as broad as the eye-height; proboscis somewhat fleshy, the portion beyond

the basal articulation not half as long as height of head; palpi well developed, clavate. Third vein bristly nearly to the small crossvein, the others bare; hind crossvein nearly midway between the small and the bend, the latter rectangular and bearing a long appendage; posterior end of hind crossvein almost opposite the small; apical cell open, ending nearly midway between the second vein and extreme tip of wing. Type, the following species:

***Metaplagia occidentalis*, sp. nov.**

♂—Black, the first two antennal joints and the palpi yellow. Front at vertex nearly twice as wide as either eye, two pairs of orbital bristles, arista thickened to the tip, which is pointed. Thorax gray pollinose, marked with four black vittæ; three postsutural and three sternopleural macrochaetæ, scutellum bearing three long marginal pairs. Abdomen subshining, bases of last three segments whitish pollinose; second segment bearing a marginal pair of macrochaetæ, third with a marginal row, the fourth with a submarginal and a marginal row. Wings hyaline, costal spine minute, calypteres white. Front claws and pulvilli much longer than the last tarsal joint, hind tibiae not ciliate. Length 7 mm.

San Diego Co., Cal. A single specimen, captured by the writer.

***Araba tergata*, sp. nov.**

♂—Black, including the palpi. Front wholly silvery pollinose, at vertex slightly wider than either eye, frontal bristles descending to middle of second antennal joint, near the middle the two rows are separated from each other fully eight times as far as from the nearest eye, two pairs of orbital bristles; sides of face silvery, bearing short bristly hairs, ridges bristly nearly their entire length; antennæ nearly as long as the face, the third joint five times as long as the second; arista thickened almost to the tip, the penultimate joint not longer than wide; cheeks nearly one-fourth as broad as the eye-height; proboscis short, fleshy, palpi clavate. Thorax opaque, black in middle of front part to behind the suture, the remainder light gray pollinose; three postsutural and two sternopleural macrochaetæ, scutellum bearing two long marginal pairs. Abdomen whitish pollinose on bases of last three segments and hind angles of the first; second segment with a marginal pair of macrochaetæ, the third and fourth each with a marginal row. Wings hyaline, third vein bearing three bristles at its base, the others bare, costal spine minute; calypteres white. Claws and pulvilli scarcely one third as long as the last tarsal joint.

♀—Differs from the ♂ as follows: Frontal vitta yellowish brown, sides of front grayish pollinose, the two rows of frontal bristles near the middle separated from each other from four times to less than twice as far as from the nearest eye. Thorax yellowish gray pollinose, marked with four black vittæ. Abdomen grayish pollinose, first three segments each marked with a posterior row of three black spots, sometimes more or less united, the fourth black on the apex. Length 4 to 6 mm.

Northern Illinois (August 2 and 16, 1894; Dr. W. A. Nason), and Los Angeles Co., Cal., in July, captured by the writer. Two males and two females.

Nemoræa labis, sp. nov.

♀—Black, the antennæ, palpi and fourth abdominal segment except its extreme base, yellow; front coxæ, front and middle trochanters, and the tibia, yellowish brown, front at vertex slightly narrower than either eye, frontal bristles descending nearly to tip of second antennal joint, two in each row curving backward, two pairs of orbital bristles, sides of front nearly destitute of pollen, a large yellowish spot followed by an opaque black one each side between the front and the golden pollinose sides of face which are bare and on lower part are destitute of yellow pollen; antennæ slightly over three-fourths as long as the face, the third joint as long as the second, only slightly longer than wide; arista thickened nearly to the middle, the penultimate joint not longer than wide; vibrissæ inserted nearly half the length of the second antennal joint above the oral margin, two or three bristles above each; cheeks two-thirds as broad as the eye-height, eyes thickly pilose; proboscis short, fleshy, palpi clavate. Thorax gray pollinose, marked with four black vittæ; three postsutural and three sternopleural macrochæte, scutellum bearing three long marginal pairs. Abdomen lightly gray pollinose and with reflecting blackish spots; first two segments destitute of dorsal macrochæte, third with a marginal row, the fourth with scattered ones. Wings hyaline, tinged with gray basally and in the costal cell, a brown cloud on the small crossvein; costal spine minute, bend of fourth vein bearing a long stump; calypteres smoky, bordered with white. Pulvilli two-thirds as long as the last tarsal joint. Length 8.5 mm.

Washington. A single specimen from Prof. O. B. Johnson.

Degeeria washingtonæ, sp. nov.

♀—Black, including the palpi. Front at vertex nearly twice as wide as either eye, frontal bristles descending to middle of second antennal joint, four in each row curving backward; two pairs of orbital bristles; sides of face bare except on upper fourth, ridges bristly on lower three-fifths; antennæ over three-fourths as long as the face; the third joint three times as long as the second; arista thickened to slightly beyond the middle, the penultimate joint three times as long as broad; cheeks slightly over half as broad as the eye-height; proboscis short, fleshy, palpi subclavate. Thorax lightly whitish pollinose, marked with four black vittæ; three postsutural and three sternopleural macrochæte, scutellum bearing three long marginal pairs and a short apical pair. Abdomen at bases of last three segments whitish pollinose; first segment bearing a marginal pair of macrochæte, second with a discal and a marginal pair, third with a discal pair and marginal row, the fourth with scattered ones except on the basal fifth. Wings subhyaline, strongly tinged with yellow at the base, along the costa and as a border to the veins, including the hind crossvein; third vein bearing three bristles at the base, the others bare, costal spine longer than the small crossvein, apical cell open, ending the length of the small crossvein in front of the wing-tip; calypteres yellow. Front tarsi greatly dilated, claws and pulvilli half as long as the last tarsal joint. Length 9 mm.

Mt. Washington, N. H. A single specimen from Mrs. A. T. Slosson.

Paraphyto, gen. nov.

Frontal bristles descending to insertion of antennæ, anterior ocellar bristles directed forward; antennæ two-thirds as long as the face, the third joint one and one-third times as long as the second; arista short pubescent, the penultimate joint not longer than broad; face in profile strongly concave, sides bare, each at the narrowest point almost half as wide as the median depression; ridges strongly arcuate, diverging below; vibrissæ widely separated, inserted half the length of the second antennal joint above the oral margin, a few short bristles above each; cheeks five-sixths as broad as the eye-height, covered with bristly hairs; head at insertion of the vibrissæ slightly longer than at base of antennæ; eyes bare; proboscis rigid, rather slender, the portion beyond the basal articulation nearly as long as height of head, labella soft, of medium size; palpi well developed, clavate. Abdomen oblong, as broad as the thorax. Third vein bristly over half-way to the small crossvein, the others bare, apical cell open, ending midway between the second vein and the extreme tip of wing, bend of fourth vein almost rectangular, destitute of an appendage, hind crossvein at four-fifths of distance between the small and the bend, its posterior end nearer to the wing-margin than to the small crossvein. Type, the following species:

Paraphyto chittendeni, sp. nov.

♂—Black, the second antennal joint and palpi yellow, abdomen, except a vitta on the first three segments, brownish red. Front at vertex as wide as either eye, with the face silvery pollinose, no orbital bristles. Thorax gray pollinose, marked with three black vittæ; three postsutural and two sternopleural macrochaete, scutellum bearing three long marginal pairs. Abdomen thinly gray pollinose; first two segments destitute of dorsal macrochaete, the other two each with a marginal row; hypopygium consisting of three segments. Femora unusually robust, more than twice as thick as the tibiae, middle and hind tibiae distinctly arcuated, the latter not ciliate outwardly, under side of femora and inner side of middle and hind tibiae toward their tips rather densely long black pilose; pulvilli as long as the last tarsal joint. Wings hyaline, tinged with yellow basally and along the costa. Length 11 mm.

Ithaca, N. Y. A single specimen from Mr. F. H. Chittenden, after whom I take pleasure in naming this interesting species.

Myiobia thecata, sp. nov.

♂—Front at vertex almost half as wide as either eye, yellowish gray pollinose, the vitta brownish black; frontal bristles descending to basal fourth of the second antennal joint, four in each row directed backward; no orbital bristles; antennæ four-fifths as long as the face, yellow, apex of the third joint brown, this joint almost twice as long as the second; arista thickened on the basal fifth, short hairy, some of the hairs slightly longer than its greatest diameter; sides of face bare, a single bristle above each vibrissa; cheeks one-tenth as broad as the eye-height; proboscis slender, rigid, yellow except at base, the portion beyond the basal articulation three-fifths as long as height of head, its basal fourth enclosed in a large white membranous sheath; labella rather large; palpi yellow, slender, slightly longer

than the antennæ. Thorax black, yellowish gray pollinose, marked with four black vittæ; three postsutural and three sternopleural macrochæte, scutellum bearing two long marginal pairs; scutellum grayish black, purer black on the sides. Abdomen light yellow, the apex reddish yellow, a dorsal vitta and base of fourth segment black; second segment with a marginal pair of macrochæte, the third and fourth each with a marginal row. Legs yellow, tibiæ tinged with brown, tarsi black; pulvilli one-third as long as the last tarsal joint. Wings hyaline, a bristle at base of third vein, the others bare; costal spine minute, apical cell open, ending the length of the small crossvein in front of the extreme wing-tip.

♀—Differs from the ♂ as follows: Front nearly as wide as either eye, two pairs of orbital bristles, third antennal joint one and one-third times as long as the second, abdomen reddish yellow, middle of first segment and narrow vitta on the second, brown. Length 6 mm.

Bucks and Delaware Cos., Pa. (Aug. 19, 1892, and June 25, 1893; C. W. Johnson). One specimen of each sex.

Argyrophylax rostrata, sp. nov.

♂—Black, the palpi, first two joints of antennæ, scutellum except at base, apex and sides of abdomen except hind angles of the third segment, yellow. Front at vertex nearly as wide as either eye, frontal bristles descending to tip of second antennal joint, three in each row curving backward, a row of short macrochæte between them and the eyes, extending to base of antennæ, no orbital bristles, anterior ocellar bristles well developed, sides of front grayish pollinose; antennæ slightly over three-fourths as long as the face, third joint one and one-half times as long as the second; arista thickened to the middle, the penultimate joint one-half longer than broad; face in profile slightly concave, the sides bare, white pollinose, ridges bristly on the lowest fourth; proboscis slender, rigid, the portion beyond the basal articulation as long as height of head, labella horny, not thicker than the proboscis proper. Thorax gray pollinose, marked with four black vittæ; four postsutural and four sternopleural macrochæte, scutellum bearing three long marginal pairs and a short apical one. First two segments of abdomen each bearing a marginal pair of macrochæte, third with a marginal row, the fourth with three rows. Hind tibiæ densely and evenly ciliate outwardly, with a bristle less than twice as long near the middle; pulvilli longer than the last tarsal joint. Wings hyaline, tinged with gray at the base, third vein bearing three bristles at the base, the others bare, costal spine minute; calypteres white. Length 10 mm.

Mobile, Ala. (Oct. 22, 1894; C. W. Johnson). A single specimen in Mr. Johnson's collection.

Gymnoprosope fulvicornis, sp. nov.

♂—Black, the antennæ and palpi yellowish. Front wholly grayish pollinose, frontal bristles descending to middle of second antennal joint, near the middle the two rows are four times as widely separated from each other as from the nearest eye; antennæ nearly as long as the face, third joint four times as long as the second; arista thickened on the basal two-thirds; sides of face and the ridges bare. Thorax

gray pollinose, the vittæ indistinct; three postsutural and two sternopleural macrochæte, scutellum bearing three long marginal pairs. Abdomen gray pollinose, three rows of spots, united on last segment, 2d and the venter, black; first two segments each with a marginal pair, the other two each with a marginal row of macrochæte. Last two joints of front tarsi unusually slender, the under side of the dilated two preceding joints bearing a large cluster of long black hairs; claws of front tarsi scarcely one-third as long as the elongated last tarsal joint. Wings hyaline, costal spine longer than the small crossvein, calypteres white.

♀—Differs from the ♂ as follows: Frontal vitta yellowish pollinose, sides of face bearing short bristly hairs, front tarsi dilated, destitute of a cluster of hairs. Length 7 mm.

Avalon, N. J. (June 29, 1894; C. W. Johnson), and Northern Illinois (Dr. W. A. Nason). One specimen of each sex.

NEW NORTH AMERICAN TETTIGINÆ.—II.

BY ALBERT P. MORSE, WELLESLEY, MASS.

Tettigidea armata, sp. nov.

Very similar to *T. acuta* Morse (JOURN. N. Y. ENT. SOC. III, 15), differing in having a less projecting vertex, and a distinctly or strongly rugulose pronotum with sharp carinae. The anterior margin of the pronotum is usually more produced, with excavated sides, and terminates in a sharply pointed cusp. The median carina is distinct, sharp, nearly horizontal, with sometimes a slight depression opposite the tegmina. In the type the wings and pronotum pass the hind femora considerably but a short-winged form occurs, described below as *depressa*.

1 pair (*in coitu*), 4 ♀ ♀, Vigo Co., Ind., collected by Prof. W. S. Blatchley. 1 ♀, Dallas, Texas, Boll (M. C. Z.). 1 ♂, 1 ♀, "Tettig. lateralis," no locality, in Scudder's collection; probably this species.

	Antenna.	Hind fem.	Pronotum.	Pron.>H. fem.	W'gs.>Pron.	Total.
♂	3.5	6.	11.5	1.7	.7	12.8
♀	4.	7. -8.	13.8-16.3	2.5-3.5	1.1-1.7	15.4-17.7
♀ (Tex.)	5.	8.5	16.5	2.8	1.2	18.

T. armata depressa, var. nov.

This is doubtless the short-winged form of *armata*, differing only in having the pronotum equalling or not reaching the tip of the hind femora and the wings more or less abortive; the dorsum of the pronotum is sinuate in profile, being more or less depressed at tip and opposite shoulders.

1 ♀, Vigo Co., Ind., Blatchley. 1 ♂, Jacksonville, Fla., Ashmead; 1 ♀, New Orleans, La., Coleman, received from Prof. Bruner. 1 ♀, St. John's River, Fla., J. A. Allen (M. C. Z.). 1 ♀, Ft. Reed, Fla., collected by Comstock, determined as "Tettig. lateralis" by

Scudder (Cornell Univ.). The ♂ from Florida was referred by Bruner with some doubt to *Batrachidea flavo-notata*.

Antenna.	Hind fem.	Pronotum.	Pron.<H. fem.	Total.
♂ —	5.5	7.7	1.5	8.5
♀ 4.	7.-8.	11.-12.	0.-.5	11.5-13.

Tettigidea spicata, sp. nov.

A small, slender, southern species, intermediate in structure of vertex between *aficulata* and *armata*, but more nearly allied to the latter. The vertex is more projecting than in *armata*, the body is narrower across the shoulders, the lateral carinae of pronotum are but slightly developed, the median carina is less distinct, and the disc is more finely rugulose.

1 ♂, Georgia (Henshaw); 2 ♀ ♀ Florida, Morrison (Bruner).

Antenna.	Hind fem.	Pronotum.	Pron.>H. fem.	W'gs.>Pron.	Total.
♂ 3.3	5.5	10.5	1.7	.7	11.6
♀ 4.	7.6	14.4	2.5	.7-1.	15.6-16.2

Restoration of Harris' name to the New England species of *Tettigidea*.

Continued study of the group of forms commonly referred to under the names of *Tettigidea lateralis* and *polymorpha* convinces me that it is composed of several distinct species, not, however, to be distinguished by the length of pronotum and wings as has so commonly been done, but by characters presented in the form of the head and pronotum aside from mere length of the latter. As has been noted above, several species may be readily separated into a group having the front margin of the pronotum produced into a sharp, pointed cusp; in the remainder the margin is either rounded or obtuse-angulate.

To this latter group belong the forms described by Say as *Acrydium laterale* (long-winged) from Georgia and East Florida; by Burmeister as *Tetrix polymorpha* var. *A* and *B* (long- and short-winged) from South Carolina, and by Harris as *Tetrix parvipennis* (short-winged) from Massachusetts.

The southern forms of this group, as well as those with cuspidate pronotum, are dimorphic in wing-length.

Examination of nearly four hundred specimens from various parts of the country, but especially from the central and southern States, and comparison with a large series of New England examples reveals the fact that the New England forms referred to in my previous papers as *lateralis* and *polymorpha* or "the northern form of *lateralis*" are distinct from those found in the region from which Say and Burmeister's

specimens were procured, thus rendering necessary the restoration of Harris' name to the New England species. As a designation for the long-winged form is desirable, I here propose for it the name *pennata*, and, believing the two forms to be one species, its full name becomes *T. parvipennis pennata*.

In arriving at these conclusions I have been especially aided by an excellent series of specimens collected in Indiana by Prof. W. S. Blatchley, some of which were obtained directly from him through exchange or for examination, and others were kindly loaned by Dr. J. L. Hancock, of Chicago. I wish to call attention to the importance, in in some cases even the necessity, of series of specimens in order to arrive at a definite knowledge of the group.

I have examined specimens of *parvipennis* from New England, New York, New Jersey, Pennsylvania, West Virginia, Indiana, Illinois, Minnesota and Ottawa, Canada. In Vigo Co., Ind., it is about equally common with another dimorphic species included under the name of *lateralis* (and *polymorpha*) by Blatchley. This latter species I have seen also from Maryland, West Virginia, southern Illinois, Kentucky, Tennessee, North Carolina, Mississippi, Louisiana, Texas. For the present it may be called as heretofore though it is doubtful if it is identical with the Florida form described by Say. Small series of specimens before me from Florida, Georgia and North Carolina present certain differences from it and between themselves which may be regarded as either varietal or specific, at present it is impossible to say which is the more probable. As soon as time and material permit I intend to supplement these descriptions by presenting drawings of these various forms and of all the species of the genus obtainable, whose discrimination in the absence of figures is attended with much difficulty.

The characters of *parvipennis* which distinguish it most readily from the other species are the strongly projecting vertex, less prominent eyes (see Morse, Notes N. E. Acrid. I. *plate*: Psyche, Oct., 1894) and stouter antennæ. The lateral carinæ of the pronotum are usually but slightly sinuate, the anterior portions being distinctly divergent and passing rather smoothly into the humeral portions. The antennæ are slightly flattened, the joints of the middle third not over two or two and-a-half times as long as broad. In the other species the antennæ are filiform, and the joints of the middle third are three to four times as long as broad; the vertex is less projecting, the eyes more prominent, and in some the lateral carinæ are parallel in the anterior part of their course.

THE EVERISIBLE REPUGNATORIAL SCENT GLANDS OF INSECTS.

PLATE V.

BY A. S. PACKARD.

While these eversible glands are not found in marine or aquatic Arthropods as Crustacea or Merostomata (*Limulus*), they are often present in the air-breathing forms, especially insects. In the winged insects they are of frequent occurrence, existing under great variety of form, varying greatly in position, and appearing usually to be in immediate relation with their active volant habits. Their presence is in direct adaptation to the needs and habits of their possessors, and being repellant, warning, or defensive structures, the odors they secrete being often exceedingly nauseous, they appear to have been called into existence in direct response to their biological environment. The fact that these singular organs do not exist in marine or aquatic Crustacea suggests that the air-breathing, aerial or volant insects by these eversible glands, usually in the form of simple evaginable hypodermic pouches, are enabled to protect themselves by emitting an infinitesimal amount of an offensively odorous fluid or ether-like spray which charges the air throughout an extent of territory which may be practically illimitable to the senses of their enemies. The principle is the same as in the mephitic sulphuretted oil ejected by the skunks, the slight quantity these creatures give out readily mixing with and charging the atmosphere within a radius of many miles of what we may call the center of distribution.

As is now well known, the very delicate, attenuated highly volatile odors exhaled are perceived by insects with extreme ease and rapidity, the degree of sensitiveness to such scents being enormously greater than in vertebrates, their organs of sense being developed in a corresponding degree. Professors Fischer and Penzoldt, of Erlangen, have recently established the fact that the sense of smell is by far the most delicate of the senses. They find that the olfactory nerve is able to detect the presence of $\frac{1}{2,766,400,000}$ of a grain of mercaptan.* The smallest particle of matter that can be detected by the eye is sodium, when observed by the spectroscope, and this particle is two hundred and fifty times

* Mercaptan is a mercury, belonging to a class of compounds analogous to alcohol, having an offensive garlic odor. Methyl mercaptan is a highly offensive and volatile liquid.

coarser than the particle of mercaptan which can be detected by the nose.

In those Arachnida which are provided with poison glands, these scent glands are absent, but in certain Acarina and Linguatulidæ, which have no poison glands, there are various oil glands, stigmatic glands, as well as scent glands, and in seizing a *Thelyphonus* with the forceps I have observed it to send out from each side of the body a jet of offensive spray.

We find not infrequently in Myriopods (*Polydesmidæ*, *Julidæ*, and *Glomeris*) repugnatorial or the so-called cyanogenic glands, which are either paired, opening on the sides of the body, or form a single row along the median line of the under side of the body. Leidy describes and figures the spherical glands of *Julus marginatus*, of which there are fifty pairs. These glands have been regarded as modified nephridia, but are more probably coxal glands, and the homologues of the parapodial glands of annelid worms.

True coxal glands occur in *Scolopendrella immaculata* on the 3d to 11th and the last segment, on the inner side of the base of the legs. Homologous glands also occur in the same position in *Campodea staphylinus* (also in *C. cookei* and *C. mexicana*) on the 1st to 8th abdominal segments, and Oudemans has described a pair of eversible sacs on each side of segments 1 to 7 of *Machilis*. These eversible sacs in the Synapterous insects are evidently modified coxal glands, and are probably repugnatorial as well as respiratory in function.

The apparatus consists of an eversible gland, composed of hypodermic cells, usually retracted by a slender muscle and with an efferent passage, but the glands vary greatly in shape and structure in different insects. In some cases these fetid glands appear not to be the homologues of the coxal glands, but simply dermal glands.

These repugnatorial glands are of not infrequent occurrence in the lower or more generalized winged insects, and in situation and appearance are evidently the homologues of the coxal glands of the Symphyla and Synaptera.

In the ear-wigs (*Forficula* and *Chelidura*) Meinert has detected a pair of what he calls fetid glands at the posterior margin of the dorsal plates of the second and third abdominal segments.

Vosseler also describes the same glands as consisting of a retort-shaped sac, in whose walls are numerous small epidermal cells and large single glandular cells provided with an efferent passage, the fluid being forced out by the pressure of the dermal muscles, one

acting specially to retract the gland. The creature can squirt to a distance of five and even ten centimeters (4 inches) a yellowish brown liquid or emulsion with the odor of a mixture of carbolic acid and creosote.

The large eversible dorsal glands of the Blattidæ, since they contain numerous hairs, which, when everted, are fan-like or like tufts, serve, as in the spraying or scent apparatus, to disseminate the odor, might be classified with the alluring unicellular scent glands or *duftapparat* of other insects, as they are by some authors; but as the glands are large and compound they may prove to be the homologues of the coxal glands rather than of the dermal glands.

Evaginable organs in the Blattids were first observed by Gerstæcker in both sexes of *Corydia*; they are yellowish white, covered with hairs, and are thrust out from between the dorsal and ventral plates of the first and second abdominal segments.

In the cockroach (*P. orientalis*) Minchin detected two pouch-like invaginations of the cuticle, lying close on each side of the middle line of the body between the fifth and sixth tergites of the abdomen. They are lined by a continuation of the cuticle, which forms, within the pouches, numerous stiff, branched, finely pointed bristles, beneath which are a number of glandular epithelial cells. In the male nymph of *P. decorata* he also found beside these glandular pouches "an additional gland, opening by a tubular duct under the intersegmental membrane between the fifth and sixth terga above the glandular pouch of each side, and extending forward into the body cavity. The gland and its duct are proliferations of the hypodermis, and there is no invagination of the cuticle." These eversible glands are most complicated in *Phyllodromia germanica*. While it is absent in the female, in the male it is relatively of enormous size, extending over the sixth and seventh somites, as well as projecting far into the body cavity (Minchin). Haase states that these glands become everted by blood-pressure and give out the well-known disagreeable smell of these insects. He states that in the male of *P. germanica* the dorsal glands in the sixth and seventh abdominal segments are without hairs and produce an oily secretion; they function as odoriferous organs in sexual union.

In the male of another Blattid (*Aphlebia bivittata*) of the Canary Islands, Krauss has detected two yellowish dorsal sacs 1.5 mm. in length, opening out on the seventh abdominal segment, and filled full of long yellowish hairs, the ends directed towards the opening, where they form a thick tuft. These eversible glands lined with hairs appear to be

closely similar to the long slender eversible hairy appendages or scent organs of certain Arctian and Syntomid moths.

I have found the external median wart with lateral lids or flaps in between the fifth and sixth tergites of *Platyzosteria ingens* Scudder, a large wingless Blattid living under the leaf scars of the cocoanut tree in Southern Florida, but was unable to detect them in *Polyzosteria* or in *Blabera* from Cuba, or in another genus from Cordova, Mexico.

In another group of Orthoptera, the Phasmidæ, occur a pair of dorsal prothoracic glands, each opening by a pore and present in both sexes. In the walking-stick, *Anisomorpha buprestoides*, ♂ and ♀, these openings are situated on each side of the prothorax at its upper anterior extremity, situated at the bottom of a large deep pit. When seized it discharged a "milky white fluid from the pores of the thorax, diffusing a strong odor, in a great measure like that of the common Gnaphalium or life everlasting" (Peale in Say's American Entomology, I, p. 84). Boll states that the females when captured "spurt from the prothorax, somewhat after the manner of bombardier beetles, a strong vapor, which slightly burnt the skin; when the females were seized by the males a thick fluid oozed from the same spot." Scudder describes these glands in another Phasmid (*Autolyca pallidicornis*) as two straight, flattened, ribbon-like bodies, with thick walls, broadly rounded at the end, lying side by side and extending to the hinder end of the mesothorax. In *Anisomorpha buprestoides* the glands are of the same size and shape (Scudder, Psyche, I, p. 137). In *Diapheromera femorata* the repugnatorial foramina are very minute, and the apparatus within consists of a pair of small obovate or subfusiform sacs, one on each side of the prothorax, about 1 mm. in length, with a short and very slender duct opening externally at the bottom of the pit (Scudder).

In the Mantidæ these seem to be genuine coxal glands, as there is a pair situated between the coxæ of the first pair of legs. An evaginable organ like a wart, with a glandular appearance, occurs on the hind femora of the Acrididæ in a furrow on the under side into which the tibia fits, about one-fourth from the base (Psyche, III, p. 32).

In the male cricket, the anal odoriferous glands are small lobes opening into a reservoir on each side of the rectum (Dufour). Homologous glands also occur in the Coleoptera and Lepidoptera, and may prove to be coxal glands.

Most Hemiptera or bugs send out a fetid or nauseous odor due to a fluid secreted by a single or double yellow or red pear-shaped gland, situated in the middle of the mesothoracic segment, and opening be-

tween the hinder or third pair of coxæ. In *Belostoma* Leidy describes these glands as consisting of two rather long cœcal tubes situated in the metathorax, beneath the other viscera, extending backwards into the abdomen, and opening between the coxæ of the third pair of legs. Some bugs, however, emit an agreeable odor, that of *Lysomastes* resembling that of a fine bergamot pear (Siebold). The fluid given out by the European fire-bug (*Pyrrhocoris apterus*) has a sweetish smell, like ether. In the nymph there are three pairs of dorsal glands, on abdominal segments 2-5, which are atrophied in the mature insect. In the bed-bug, the nymph has three odoriferous glands, each with paired openings in the three basal abdominal segments respectively; and situated on the median dorsal line, being arranged transversely at the edge of the tergites, but after the last molt these are aborted, and replaced by the sternal metathoracic glands (Künckel).

Certain beetles are endowed with eversible repugnatorial glands. *Eleodes gigantea* and *E. dentipes* of both sexes are said by Gissler to possess these glands. When teased "they stand on their anterior and middle legs, holding the abdomen high up and spurning the contents of the glands right and left." The glands (Plate V, Fig. 1) are two reddish brown, somewhat bilobed sacs, and extend from the base of the last up to the middle of the second abdominal segment, with an average length of 6.5 mm. The liquid stains the human skin, has an acid reaction, with a peculiar, "intensely penetrant odor, causing the eye to lachrymate. It is soluble in water, alcohol and ether. Boiled with concentrated sulphuric acid and alcohol an ethereal aromatic vapor is produced, indicating the presence of one or more organic acids, though neither formic or acetic acid could be detected. Williston has observed the same habits in seven other species of *Eleodes*, all ejecting a pungent vile-smelling liquid, one species (*E. longicollis*) ejecting a stream of fluid from the anal gland, backwards sometimes to the distance of ten centimeters or more, and he regards these beetles as "the veritable skunks of their order." Leidy briefly describes the odoriferous glands of *Upis pennsylvanica*.

Glands like those of *Eleodes* found in *Blaps mortisaga* are described in detail by Gilson (Plate V, Fig. 2). They form two pouches or cuticular invaginations situated in the end of the abdomen on the sides of the end of the intestine and unite on the median line underneath the genital organs, forming a very short tube with a chitinous wall, continuous with the cuticle of the last abdominal segment. Into each pouch open a large number of fine slender lobules varying in shape, giving a vil-

ulous aspect to the surface. These lobules are composed of as many as fifty unicellular glands, each of which is composed of four parts: (1) A radiated vesicle, (2) a central sac, giving rise (3) to a fine excretory tube, and (4) a sheath near the origin of the excretory tube. These are all modifications of the cytoplasm of the cell with its reticulum; the nucleus with its chromosomes is also present, but situated on one side of the central sac. The fine excretory tubules form a bundle passing down into the mouth of each lobule.

Similar glands, though usually smaller, which have not been carefully examined, occur in *Carabus* (Fig. 3) and *Cychrus*, which eject from the vent a disagreeable fluid containing butyric acid (Pelouse). The bombardier beetle *Brachinus*, with its anal glands, ejects a jet of bluish vapor accompanied with a considerable explosion, which colors the human skin rust red; it is caustic, smells like nitrous acid and turns blue paper red. Westwood states that individuals of a large South American *Brachinus* on being seized "immediately began to play off their artillery, burning and staining the flesh to such a degree that only a few specimens could be captured with the native hand, leaving a mark which remained for a considerable time." The fluid ejected by another species in Tripoli, blackened the fingers of the collector. "It is neither alkaline nor acid, and it is soluble in water and in alcohol" (Kirby and Spence, IV, p. 149).

Species of other genera (*Agonum*, *Pheropsophus*, *Galerita*, *Hel-luo*, *Paussus*, *Ozæna*) are also bombardiers, though less decidedly so than *Brachinus*. A Paussid beetle (*Cerapterus*) ejects explosively a fluid containing free iodine (Loman), while *Staphylinus*, *Stenus*, *Ocypus olens*, *Lacon*, etc., have similar anal fetid glands, the liquid being more or less corrosive. The secretion of *Mormolyce phyllodes* is so corrosive that it is said to paralyze the fingers for twenty-four hours after (Cuénot).

The two pairs of remarkably large soft eversible forked orange yellow glands of the European genus *Malachius*, are thrust out from the side of the first and the third thoracic segments. They are everted by blood-pressure, and retracted by muscles. The larva of *Hydrophilus piceus* ejects by the anus a black fetid fluid.

Claus has shown that the larva of *Lina populi* and other Chryso-melidæ possess numerous minute eversible glands in each of the warts on the upper surface of the body, each gland containing a whitish repellent fluid smelling like the oil of bitter almonds and containing salicylic acid derived from its food plant, which issues as pearl-like drops.

Candèze thinks the fluid may contain prussic acid. The fluid is secreted by a variable number of glandular cells, each provided with an efferent duct. The larvæ of sawflies, notably *Cimbex americana*, also eject droplets of a clear fluid from their skin.

In this connection it may be mentioned that though there are no special glands present, many beetles emit drops of blood from the femoro-tibial joints of their legs as a means of defence. Such are the oil beetles (*Melœ*), *Cantharis*, *Lytta*. The cantharadine secreted by these beetles, according to Beauregard, is an efficient means of defense as birds, reptiles and carnivorous insects will not usually attack them. This substance is formed in the blood and also in the genital organs, and is so extremely caustic that scavenger insects which feed upon their dead bodies will leave untouched the parts containing cantharadine, and if May-beetles or Mole Crickets are washed with the blood of *Melœ* or with cantharidate of potassa, it will for several days render them safe from the attacks of the carabids which usually prey upon them. The eggs even after deposition are strongly vesicant, and are thus free from the attacks of egg-eating insects (Cuénot). The Coccinellidæ are also protected by a yellow mucilaginous disagreeable fluid oozing out of the sides of the thorax; in our common two-spotted Lady-bird (*C. bipunctata*) the yellow fluid is disagreeable, smelling like opium.*

The Dytiscidæ eject from the anus a colorless disagreeable fluid, while these beetles, and especially the Gyrimidæ, when captured send out a milky fluid which appears to issue from the joints of the body. The Silphidæ throw out both from the mouth and vent a fetid liquid with an ammonial odor. They possess but a single anal gland, the reservoir opening on one side of the rectum (Dufour).

More agreeable secretions, but probably formed by similar glands, is the odor of rose or hyacinth given out by Cicindelæ, or the rose fragrance exhaled by the European *Aromia moschata*.

Other malodorous insects have not yet been investigated; such are the very persistent odors of lace-winged flies (*Chrysopa*).

The anal glands consist, according to Meckel and also Dufour, of two long simple flexuous cœca with reservoirs having two short excretory ducts situated near the anus (Siebold).

Many caterpillars, as our subjoined list will show, are very well protected by eversible repugnatorial glands situated either in the under or upper side of the body. Since the time of DeGeer (1750) the fork-

* Lutz has found that the blood in Coccinellidæ passes out through a minute opening situated at the end of each femur. (Zool. Anzeiger, June 24, 1895.)

tailed larva of *Cerura* has been known to throw out a secretion, which was described by Bonnet in 1755 as a true acid, sharp, sour and biting. This spraying apparatus in *Cerura* (*Harpyia*) *vinula* has been well described by Klemensiewicz (Plate V, Fig. 4), though Rengger in 1817 noticed the general form of the secretory sac, and that it opens out in two muscular evertible tubes, out of which the secretion is ejected.

The fork-tailed larva of *Macrurocampa marthesia*, which is much like that of *Cerura*, when teased sends out a jet of spray to the distance of nearly an inch from each side of the neck. While examining the very gaily colored and heavily spined caterpillars of *Schizura concinna* I observed that when a fully grown one was roughly seized with the forceps or fingers it sent out a shower of spray from each side of the prothoracic segment, exactly like that of *Cerura* and *Macrurocampa*.

In the European *Cerura vinula* the apparatus consists of a single sac, which opens by a narrow transverse slit on the under side of the neck, out of which is rapidly everted four lateral tubes, two on each side (Plate V, Fig. 4 *f*), which are withdrawn within the opening by the contraction of several fine muscles. The apparatus in the American *C. multiscrita* is as in the European *C. vinula*. In a living specimen the large secretory sac was seen to be of the same size and shape as in *Macrurocampa*, and of the color of raw silk. The sac when disturbed extends back to a little behind the middle pair of legs, and is nearly two-thirds as wide as the body. The caterpillar sent out the fluid when handled, but I could not make it spray.

In the larva of *Macrurocampa marthesia* the cervical or secretory gland (Plate V, Fig. 5) is situated in the first and second thoracic segments, extending to the hinder edge of the latter and lying between the nervous cord and the œsophagus and proventriculus, and when empty the bulk of it lies a little to one side of the median line of the body. It is partly held in place by small tracheæ, one quite large branch being sent to it from near the prothoracic spiracle. The short large duct leading from it to the transverse opening in the membrane between the head and prothoracic segment is a little narrower than this opening, and is kept distended by tænidia or a series of short spiral threads which are pale, not honey-yellowish in color. This duct lies on one side of the prothoracic ganglion resting just under the commissures passing up to the brain; it is also situated between the two salivary ducts.

The very distensible sac (Plate V, Fig. 5) is rendered elastic by a curious arrangement of the cuticle, the tænidia of the duct itself being represented by very thickly scattered irregular separate, sinuous

chitinous ridges which stand up from the cuticular lining of the wall of the sac (Plate V, Fig. 6). The secretory cells of the walls of this sac in *Cerura vinula* are said by Klemensiewicz to be large hexagonal cells, resembling those of silk glands, having like them large branched nuclei.

The fluid thrown out is said by Poulton to be formic acid; it causes violent effervescence when allowed to fall upon sodium-bicarbonate, and colors blue litmus paper red.

In the caterpillar of *Astyanax archippus* (*Limenitis disippus*) a dark bladder-like sac is everted, but the lateral tubes appear to be wanting and no spray is sent out; it occurs in the larvæ of many Nymphalidæ, and other butterflies and moths.

Scudder tells me that these glands are generally present in the larvæ of butterflies, including the present species, but as I observed it repeatedly and with some care in this caterpillar I will record my observations. A larva which had hibernated was found May 11 at Providence on a leaf of the wild cherry; its length was 12 mm. I could not but be struck with the protective resemblance of the creature when curled up to a mass of birds' droppings.

While examining the caterpillar, my attention was called to a whitish mass with a black outer edge, situated on the under side of the prothoracic segment just behind the head, and in front of the first pair of legs. On removing this mass with the needle I found under it a large low conical eversible soft tubercle covered with short hairs. On rupturing the gland with a needle a little fluid exuded from it. When at rest the gland is retracted within a transverse oval opening. No odor appears to be given out by the fluid, as tested by four persons.

The caterpillar when at rest was experimented on, with the following result. On rudely touching it with the point of a needle, it turned the head on one side and suddenly evaginated the gland to its fullest extent, but no fluid could be seen. On teasing it still further the caterpillar would angrily turn its head over upon its back, so that the hirsute gland would be directed upwards. It then, on being let alone, gradually, but rather rapidly retracted the gland, the thick, rather swollen lips forming a narrow transversely oval opening, which would be easily overlooked.

The gland is bladder-like and of simple bag-like shape, without the pair of diverging siphon-like tubes seen in *Cerura* and *Pheosia*, and it is probable that the fluid is not ejected in a stream or spray, but simply exudes from the gland, in which no opening could be detected.

The gland is of the same dark brown color as the skin of the caterpillar itself, and not light in tint as in *Cerura*, *Pheosia*, etc.

While describing the living larva of *Perophora melzheimerii* my attention was called to some small singular sternal tubercles on the two hinder thoracic segments; but I did not, to my regret, then carefully examine them. On farther examination of two alcoholic specimens, however, I find that the tubercles guard the lips of an eversible gland. They are most distinct on the third thoracic segment, where there are to be readily found four dark prominent papillæ, two on each side of the median line of the body, directly behind the base of the legs. The heads of the papillæ are dark and finely granulated. The two tubercles on each side touch each other; they are probably modified piliferous warts. These four papillæ enclose a square area in the middle of which are the lips, arranged transversely, of the mouth of an eversible gland. These organs are also present on the second segment, and are of the same degree of development. Whether there is the opening of a functional sternal eversible gland on the first thoracic segment I am uncertain, as I have been unable in my two alcoholic specimens (one of which had died and shrivelled up) to detect any traces of lips. On this segment the base of the legs are close together, the basal joints being large and closely contiguous. There are no tubercles developed like those on the second and third segments, and in the material at my disposal I have been unable to find an opening. It is not improbable, however, that such a gland with lips once existed in the ancestors of this and of *Lacosoma*, for in *Nola*, which is a member of a family probably much later in appearance, there are two well developed sternal glands. In several Notodontians one is well developed on the under side of the first thoracic segment, while there are none behind. Probably in the Perophorinæ, owing to the modifications of the body, due perhaps to their constructing a case and thus causing some change in the movements of the first pair of legs, they are much nearer together than usual in larvæ not thus adapted to living in cases.

In *Lacosoma* homologous papillæ are present in the corresponding segments, but whether the external opening of the gland is present I am unable as yet to state. On the third thoracic segment there are four tubercles present in the same general position as in *Perophora*. The anterior pair, however, are very small, and (antero-posteriorly) remote from the hinder pair. The latter are much larger than the front pair and in the form of small, rather slender papilliform tubercles, and armed at the end with several crowded spine-like granulations. Between them is to be seen in my single alcoholic specimen a depression, but I cannot detect any lips or any opening. On the second thoracic

segment is only a single pair of papillæ; the anterior pair being obsolete, and I cannot detect any opening to a gland.

On the first thoracic segment, the legs are closely contiguous at their broad expanded bases. Directly behind the legs and in the median line of the body is a minute area bearing two minute tubercles, but no opening near them is visible.

It is possible, though careful observations on the living larvæ are needed, that the openings of the repugnatorial glands in *Lacosoma* are closed from disuse, and that the glands themselves only exist in a rudimentary state. It is interesting, however, to find these glands in this family, and to find that they appear obsolete (at least the external openings in *Lacosoma*), while the glands are functionally active in *Pero-phora*, a genus so nearly allied. It will be interesting to ascertain whether these glands are present in the true sackworms, or Psychidæ. We should hardly, however, expect to find them developed, since these caterpillars are in closer quarters, the sacks being smaller and more tubular, and there seems to be little need of active repugnatorial glands in creatures otherwise so well protected from attack.*

The caterpillars of the swallow-tailed butterflies (*Papilio*, *Doritis* and *Thais*), as is well known when irritated thrust out from a transverse slit on the upper part of the prothoracic segment, a large orange-yellow V-shaped fleshy tubular process (the *osmeterium*), from which is diffused a more or less melon-like but disagreeable, in some cases, an insufferable, odor; the secretion is acid and reddens litmus paper. The mechanism has been described and figured by Klemensiewicz.

When at rest or retracted the osmeterium lies in the upper part of the body in the three thoracic segments, and are crossed obliquely by several muscular bundles attached to the walls of the body, and by the action of these muscles the evagination of the osmeterium is strongly promoted. After eversion the tubes are slowly retracted by two slender muscles inserted at the end of each fork or tube, and arising from the sides of the third segment behind the head, crossing each other in the median line (Plate V, Fig. 7, *r. m.*). The secretion is formed by an oval mass of glandular cells at the base of the forks; in the glandular mass is a furrow-like depression about which the secretory cells are grouped. The secretion collects in very fine drops on the side of each furrow opposite the glandular cells.

According to C. D. Ash the larva of an Australian Notodontid

* After an examination of microscopic sections of two young larvæ of *Thyridopteryx* I am unable to detect them.

(*Danima banksii* Lewin) protrudes from the under side of the prothoracic segment a y-shaped red organ like that of *Papilio*; no fluid or odor is given out.

The showy caterpillars of *Orgyia* and its allies have a conspicuous coral-red tubercle on the back of the sixth and also the seventh abdominal segment, which on irritation are elongated, the end of the tubercles being eversible. When at rest the summit is crateriform, but on eversion the end becomes rounded and conical. These osmeteria are everted by blood pressure, and retracted by a muscle. Plate V, Fig. 9 represents a section of an osmeterium of *Orgyia leucostigma* when retracted by the muscle (*m*); at the bottom of the crater are the secreting or glandular cells (*gc*), being modified hypodermal cells. These doubtless serve as terrifying organs to ichneumons and other insect enemies, and though we have been unable to detect any odor emanating from the tubercles, yet doubtless they give out a scent perceived by and disagreeable to their insect assailants.

In the Hemileucidæ there are two pairs of lateral osmeteria, which, however, are not highly colored (Pl. V, Fig. 10). In *Megalopyge* (*Lagoa*) there is a lateral row of singular pale permanently everted processes which appear to be the homologues of the osmeteria of larvæ of other lepidopterous families.

In the caterpillars of certain blue butterflies (Lycænidiæ) is an internal osmeterium, being a very minute sac which is everted from a transverse slit on the top of the seventh abdominal segment. Its function is quite the opposite of those of the caterpillars of other families since the sac exudes a sweet fluid very attractive to ants, which may be diffused more widely by the delicate spinulose bristles crowning the summit. W. H. Edwards states that in several species of *Lycæna*, besides that on the seventh abdominal segment, there is on the eighth segment a pair of minute dorsal evaginable tubercles.

In certain of the butterflies, the *Heliconidæ* (*Colænis*, *Heliconius*, *Euides* and *Dione*), there is thrust from the end of the abdomen a pair of large irregular rounded evertible glands, which give out a disagreeable odor, and are consequently repellent, and which seem to be the homologues of the odoriferous glands of other butterflies.

The large soft rounded evertible glands, looking like puff-balls or a rounded pudding (Pl. V, Fig. 12) are everted, when the butterflies are roughly seized, from the dorsal side of the penultimate segment of the abdomen. The males possess two smaller tubercles on the inside of the anal claspers or lobes. Müller also detected, in the females of vari-

ous species of the Heliconidæ enumerated above, a pair of club-shaped processes like the balancers of flies, which are thrust out on each side of and under the odoriferous puff-balls of the hinder edge of the penultimate segment (Pl. V, Fig. 13). The club or head is armed with hairs or bristles, which in *Heliconius* are like the scales of a butterfly.

A pair of small ramose odoriferous glands are said by Siebold, who regarded them as alluring glands, to occur in *Argynnis*, *Melitæa* and *Zygæna*, to be situated near the orifice of the oviduct, and Scudder has detected them near the anus of the female pupa of *Danaïs archippus*. The appearance of the odoriferous glands in the pupa of *Vanessa io* is well shown by Jackson (Pl. V, Fig. 14). They develop as two tubular ingrowths of the hypodermis, perfectly distinct one from the other, each having its own separate aperture to the exterior. In Fig. 14 the condition of parts is nearly as in the imago, the glands being situated below the rectum and opening of the oviduct. In both sexes of another Brazilian butterfly (*Didonis biblis*) on the median line of the abdomen between the fourth and fifth segments are two roundish vesicles covered with short gray hairs, which emit a disagreeable smell.

It is possible that the dark green fluid in *Parnassius*, secreted by an evaginable gland and which is moulded into shape by the scimeter-shaped *peraplast* (Scudder), is formed by the homologues of the anal glands of other butterflies.

Distribution of repugnatorial or alluring scent Glands in Insects.*

The names of the discoverers of the glands are enclosed in parenthesis.

A. LARVAL INSECTS.

a. *Prothoracic sternal*. *Phryganea*.

b. *Prothoracic sternal*, discharging a lateral jet of spray; with a single large internal sack.

LEPIDOPTERA.

Super-family TINEINA.

Hyponomeuta evonymella (*Schaeffer*).

* Embryonic or temporary glands, the "pleuropodia" of Wheeler, viz., the modified first pair of abdominal legs, occur in *Ecanthus*, *Gryllotalpa*, *Niphidium*, *Stenobothrus*, *Mantis* (occasionally a pair on the second abdominal segment, Graber); *Blatta*, *Periplaneta*, *Cicada*, *Zaitha*, *Hydrophilus*, *Acilius*, *Aelolontha*, *Meloe*, *Sialis*, *Neophylax*. (See Wheeler, Appendages of the First Abdominal Segment, etc., 1890.)

Family NOCTUIDÆ.

Bryophila (<i>Rogenhofer</i>).	Aporia crataegæ (<i>Goossens</i>).
Cucullia formosa (<i>Rogenhofer</i> .)	Aplecta nebulosa (<i>Goossens</i>).
Cucullia scrophulariæ (<i>Rogenhofer</i>).	Leucania staminea (<i>Goossens</i>).
	Leucania hispanica (<i>Goossens</i>).
Habrostola (<i>Rogenhofer</i>).	Leucania nonagrioides (<i>Goossens</i>).
Cleophana linearis (<i>Rogenhofer</i>).	Plusia gamma (<i>Schaeffer</i>).
Catocala , sp. (<i>Poulton</i>).	

Family NOTODONTIDÆ.

Pheosia rimosa (<i>Packard</i>).	Heterocampa pulvereæ (sends out vapor from neck, <i>Riley</i> , in conversation).
Schizura concinna (<i>Packard</i>).	
Danima Banksii (<i>Ash</i>). (Australia, Ent. Month. Mag., Sept. 1892).	Cerura vinula <i>Goedart</i> (<i>Schaeffer</i>).
Macrurocampa marthesia (<i>Packard</i>).	Cerura furcula (<i>Poulton</i>).
	Cerura borealis (<i>Packard</i>).
	Cerura multiscripta (<i>Packard</i>).

Superfamily RHOPALOCERA.

Family NYMPHALIDÆ.

Limenitis disippus (<i>Scudder</i>).	Melitæa artemis (<i>Walsingham</i>).
Astyanax archippus (<i>Scudder, Packard</i>).	Melitæa sp. (<i>Rogenhofer</i>).
Argynnis cybele (<i>Scudder</i>).	Vanessa sp. (<i>Rogenhofer</i>).
Vanessa io (<i>Klemensiewicz</i>).	Argynnis sp. (<i>Goossens</i>).
	“Larvæ of many Satyrids.”
	(<i>Goossens</i>).

c. Prothoracic, dorsal; sending out a v-shaped odoriferous organ (Osmeterium).

Family PAPILIONIDÆ—all the species, as a rule.

d. Thoracic sternal, evaginable glands.

Family PEROPHORIDÆ.

Lacosoma chirodota (<i>Packard</i>).
Perophora melsheimerii (<i>Packard</i>).

Family NOLIDÆ.

Nola strigula (*Goossens*).**Nola ovilla** (*Packard*).**Nola cucullatella** (*Chrétien, Packard*).

Order HYMENOPTERA.

Family TENTHREDINIDÆ.

Cræsus septentrionalis (*Poulton*). **Cimbex americana** (*Packard*).**Cræsus varus** (*Poulton*).*e. Lateral abdominal partly eversible glands emitting neither moisture nor odor, but flesh-colored.*

Superfamily TINEINÆ.

Phyllocnistis? (*Chambers*). Eight pairs.

Family HEMILEUCIDÆ.

Hyperchiria io (*Dimmock, Packard*). Two pairs, viz., on 1st and 7th segment.**Hyperchiria?** sp. Mexico. (*Packard*).**Hemileuca yavapai** (*Packard*).**Hemileuca maia** (*Packard*).**Pseudohazis eglanterina** (*Packard*).*f. Lateral abdominal permanently everted glands, not known to secrete a fluid, nor to be odoriferous.*

Family LAGOIDÆ.

Lagoa crispata (*Packard*).*g. Medio-dorsal partly eversible glands, emitting a spray of liquid and an odor (?), and colored coral-red or orange-yellow (P. auriflua), but usually in the European species yellowish.*

Family LIPARIDÆ.

Orgyia antiqua.**Orgyia ericæ** (*Packard*).**Orgyia gonostigma** (*Klemensiewicz*).**Orgyia gulosa** (*Riley*).**Orgyia vetusta** (*Riley*).**Parorgyia clintonii** (*Coquillett, Riley*).**Dasychira fascelina** (*Klemensiewicz, Packard*).**Leucoma salicis** (*Klemensiewicz*).**Laria rossii** (*Packard*).**Psilura monacha** (*Poulton*).**Ocneria dispar** (*Klemensiewicz, Packard*).

- Parorgyia leucophæa** (Riley). **Liparis detrita** (Klemensiewicz).
Parorgyia paralella (Packard). **Liparis auriflua** (Klemensiewicz,
Dasychira pudibunda (Poul- Packard.)
 ton, Packard). **Liparis rubea** (Klemensiewicz).

All Liparidæ except *Demas* (Poulton).

In the following Indian species they have been observed by Mr. Poulton:

- Lymantria concolor.** **Artaxa scintillaris.**
Chærotricha plana. **Artaxa guttata.**
Charmidas exclamationis. **Dasychira dalbergiæ.**
Artaxa vitellina.

h. A single median abdominal dorsal gland emitting a fluid attractive to ants, on seventh segment; with a pair of minute index glands on the eighth segment.

Family LYCÆNIDÆ.

- Lycæna damon** (Pezold). **Lycæna icarus** (Edwards).
Lycæna bætica (Guenée). **Lycæna scudderi** (Saunders).
Lycæna pseudargiolus (Edwards).

i. Protrusile organs near the anus.

Myrmeleon larva (Hagen ? Dimmock).

B. NYMPH OF AMETABOLOUS INSECTS.

a. Paired dorsal glands on abdominal segments 1, 2 and 3.

Cimex lectularius (Künckel).

b. The same on abdominal segment 5.

Lachnus strobi (Gissler).

C. PUPA OF CERTAIN BOMBYCES.

At anterior end of certain pupæ, internal glands to moisten threads of the cocoon for exit of moth.

D. ADULT INSECTS.

a. Occurring on the prothorax only; strongly repugnatorial, best developed in ♂.

- Anisomorpha buprestoides** **Phasma putidum** (Bates).
 (Peale, Say, Boll, Scudder). **Phyllium**, sp. (Scudder).
Autolyca pallidicornis (Stål, **Heteropteryx**, sp. (Scudder).
 Scudder).

Diapheromera femoratum*(Scudder)*.Probably in all the species of the family (*Scudder*).**Mantis carolina** (*Packard*).*b. Occurring on the pro- and mesothorax, and on the middle of the abdomen orange-yellow fleshy tubercles or evaginations.***Malachius bipustulatus** (*Laboulbène, Klemensiewicz*).**Anthocomus equestris** *Laboulbène.***Evæus thoracicus** (*Laboulbène*).*c. Segmental eversible glands homologues of the coxal glands of other Arthropods, occurring on all or nearly all the abdominal segments.***Scolopendrella immaculata**, coxal glands on third to eleventh and last pair of legs (*Latzel, Haase*).**Campodea staphylinus**, a pair of coxal glands on first to eighth abdominal segments.**Campodea cookei** (*Packard*).**Campodea mexicana** (*Packard*).**Machilis maritima**, eversible coxal glands on segments 1-7 (*Oudemans*).*d. Occurring on the under side of the abdomen.**dv. In the two first abdominal segments.***Corydia carunculigera** ♂ and ♀ (*Gerstaecker*).*d². Alluring organs situated on the dorsal side of the abdomen, in the sixth, or sixth and seventh, abdominal segment.***Periplaneta americana** ♂ (*Minchin*).**Ectobia lapponica** ♂ (*Minchin*).*chin*).**Phyllodromia** ♂ only (*Minchin*)**Periplaneta orientalis** (*Minchin* Haase).larva), (*Haase, Packard*).**Aphlebia bivittata** ♂ (*Krauss*).**Periplaneta decorata** ♂ nymph (*Minchin*).**Platyzosterea ingens**, on seventh segment (*Packard*).**Ectoblatta germanica** ♂ (*Minchin*).*e. At the end of the body.***Colænis julia** ♀ (*F. Müller*).**Heliconius apseudes** (*F. Müller*).*f. A long ribbon-like pointed gland, everted during sexual excitement by the male, and situated under the sixth to ninth abdominal tergites. Probably alluring glands.***Hadenœcus subterraneus** (*Garman, Packard*).**Ceuthophilus maculatus** (*Packard*). In this insect the two alluring glands are rounded at rest.

EXPLANATION OF PLATE V.

- Fig. 1. Anal eversible glands of *Eleodes*. (After Gissler.)
- Fig. 2. Anal eversible glands of *Blaps*. (After Gilson.)
- Fig. 3. Anal glands (*agl*) of *Carabus hortensis*; *rs*, reservoir; *d*, excretory duct; *i*, intestine; *r*, rectum. (After Kolbe.)
- Fig. 4. Prothoracic spraying apparatus of *Cerura vinula*; *gl*, the gland; *d*, its duct, with tænidia; *t*, the spraying tubes; *m*, muscles; *rm*, retractor muscles. (After Kliemensiewicz.)
- Fig. 5. The thoracic glandular sac of *Macrurocampa marthesia*; *gl*, the glandular sac; *d*, its duct; *e*, peritracheal epithelium; *t*, the spiral threads or tænidia.
- Fig. 6. Irregular separate masses of chitinous ridges on the cuticular lining of the wall of the sacs of *Macrurocampa marthesia*.
- Fig. 7. Osmeterium (*os*) of the larva of *Papilio machaon* at rest; *rm*, the retractor muscles at the ends; *m*, the numerous oblique muscles; *dm*, dorsal longitudinal muscles; *t*, trachea; *œ*, œsophagus; *gang*, brain; **1**, head; **2**, **3**, **4**, thoracic segments.
- Fig. 8. Osmeterium (*os*) of one side, enlarged; *g*, glandular portion at the base; *d*, depressions in the cuticula of the glandular portion; *t*, trachea. (This and Fig. 7 after Kliemensiewicz.)
- Fig. 9. Eversible dorsal glands (*ev. gl*) of larva of *Orgyia leucostigma* in Stage II; *gc*, glandular cells at bottom of the crater-like depression; *m*, retractor muscle; *p*, poison gland-cells of the root of the seta (*s*); *c*, cuticula; *hyp*, hypodermis; *A*, portion of the cuticle and hypodermis enlarged.
- Fig. 10. Lateral eversible gland of *Hyperchiria io*, Stage II; *rm*, retractor muscle; *œn*, œnocytes.
- Fig. 11. The same as Fig. 10, but representing a section through one side of the eversible gland.
- Fig. 12. *A*, end of body of *Colenis julia*; *ev*, eversible anal gland; *oa*, odoriferous appendages; *B*, the same in *Heliconius apseudes*, side view; *C*, odoriferous appendages of *Colenis dido* in fresh condition; *D*, tested with alcohol and benzine.
- Fig. 13. Odoriferous appendages of *Heliconius eucrate*, head cleansed—(Figs. 12-13 after F. Müller.)
- Fig. 14. Odoriferous glands (*ogtl*) in the pupa of *Vanessa io*; *r*, rectum; *h*, the folds of hypodermis which forms the terminal papilla of the abdomen; *ov*, oviduct. (After Jackson.)

SOME ACARIANS FROM A SPHAGNUM SWAMP.

By NATHAN BANKS.

Near the village of Roslyn, L. I., N. Y., there is, on a hill about one hundred feet high, a deep swamp, locally known as "The Black Swamp." Sphagnum grows abundantly in the swamp, and in some places it is covered with water for a considerable portion of the year. It was from the sphagnum which was covered with a few inches of water that the following mites were taken. None of the forms exhibit any peculiar structure fitting them for their semi-aquatic life. One of the Oribatids has very long setæ, and another species, which I have also found elsewhere, has slightly longer setæ than when in drier situations.

GAMASIDÆ.

Laelaps placidus, sp. nov.

Length .65 mm. Reddish yellow, legs and venter more yellowish. Body oval, narrower in front, broadly rounded behind; dorsal shield smooth undivided, covering entire dorsum, with a few very short and fine hairs, especially behind; epistoma longer than broad, rounded at tip, with a faint median spine and minute denticulations each side; the mandibles moderate, the superior branch bearing a sharp tooth or spine near its tip beneath and one or two short basal hairs, the finger or movable branch much more slender than the superior branch. The scuta which bears the peritreme on its lower margin gradually broadens in front, the circular spot of peritreme opposite the space between third and fourth coxæ. The legs about equally stout, the first pair a little longer than the fourth, and not quite as long as the body; all provided with short stiff bristles, and terminate in a prominent sucker, as well developed on the first pair as on the rest; anterior coxæ separated by the bases of the mandible and palpi; the latter one-half as large as the legs and two-thirds as long as the body. Ventral shield divided at the third coxæ; not covering the whole of the venter, but leaving a quite broad, membranous, white portion on the sides and behind; the shield smooth, bluntly pointed behind and there containing a round, white dot; a narrow, interrupted, transverse shield at bases of mandibles and palpi.

Several specimens in wet sphagnum, near Roslyn, N. Y. Like some other species of the genus it resembles a *Uropoda*.

ORIBATIDÆ.

Oribata palustris, sp. nov.

Length .42 mm. Red-brown, legs yellowish, a white spot at base of abdomen. Tectal plate very short, no superior bristles, anterior bristles short; setæ moderate, clavate, not as long as depth of wings, which are much deeper than long at base. Body short, high, broad, globose, wings prominent; venter finely granulate, genital opening about its length in front of the much larger and somewhat triangular anal

opening; coxal plate with two transverse lines; legs very short, anterior tibia barely longer than the patella, posterior femora very broad and margined below, a curved plate just behind the anterior coxæ; legs most hairy at tips. Differs from *O. arborea*, to which it is allied, by the shape of the wings, in having no superior bristles, the longer setæ, small tectal plate, shorter legs, and broad, margined hind femora.

Many specimens from wet sphagnum, near Roslyn, N. Y.

Oribata emarginata Bks.

Several specimens of this species were shaken from the sphagnum; the setæ are a little longer than in typical specimens.

Oribatella setosa, sp. nov.

Length .48 mm. Red-brown, legs paler, a pale spot at base of abdomen. Body longer than broad, only moderately high; tectal plate short, the anterior corners free and projecting spine-like, each with a bristle at tip; superior bristles extremely long, erect and prominent, nearly as long as the anterior legs; setæ nearly two-thirds as long as the superior bristles, weakly clavate. Abdomen smooth, broad, evenly convex; wings quite large, somewhat triangular, the tip broadly rounded, posterior margin very oblique, anterior faintly concave, distinctly longer than deep, hyaline; venter finely granulate; genital opening small, about its length in front of the larger anal opening; coxæ with the outlines distinct; legs short, hairy as usual.

I place this species in *Oribatella* as the extreme tip of the tectal plate is free and each corner prolonged into a spine; but the tectal plate is more united to the cephalothorax than in the other species of the genus; still in *Oribata* it is wholly united and the corners never extend into spines. It is readily recognized by its long bristles and setæ.

Many specimens shaken from wet sphagnum; Roslyn, N. Y.

Carabodes granulatus, sp. nov.

Length .4 mm. Black. Cephalothorax granulate, broad, tapering to the truncate front, where there are a few simple hairs, a plate-like elevated ridge each side, a median pair of short clavate hairs; setæ a little longer than the hairs and capitate. Abdomen roughly granulate, distinctly longer than broad, sides nearly parallel, base truncate, tip broadly rounded, with four short capitate hairs on each posterior side and four rows above, the submedian with four and the lateral with three hairs; venter granulate like dorsum; genital opening about once and a-half its length in front of the slightly larger anal opening; coxæ separate, legs short, femora thickened.

Related to *C. oblonga* and to a new species by having the ventral apertures widely separate, and with them should probably form a new genus. It differs from *C. oblonga* in the shorter body, more coarsely granulate abdomen, and in the clavate hairs. Two specimens shaken from wet sphagnum; Roslyn, N. Y.

Nothrus simplex, sp. nov.

Length .9 mm. Pale yellow-brown. Cephalothorax quite flat, triangular, concave in the middle sides, rounded in front, and with a pair of bristles: superior bristles quite long; setæ moderate, clavate. Abdomen much depressed, smooth above, with irregular, shallow depressions, truncate at base, gradually growing broader, broadly rounded behind; two simple bristles on margin, one near middle, and one towards the tip; margin very acute. Venter finely granulate, showing a narrow triangular area which encloses the connate ventral apertures; the genital one being a little broader than long and slightly narrower behind; the anal one slightly longer than the genital, nearly twice as long as broad, and much broader at base than at tip; legs short, the joints thick, with parallel sides, slightly roughened, and with short simple bristles, the coxæ separate.

Readily distinguished by its depressed and simple body, the rounded tip and the few simple bristles. The young are of an obovate form and have a corrugated epidermis; *i. e.*, folded into curved ridges. A few specimens shaken from wet sphagnum, Roslyn, N. Y.

LARVA OF *DEMAS PROPINQUILINEA*; ITS SYSTEMATIC POSITION.

By HARRISON G. DYAR, Ph. D.

Prof. E. B. Poulton has shown that dorsal eversible glands are of general occurrence throughout the larvæ of the Lymantriidæ (Trans. Ent. Soc., London, 1887, p. 300) on the tenth and eleventh joints, or rarely only on the eleventh joint (*Dasychira pudibunda*). Probably these structures are characteristic of the family, but Prof. Poulton did not find them in *Demas*. This genus has been considered to belong to the Noctuidæ, but English authors assume it to be a Lymantriid. Mr. J. W. Tutt remarks in speaking of Prof. J. B. Smith's recent catalogue of the Noctuidæ (Entom. Record, etc., VI., 70), "The obsolete position of *Demas* among the Noctuidæ is retained." Now is this position "obsolete"? The absence of the retractile tubercles certainly throws doubt on the matter. Now I have shown a characteristic difference in the arrangement of the thoracic tubercles between the Lymantriidæ and Noctuidæ (Trans. N. Y. Acad. Sci., XIV, 57) and *Demas* shows the Noctuid structure. Therefore, on all essential larval characters *Demas* is a Noctuid. It might, indeed, be an Arctian, as far as the larva goes, but not a Lymantriid. As concerning the structure of the imago, *Demas* seems to have greater affinity with the Noctuidæ than any

other family. In fact, it appears to me that the placing of *Demas* among the Lymantriidæ may properly be characterized as premature.

The larva of our one species (*D. propinquilinea*) has been described by Goodell and Thaxter. Mr. Goodell describes the usual form, but his description of the red hair-tufts I cannot exactly reconcile and he does not mention the anterior pair. Dr. Thaxter notes a variety in which the tufts are black instead of red. I subjoin my own notes. Two points of interest may be noted about this larva. (1) It greatly resembles in general appearance *Halisidota harrisii*, and like it is fond of hiding during the day. (2) It possesses a curious coloration which may serve to suggest to its insect enemies that it is already occupied by a parasite. This consists of a series of oblique black shades adjoining the white spiracles; the elliptical white spiracle greatly resembles the egg of *Tachina*, while the dark shade represents the path of the emerged parasite. The appearance is very natural.

Larva.—Head white shining, covered with angular light red blotches which obscure the ground color above apex of clypeus, except in narrow irregular lines; jaws black; bases of antennæ and labrum pale; width about 4 mm. Body grayish white with wrinkled irregular transverse lines. Spiracles white, each surrounded and preceded by an oblique black patch. Warts large, iv absent, on joints 3 and 4 two warts above the stigmatal wart and one below it; hair rather bristly, not long nor obscuring the body, but quite abundant, white; from tubercle ii on joint 3 a light red pencil; from the upper half of tubercle i on joints 5 and 12 a red tuft, the component parts approximating and forming a single dorsal tuft. No secondary hairs, but a few long ones from the extremities. Warts white. A faint dorsal and lateral dusky stripe, not formed of pigment, but more transparent than the other parts of the skin. Warts i and ii on joint 12 form a trapezoid.

Found on maple in a house of two leaves united by silk. Imago in May.

Pupa shining dark brown with a large wrinkled cremaster and three movable incisures. Of the usual Noctuid appearance (quite unlike *Orgyia*) and passing the winter.

NOTE ON THE SMERINTHINÆ.

By A. RADCLIFFE GROTE, A. M.

Having recently enjoyed the opportunity of studying the three or four common European species usually referred to *Smerinthus*, I find they belong to distinct genera. *C. ocellatus* has a blunt spine at extremity of fore tibiæ, and in cut of wing agrees well with *Copismerinthus ophthalmicus*, as pointed out by me twenty years ago. I would therefore refer *C. ocellatus*, *C. cerisii* and *C. ophthalmicus* to *Copismerinthus* Grote, 1886. I have formerly assumed that *ocellatus* was the type of Latreille's genus, but incorrectly so; since Latreille considers *populi* the type. Thus *Amorpha* Hübn. Tent., proposed for *populi* alone, is a synonym of *Smerinthus*. To *Eusmerinthus* Grt., 1886, belongs *E. geminatus* as type, which has the fore tibiæ unarmed. *Paonias* Hübn., 1818, I have restricted originally to our *P. excrucatus*, and it is now generally used for this type. The genus as it stands in the Verzeichniss is a mixed genus, but it seems to have been entirely neglected by European writers until I restricted its use to *P. excrucatus*. Our eyed Smerinths remaining belong to *Calasymbolus* Grote, with *astylus* as type. Butler's extension of my generic term cannot be followed.

For *tiliæ*, the term *Mimas*, Hübn. Verz. must be kept, since this is the sole species and therefore type. To this genus the European *Polyptychus quercus* is allied in the shape of the wings, There is a sulcation on primaries opposite the cell and the secondaries have a shallow excavation from vein 4 to anal angle. In *Smerinthus populi*, *Polyptychus quercus* and *Mimas tiliæ*, the fore tibiæ are unarmed. The differences in the structure of the frenulum is described by Mr. Griffiths in Entom. Record for June, 1895. In America we have no species strictly congeneric with either of these three; the nearest ally to *Smerinthus populi* is *Triptogon modesta*. Our N. Am. *Cressonia juglandis* is distinctly an American type of the group. The relationship between *Mimas* and *Polyptychus* is further evidenced by the deflexion of the antennæ at tips, more prominent in *M. tiliæ*. I would arrange these forms as follows; I have not attempted a full synonymy.

Copismerinthus Grote, 1886.Type: *C. CERISII*.

1. **ocellatus** Linn. Europe.
salicis HÜBN.
2. **cerisii** Kirby. Canada; Northern New England.
3. **ophthalmicus** Boisd. Vancouver; Northern California.

Eusmerinthus *Grote*, 1886.

Type: E. GEMINATUS.

4. **geminatus** *Say*.^{*} Lower Canada to Middle States.
var. jamaicensis *Fernald*.
var. tripartitus *Grt*.

Calasymbolus *Grote*, 1874.

Type: C. ASTYLUS.

5. **astylus** *Drury*. Southern New England; Middle States.
integerrima *HARRIS*.
 6. **myops** *Ab.* & *Sm.* Canada to Southern States.

Paonias *Hübner*, 1881.Type: P. EXCÆCATUS *A.* & *S.* (*Grote* restr.).

7. **excæcatus** *Ab.* & *Sm.* Canada to Southern States.

Mimas *Hübner*, 1818.Type: M. *tiliæ*.

8. **tiliæ** *Linn.* Europe.

Polyptychus *Hübner*, 1818.Type: P. QUERCUS (*Grote* restr.).

9. **quercus** *Schiff.* Southern Europe.

Smerinthus *Latr.*, 1805 = *AMORTHIA* *Hübner*, 1806.

Type: S. POPULI.

10. **populi** *Linn.* Europe.

Triptogon *Bremer*.

11. **modesta** *Harris*. Canada; U. S. east of Rocky Mts.
var. occidentalis *Hy. Edw.*

Cressonia *G.* & *R.* 1865.

Type: C. JUGLANDIS.

12. **juglandis** *Ab.* & *Sm.* Canada to Southern States; Mexico.

* If *jamaicensis* *Drury* is our species with a wrong locality, the name has priority, but from the uncertainty I do not propose it. I have not found any *Smerinthus* in any West Indian collection hitherto examined by me. I have not been able to examine any of the Asiatic species.

ON THE CORRELATION OF HABIT IN NEMOSCEROUS AND BRACHYCEROUS DIPTERA BETWEEN AQUATIC LARVÆ AND BLOOD-SUCKING ADULT FEMALES.

By C. H. TYLER TOWNSEND.

It is a rather striking fact that in most of the dipterous families whose adult females are of mammalian blood-sucking habit, the larvæ are commonly aquatic. Such larvæ breathe in various ways, but often by means of tracheal gills or vesicles. Especially is this correlation of habit evident in the older families of diptera, the Nemocera and those more nearly allied to them. It seems strange that such an apparent connection in habits in these families should have escaped the notice of previous observers, yet no one seems to have ever remarked upon it.

The following families possess such blood-sucking females. The known blood-sucking genera are starred, while all the other genera given possess mouth-parts capable of biting, though they are not so far known to suck blood.

- | | | | |
|----------------------------|---|----------------------|--|
| | { | Simulidæ : | Single genus <i>Simulium</i> .* |
| | | Culicidæ : | <i>Megarhina</i> .* <i>Culex</i> .* <i>Anopheles</i> .* <i>Aedes</i> ,
<i>Corethra</i> , <i>Mochlonyx</i> (European). |
| Orthorhapha
Nemocera. | | Chironomidæ : | <i>Ceratopogen</i> * (some spp.), <i>Terrestes</i> .* <i>Oecacta</i> .* <i>Chironomus</i> , <i>Tanypus</i> , <i>Diamesa</i> ,
<i>Chasmatonotus</i> , <i>Hydrobænus</i> , <i>Heteromyia</i> , <i>Coryoneura</i> (Eu.). In fact all the known genera except
<i>Clunio</i> (Eu.) have biting mouth parts. |
| | { | Psychodidæ : | <i>Phlebotomus</i> * (Eu.), and perhaps some
other genera. |
| Orthorhapha
Brachycera. | | Tabanidæ :* | All known genera, about forty in
number, are without exception blood-sucking in
habit in the female. |
| | { | Leptidæ : | <i>Symphoromyia</i> * , <i>Leptis</i> , <i>Atherix</i> and
other genera. |
| Cyclorhapha. | | Muscidæ : | <i>Stomoxys</i> * , <i>Hæmatobia</i> * , <i>Glossina</i> *
(the Tsetse fly of Africa). |

I exclude the HIPPOBOSCIDÆ and NYCTERIBIDÆ, as being degradedly parasitic in both sexes, and as not possessing a blood-sucking habit of

comparatively recent acquirement in the female sex. They suck not only mammalian blood (horses, sheep and bats), but also that of birds.

The larval habits of the genera above named, so far as known, are as follows:

Simulium: Larvæ live in water, usually swift running water.

Megarrhina: In water.

Culex: In water.

Anopheles: In water.

Aedes: Unknown.

Corethra: In water.

Mochlonyx: In water.

Ceratopogon: Some species live in water, others in foul vegetable matter.

Terresthes: Unknown.

Oecacta: Unknown.

Chironomus: Some species in water, others in earth and dung.

Tanypus: In water.

Diamesa: Unknown.

Chasmatonotus: Unknown.

Hydrobænus: In slimy mud.

Heteromyia: Unknown.

Corynoneura: Unknown.

Phlebotomus: Probably aquatic, as some Psychodid larvæ live in water.

Tabanidæ: The larvæ of *Tabanus* live in water or in moist earth, and those of *Chrysops* probably in slimy mud and water. The larval habits of other genera are not known, but are doubtless the same.

Symphoromyia: Unknown.

Leptis: Moist earth.

Atherix: In water.

Stomoxys: In horse dung.

Hæmatobia: In cow dung.

Glossina: Unknown.

The mode of larval respiration in the strictly aquatic forms, so far as known, is as follows: *Simulium* larvæ breathe by means of a tracheal network in the skin, also by tracheal vesicles at the anal extremity.

Chironomus, *Tanypus*, and the aquatic larvæ of *Ceratopogon* have a closed tracheal system, rudimentary and completely closed in *Chironomus*. In *Corethra* it is also rudimentary, and perhaps supplemented by respiration through the skin.

Culex, *Anopheles* and *Mochlonyx* have a pair of longitudinal tracheæ, ending in anal spiracles, through which they inhale air. They also, together with most Chironomidæ are provided with various branchial appendages.

Some Psychodid larvæ possess branchiæ of various shapes. Further notes of interest in this connection are the following: The European genus *Clunio* Haliday is the only known Chironomid genus in which the proboscis is rudimentary and almost entirely wanting.

The larvæ of Blepharoceridæ live in swift running water like those of *Simulium*, or in still swifter water. The mouth parts of the adults seem to be capable of biting.

Rhyphus, and some Bibionidæ, have biting mouth parts.

Going now to the Brachycera, we find that *Leptis* and *Atherix*, probably also other Leptidæ, possess biting mouth parts capable of sucking blood, but *Symphoromyia* is the only Leptid genus which has so far been recorded to practice this habit. I have observed its blood-sucking habit on San Francisco Mt., in Arizona.

Thereva has biting mouth parts much like a Tabanid. Its larvæ live in slimy mud or moist earth. Other Therevidæ have similar mouth parts, but no species are known to suck mammalian blood. The larvæ in general are said to live in fungi and decaying wood, and the adults to prey on other insects.

In this connection it will be well also to mention the mouth parts of the Asilidæ, which are fitted for piercing and sucking, but which are very different from those of the Tabanidæ. They are specially fitted for piercing the exoskeleton of insects, and differ strongly from the mouth parts of genera which pierce the skin of mammals.

To sum up, we have the following genera which are known to have aquatic larvæ and blood-sucking adult females: * *Simulium*, *Megarhina*, *Culex*, *Anopheles*, *Ceratopogon*, *Phlebotomus* (probably), and many Tabanidæ genera. This list will doubtless in time be increased, as we have blood-sucking genera, of which the larval habits are unknown; and genera whose larvæ are known to live in water, but whose adults, while possessing mouth parts capable of biting, have never been observed to suck blood.

On the whole the rule seems to hold good in the Nemocera, nearly as good in the Brachycera, and not at all in the Cyclorhapha. The Muscid genera seem to offer a marked contrast. In other words it is in the oldest families that this correlation of habit obtains. These families doubtless originally sucked the plants (Culicidæ, Chironomidæ Simulidæ, etc.), as has recently been suggested by Ficalbi, an Italian observer. The explanation of these facts is left to the future student. Why should this more or less complete correlation of habit exist in the older families of diptera?

* I am aware that males of *Culex* have been recorded as sucking blood.—C. H. T. T.

DESCRIPTIONS OF THE PREPARATORY STAGES OF ENNOMOS ALNIARIA (*Linn.*).

By WM. BEUTENMÜLLER.

Egg.—Oblong, flattened above and below, shining, smooth, olive brown with a large white spot on the side which is truncate and where the young larva escapes; at the other end it is slightly rounded; sides almost parallel. Length 1 mm.; width .5 mm. Laid October 6, 1892, in chain-like rows, one egg against the other; emerged April 7, 1893.

Young Larva.—Length 3 mm. Head testaceous, body above dull green; below the spiracles and under side yellowish, translucent; as the larva grows older it is wholly pale green. Length 8 mm. Moulded April 29th.

After first moult.—Entirely pale green, without any visible markings whatever, smooth and somewhat shining. Length 13 mm. Moulded May 6th.

After second moult.—Green as in the previous stage; apparently no change, except that the junctions of the segments are yellow. Length 16 mm. Moulded May 15th.

After third moult.—Not much different from the last stage. The body beneath is quite flattened and the lateral edge is ridged beneath the spiracles. The head is also much flattened and projects forward. Length 22 mm. Moulded May 24th.

After fourth moult. Green; thoracic feet brownish, antennæ rather long, pinkish; beyond the middle of the fifth segment is a transverse fold or ridge, which is brown in some individuals and on the eighth and eleventh are two small tubercles, the summits of which in some individuals are brown. On each segment along the dorsum are two minute piliferous spots, which are hardly visible without a lens. On the eleventh and twelfth segments are a few short yellowish hairs. The pair of abdominal legs on the ninth segment brown outside (no other abdominal legs present). Anal legs pinkish at extremities. Beneath, there is a pair of tubercles on the sixth segment. The minute tubercles are also present. Length 27 mm. Moulded June 4th.

After fifth moult.—The fifth segment above is now much more swollen into a transverse ridge and a corresponding one on the sixth segment beneath, but which is not quite so prominent. The two first pair of thoracic feet project forward and are pressed to the body, while the last pair rest on the twig. On the eighth segment is also a trans-

verse swollen ridge. The tenth to twelfth segments inclusive are dull green, mottled with brown spots, and on the dorsum of the eleventh segment are two brown spots. The body is bright green, with the junctions of the segments yellow. Length 65 mm. Moulded June 15th.

Fully-grown Larva.—The body is now dull dirty green instead of bright green, and mottled with greenish ochreous. The head is comparatively small, and the first segment is about equal the width, the remaining segments gradually increasing in size. The thoracic feet have the bases considerably swollen and ringed with ochraceous. The pair of abdominal and anal legs are chocolate brown. Over the body are scattered irregularly small, elevated, pale yellowish spots, especially on the last three segments, which are conspicuously mottled. The cervical shield is dirty chocolate brown; on the second to tenth segments inclusive, are four minute black tuberculate spots; the fourth and fifth segments have an additional pair of spots. The transverse ridge on the fifth is very prominent, as is also the one on the underside of the sixth segment and the one on the eighth segment, and the two black tuberculate spots on the dorsum of the eleventh segment. Underside of body same as above, except the last three segments pale whitish-green. Anal plates tinged with lilac. Length 110 mm.

When fully fed the larva spins a loose thin double cocoon between leaves. The cocoon is an ovate elongated whitish web, and is open on each end. The pupa is pinkish white, roughened on all the segments, but the spaces between are semitransparent and yellowish. The pupa is also covered with a mealy substance. Length, 35 mm.; cocoon, 40 mm.

Food-Plants: Elm, Maple, Sweet gum, etc.

NOTE ON HYPERCHIRIA IO VAR. LILITH.

By WM. BEUTENMULLER.

About three years ago, early in April, I received two half-grown larvæ of *H. lilith*, from Mrs. A. T. Slosson, who obtained them in Florida from eggs laid by this form. The larvæ were fed on dried bay leaves, softened in hot water, it being too early in the season to obtain fresh food. I offered them this food and also a species of *Myrica* which I brought with me from Florida in 1887. The larvæ only nibbled these leaves, and as a consequence they just about managed to keep alive, and their growth was very much retarded. After existing

a little over a week on "hard-tack," they were transferred to fresh leaves of *Rhododendron*, which was then beginning to bud. This food they ate with great relish, and the change was very striking. They began to grow rapidly and became very active. After passing two more moults they finally spun their cocoons, from which emerged, about one week later a perfect male moth. The other pupa did not hatch. It was at one time supposed that *H. lilita* was a valid species. I have carefully compared the larva with that of the type form, *H. io*, but could not detect the slightest difference, either in shape, coloration or markings. Mrs. Slosson, however, informs me that the young larva of *lilita* is much paler in color than that of *io*.

THE EARTHWORM AS A TREE-PLANTER.

By F. M. WEBSTER.

The habit of drawing the leaves and stems of various plants into their burrows has been frequently noticed of these worms, and Darwin, in his classic work, has cited many instances of this character. I have more than once surprised them tugging at a leaf of grass that was attached to the stem, the latter sometimes being bent to the ground by their exertions. This spring a small patch of sward had been spaded up with a view of planting flowers thereon, but the ground lay for sometime untouched, and was observed to be quite thickly populated by earthworms, and the openings of their vertical homes were very numerous after a rain had fallen and formed a slight crust over the surface of the ground. About this time a maple tree close by began dropping its seeds and quite a number fell on the still undisturbed flower bed. In a short time many of these seeds assumed a vertical position, while in other places a number would be grouped together, obliquely, forming a sort of rosette. A little patience and careful watching showed that the maple seeds had been drawn into the homes of these creatures, and, as many of the seeds afterwards germinated and grew, if left undisturbed, they might have made a small forest, the planters thereof having worked without hands, and with little knowledge of their influence upon the vegetable that they had only attempted to secure as a morsel of food.

LOCAL ENTOMOLOGICAL NOTES.

Members of the New York Entomological Society and all others are solicited to contribute to this column, their rare captures, local lists and other items of interest relating to the insect fauna of New York city and vicinity.

INSECTS AT WATCHOGUE AND BEULAH LAND, STATEN ISLAND, N. Y.

By WILLIAM T. DAVIS.

Charles Lamb is said to have preferred the city because that marked change of the seasons which he witnessed in the country was nearly absent from the paved streets. But to most people this gradual march of the year is pleasant—the ushering in of spring, the hospitable days of summer that seem to invite you to sleep out of doors, the cool invigorating autumn and the still more brisk season of winter, pass like changing scenery before a car window. In the same way the varied prospect offered by even so small a piece of mother earth as Staten Island—the change from rocky hills to barren sandy tracts and salt meadows—is ever inviting. It is pleasant to make numerous comparisons as the season advances, to walk from the hills over to the sandy ground, or to the meadows, for in nature comparisons are not odious. One of the most interesting of these sandy tracts lies about Old Place meadow, in the midst of which is the tortuous Old Place creek, an arm of the Sound. The sandy point that projects northward into the meadow is called Beulah by the natives in a spirit of irony, but to a naturalist it is truly Beulah Land and most interesting.

The standing or upright Clematis (*Clematis ochroleuca*) grows at Beulah, as does the Lupine, the Hoary Pea and many small oaks (*Quercus humilis*), while nearby are Moccasin flowers (*Cypripedium acaule*) and the Marsh Marigolds of early spring. The flower-bed arrangement of plants—the little clumps of certain kinds that grow together to the almost exclusion of the neighboring vegetation—is interesting and at Watchogue and Beulah Land many parcels of sandy ground are given up to colonies of Birds-foot Violets, and other equally pleasing settlers.

In early spring, when the snow still lingers in sheltered places, the beautiful deep orange, brown and black moth, *Brephos infans*, makes its appearance on the borders of Old Place meadow. It is not seen every spring, though of course it must be present, but every few years, on some sunny day, it appears in numbers. It alights in the open

wood paths and, spreading its wings, displays its beautiful colors, or flying up into some tree, particularly a red maple, crawls about the terminal branches. There are few signs of spring when this moth arrives, the wood paths are brown, and the contrast of its bright colors with the dead leaves is one of the memorable sights of the season.

A little later *Thecla augusta* makes its appearance in considerable numbers, seeking the sheltered, sunny places, and often alighting on the sweet-ferns, the huckleberry bushes and the pines. It is said that the food-plant of this Indian colored butterfly is unknown, and it is to be regretted that Staten Islanders have not been more industrious in gaining this point of information, for probably nowhere in the vicinity of New York can it be so easily obtained.

On the 8th of May, 1881, while in company with Mr. Leng, six or seven *Thecla niphon* and a single *Thecla damon* (*smilacis*) were collected at Watchogue. Perhaps these two butterflies have appeared since, but every spring the sandy stretch of road where they occurred on that May day has been visited without seeing them again. Wood fires are altogether too frequent, and possibly the colony was thus destroyed, as have been many rare plants. The growing fraternity of tramping naturalists should utter upon every opportunity their protest against burning the woods. Many ignorant boys set fire to the dry leaves for "the fun," as they say, of seeing them burn, and thus much that is interesting and beautiful in the country is permanently destroyed.

Papilio ajax was seen on June 30th, 1889, near Old Place creek, but it was in its customary haste. *Nisoniades brizo* is one of the most common butterflies of the vicinity, and *Euptoieta claudia* one of the rarest.

Early in April *Cicindela modesta* commences to fly on the sand dunes. This beetle is, as a rule, quite local, confining itself to certain dunes, but stragglers are to be met with elsewhere. During the summer a few are seen, and in September and October they make their second general appearance.

Cicindela generosa is also quite plentiful on certain sandy stretches. It has been taken in company with *C. vulgaris* as early as the 9th of April and as late as the middle of October. *Cicindela repanda* also puts in appearance during the first days of April, coming earlier than *hirticollis* by over a month. *Omophron americanum* may be washed from the banks of Old Place brook, and the funny little protective-colored *Elaphrus ruscarius* has been found running in the muddy ditches by the side of the road.

Watchogue and Beulah Land have been industriously explored in quest of Orthoptera, and none collected have proved more interesting than the small wonderful jumping cricket, *Tridactylus terminalis*. These little creatures occur along Old Place brook and in the damp ditches by the road side, from May to September. Their power of leaping is so remarkable that they seem to disappear quite mysteriously and one wonders which way they have gone. It is seldom that their departure can be accurately followed by the eye.

Among tree-crickets, *Æcanthus*, *niveus*, *angustipennis*, *nigricornis* and *latipennis* have been found, the latter being the most local of the four. The best way to collect tree-crickets is to become acquainted with their notes, after which simply walking through the woods and over grown pastures, especially about the hour of sunset, will disclose what kinds are to be found in the district. They are energetic though faint songsters, and even the cold summer storms that seem so discouraging cannot hush their tingling lays.

Another interesting Cricket is *Phylloscirtus pulchellus*. It is not a good jumper, but has a comely shiny coat of mail that makes it ever a pleasing insect. It runs about the tree branches, especially those of the sweet gum, and in the fall, when it is chilly, it will often be found hidden in a curled leaf, from whence issues its continuous rolling song.

Four kinds of cone-headed Katydids reside about Old Place creek; three of them, *ensiger*, *dissimilis* and *robustus*, often occupying the dry dunes. When they live in such situations they are more often protectively sand colored than their fellows which reside in the green pastures. The fourth species, *Conocephalus exiliscanorus*, lives in the tall meadow grass along the creek itself, and sings its lazy slow song from July until the cold nights of autumn. This is also a common insect on the Newark meadows.

Atlanticus pachymerus is a loud singing Katydid that resides in the tussocks of grass in the moist meadows near Watchogue. It has no wings, but is a fairly good jumper and makes an amusing pet. I kept one during the summer of 1892, from his youth to old age. At first he was an energetic singer, but he finally became decrepid, and it was hard for him to get about. No doubt in his native pasture he would long before have been killed by some powerful enemy.

The large harvest fly, *Cicada marginata*, has only been taken on the Island at Watchogue and vicinity. On the 19th of July, 1892, Mr. Beutenmüller and I found one on a post oak growing on a sand dune,

and later in the summer a pupa case was discovered on a black-jack oak, also on sandy ground.

In 1894 the distribution of the 17-year Cicadas about Old Place meadow was particularly interesting. They were quite rare on the most sandy districts along its southern edge, though abundant in the woods on its eastern margin. It was in this last mentioned place where pupæ cones were found on the 8th of April under some boards that did not lie sufficiently close to the ground to prevent their construction. Later these pupæ cones were discovered in considerable numbers along Willow Brook, a mile or two away. They were found in the woods under stones, logs and the chips about the stumps of trees cut down in the winter. Many more were without protection of this kind, the cones rising among the dead leaves, occasionally to the height of three inches.

There has been much written about the periodical Cicada, but it is certainly one of the most interesting of insects, and attracts the attention of all thoughtful persons. In June days in locust year its song sounds like the hum of an ever-busy factory. There is a continuous roar in the trees and the bird notes form but an unimportant part in the melody of nature. If you cease listening to Cicadas, then you may hear the bird's songs, for the singing of the insects is so constant that you may easily forget that it exists. Man writes poems on love, but the male Cicada utters his love song with a greater vim. He is no laggard in love and would please Sir Walter Scott mightily. He lifts his body and calls Phar-r-roah, a song of but a few moments duration, and quickly flies away, for why should he tarry when Chloe comes not? Thus he flies on the warm days from tree to tree, and mayhap at last meets his red-eyed spouse.

Thecla acadica was taken June 29th at Greenwood Lake, New Jersey, by Mr. Wm. Sachs. As far as we are aware this is the first record of the occurrence of the species in this vicinity. *Catocala coccinata* was also taken at the same place, and also *Phyciodes nycteis*, which appeared in abundance.

Two specimens of *Dichelonychia fuscula* were taken at Valley Stream, Long Island, in July.

WM. B.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MAY 21, 1895.

Held at the American Museum of Natural History.

President Zabriskie in the chair. Ten members present.

Dr. E. G. Love and Mr. Martin Birnbaum were proposed for active membership by Mr. Beutenmüller.

An invitation from the Newark Entomological Society to attend their field meeting on Decoration Day, at Orange, N. J., was received and accepted with thanks.

A lot of rare insects from Florida and New Hampshire were donated to the Society by Mrs. Slosson with the request to sell them for the benefit of the JOURNAL. On motion a vote of thanks was extended to Mrs. Slosson.

Mr. Palm spoke on collecting insects and exhibited his apparatus. Adjournment.

MEETING OF JUNE 4, 1895.

Held at the American Museum of Natural History. President Zabriskie in the chair. Twelve members present.

Dr. E. G. Love and Mr. Martin Birnbaum were elected active members of the Society.

Mr. Zabriskie told how the foot stalks of the leaves of the maples at Flatbush, Long Island, were injured by some insect which caused them to fall, but was unable to detect species.

A discussion as to the merits of sweeping and beating for insects was held by Messrs. Palm, Schaffer and Münch.

Mr. Münch described his collecting trip to Delaware Water Gap with Messrs. Palm and Ditmars.

Adjournment.

JOURNAL

OF THE

New York Entomological Society.

Vol. III.

DECEMBER, 1895.

No. 4.

THE LIFE-HISTORIES OF THE NEW YORK SLUG CATERpillARS.—I.

PLATE VI, FIGS. 1-19.

By HARRISON G. DYAR, A. M., Ph. D. and MISS EMILY L. MORTON.

INTRODUCTORY.

The authors of the series of articles, of which this is the first, have long been interested in the species of Eucleidæ found in this country, especially in their larval state. We have concluded to present jointly a full account of the life-history of each species, as rapidly as we are able to work them out. The accounts of the habits are by Miss Morton, and the labor of obtaining fertile eggs has been performed by her. Dr. Dyar has prepared the technical descriptions.

The following is a preliminary synopsis of the different species known to occur in New York State, listed in ascending order. We are unable to make it final at present, for the reason that several of the forms are still imperfectly known, and there may be one or two more species than we now recognize. It will, however, serve to outline the scope of our work, but we shall not be able to present the descriptions consecutively. It is, perhaps, unnecessary to state that we would feel duly grateful to receive larvæ or cocoons of any of the less known species (marked with an asterisk below) or of any species not on this list.

SECTION I. Spined larvæ.—Larvæ with spinose processes; the spiracle on joint 5 higher up than those on joints 6 to 12 and the tubercle above it missing.

Type 1. Three distinct tubercles on the last two thoracic segments. Subdorsal row on joints 4 to 13 converted into detachable, hairy, fleshy appendages.

Phobetron pithecium.

Type 2. Only two tubercles on the thoracic segments. Spines arising from fleshy horns more or less developed. Dorsal and lateral areas both broad.

Without patches of long, detachable skin spines between the terminal horns

Horns short, the purple dorsal band without black lines.

Adoneta spinuloides.

Horns partly long, the bluish dorsal band four times lined with black.

Euclea indetermina.

With one pair of spine patches. The red subdorsal band entire or broken by marks concolorous with the side lines. **Euclea pænulata.**

With two pairs of spine patches.

Horns short; the red or yellow subdorsal band conspicuously broken by quadrate discolorous patches. **Euclea delphinii.**

Horns partly long, partly obsolete. A green dorsal "blanket" with central purple patch. **Sibine stimulea.**

Type 3. As in type 2, but the pair of horns of joint 13 consolidated into a pointed tail. Tubercles and spines much reduced, obsolescent. **Parasa chloris.**

Type 4. Dorsal space contracted, larva much flattened. Horns tapering, flattened, projecting laterally, fringed by the slender spines. Green with few red dots between the yellow subdorsal lines. **Sisyrosea inornata.**

SECTION 2. Smooth larvæ. Without any spinose horns or processes. Tubercles obsolete or obscurely setiferous. Spiracles in line; all the tubercles represented.

Type 5. Dorsal and lateral spaces both broad, subventral space narrow. Last segment rounded quadrate. Color green.

Without dorsal red marks.

Yellow subdorsal line bordered above by a dark shade.

Apoda y-inversa.

"Similar" to the preceding. * **Apoda biguttata.**

No bordering shade to the subdorsal line. **Tortricidia fasciola.**

With dorsal red marks.

A large, blurred, red cross covering the back. . . . * **Tortricidia flavula.**

A small, red cross in the middle of the back. . . . (?) **Tortricidia testacea.**

A tiny red dorsal dot centrally and series of red dots near anterior end or a continuous red band. * (?) **Heterogenea flexuosa.**

Type 6. As in type 5, but the body ends with a pointed tail.

Whitish green with straight subdorsal line. * **Packardia geminata.**

Yellowish green with wavy subdorsal line. * **Packardia elegans.**

Type 7. Lateral space obsolete, dorsal and subventral spaces broad. Green with variable brown patches. Body ends in a pointed tail. . **Eulimacodes scapha.**

NORTH AMERICAN EUCLEIDÆ.

NOMENCLATURE.

We have adopted the name Eucleidæ for this family in preference to those formerly in use, since we consider it proper that the family name should be taken from a genus which is not a synonym, and under this restriction the rule of priority applied. We have, therefore, discarded the names Limacodidæ and Cochlidiidæ, since the genera *Limacodes* and *Cochlidion*, on which they were founded, have been relegated to

the synonymy. The name *Eucleidæ* was proposed in the works of Messrs. Neumoegen and Dyar and of Professor J. H. Comstock. The term *Apodidæ* of Mr. Grote (Syst. Lep. Hild. 1895) is synonymous as is also the term *Heterogeneidæ* of Mr. Meyrick (Handb. Brit. Lep. 1895.)

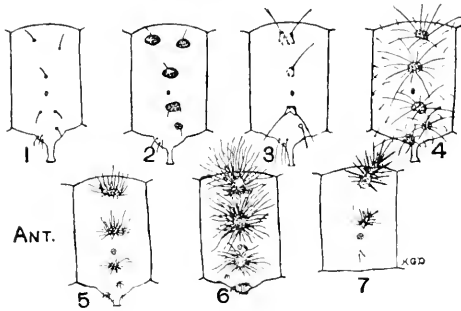
GENERAL CHARACTERS.

Eggs. The eggs of the several species of *Eucleidæ* do not offer specific differences, as a rule. The shell is very thin, skin-like, not distinctly ornamented. The egg is elliptical in outline and greatly flattened, so much so as scarcely to present a measurable thickness (to the naked eye), at least when freshly laid. They are deposited singly or in groups, in the latter case overlapping like the shingles on a roof. This type of egg is found in other groups of the Microlepidoptera, and refers the *Eucleidæ* to this superfamily.

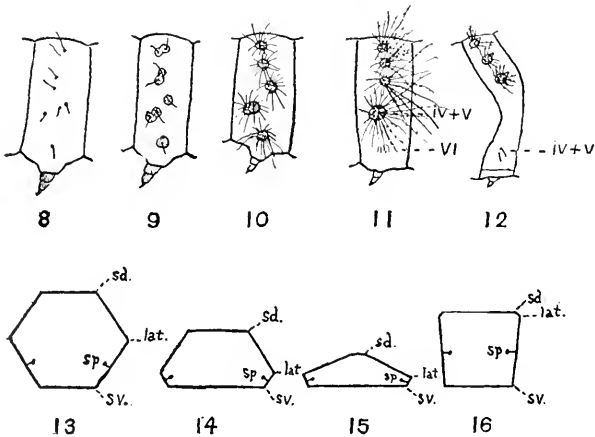
Larva. The head is modified from the type usual in Lepidoptera in lacking in all that portion of the corneous case above the clypeus the usual hard character. It is withdrawn under joint 2, which folds over it like a hood. Joint 2 is more or less completely withdrawn under joint 3, and is usually unornamented, so that the first segment completely visible from above, and the one on which the various markings commence is joint 3 (the mesothoracic segment). The prothoracic shield is present, but more or less rudimentary and always functionless. The segments are of the usual number, thirteen, the last one small and not showing its compound nature by a constriction, as is often the case in the lower Microlepidoptera. All the segments are closely united, the separating incisures often very obscure and difficult to distinguish. The body is flattened by the reduction of the feet and subventral area; in general outline elliptical, the dorsum arching more or less, as the height is considerable or the reverse. The thoracic feet are very small, the abdominal ones wanting, the whole ventral region being flexible and adapted for locomotion. Dr. Chapman states (Trans. Ent. Soc. Lond. 1894, p. 345) that there are suckers on the first eight abdominal segments, though the first and last of these are poorly developed; these suckers are probably homologous with prolegs.

The abdominal tubercles are derived from the highest Microlepidopterous type. Primitive tubercles i and ii consolidated, iii single, iv and v consolidated, all converted into many haired warts, thus giving three segmentary rows of setiferous warts, subdorsal, lateral and subventral. By the reduction of the subventral area, the third row of

warts is obsolete, represented in the Eucleidæ by a few weak setae. The other two rows are functional and compose the armature of the several species. The evolution is illustrated in the accompanying cut



(figs. 1 to 7), which shows a series of segments advancing from the most generalized type up to *Sibine stimulea*. The thoracic warts are also derived from the Microlepidopterous type; but are more modified. In this type there are five warts formed from the primary and subprimary tubercles $ia+ib$, ii_a+ii_b , iii , $iv+v$ and vi as shown in figures 9 (*Sime>this pariana*) and 10 (*Ino pruni*). In the Megalopygidæ (fig. 11) a reduction has been effected in the lower row as on the abdomen (fig. 6). In the Eucleidæ, one more row is rudimentary on both thorax and abdo-



men and the rudimentary subventral row of the Megalopygidæ is lost. Therefore there remain three well developed thoracic tubercles (see the figures of *A. y-inversa* Plate VI, fig. 8). These are all present in the

series of species with reduced tubercles and in the lowest of the spined Eucleids (*Phobetron*, fig. 12); but in the higher spined forms, the middle row disappears, precisely as it has disappeared on joint 4 of *Megalopyge*, probably in response to a similar need. In all the spined Eucleids, there is also a reduction in the number of warts on the first abdominal segment, which will be specially described under *Sibine stimulea*.

Along the three abdominal rows of tubercles, and correspondingly on the thorax, the body is more or less ridged. We shall call these the subdorsal, lateral and subventral ridges respectively. Owing to them a section of the body of a Eucleid larva forms a hexagon instead of a circle, as in most other Lepidoptera. This may be regarded as the fundamental type (fig. 13), though it nowhere actually exists that we know of. Usually the space between the lateral and subventral ridges is contracted, giving the form shown in fig. 14. In *Sisyrosea* the uppermost space is also contracted, giving the form of fig. 15, the flattest Eucleid larva known to us. In *Eulimacodes*, a quite different process has taken place. Instead of the lower side-area being contracted, the upper side-area is reduced nearly to obliteration, and we get the outline of fig. 16, a square.

The surface of the body is divided by these ridges into three areas. We shall name them as follows:

The unpaired dorsal space between the two subdorsal ridges we shall call the dorsal space. The space on each side between the subdorsal and lateral ridges, the lateral space. The space between the lateral ridge and the lower edge of the body, which contains the spiracles, the subventral space.

The surface of the skin is not smooth in the later larval stages, but is sunken in certain more or less well defined areas. These areas have a flat bottom and more or less perpendicular sides and appear to be possible in these larvæ on account of the unusually thick skin. They have the following definite arrangement, though they may be imperfectly developed or even partly absent, as we shall describe in individual species: In dorsal space (1) a median row of large depressions, intersegmental, we shall call the dorsal row; (2) a paired row just above the subdorsal ridge; segmental, and therefore alternating with the dorsal, we call the addorsal depressions. In the lateral space (3) a segmental row of small depressions just under the subdorsal ridge, the upper lateral segmental, (4) a large intersegmental row in the middle of the lateral space, the lateral depressions, two rows closely

alternating and nearly in line (5) one segmental, (6) the other intersegmental, just above the lateral ridge, we shall call the lower segmental and lower intersegmental lateral respectively. In the subventral space, two intersegmental rows one above the other, the lower a little the most posterior, will be called (7) the upper subventral and (8) lower subventral; finally between the latter may be developed (9) a small segmentary row just above the ventral edge; and the smallest depressions of all, only rarely seen, are (10) the stigmatal row, situated segmentarily above and before the spiracles. Each of these depressions contains one or more glandular centers which appear as small rounded patches. They are more primitive than the areas themselves,* and may appear when the latter are scarcely distinguishable. The dorsal depressions correspond to four glandular centers, a paired row on the anterior and posterior edge of each segment, consolidated intersegmentally; the other depressions seem to have but one center. †

The setæ on the warts vary greatly, but are only rarely primitive setæ. They will be specially described. The skin surface is covered with minute points, which usually are converted into clear granules. These also come under the series of special characters. In general the depressed areas are smoother than the elevated portions of the surface.

Cocoon.—The cocoon is composed entirely of the secretion of the spinning organ. It is closely woven and forms a hard, compact, though thin layer like stiff cardboard. It is so constructed that one end opens in the form of a circular lid at slight pressure. This structure is similar to that of the Megalopygidae, but is an improvement on it, being more compact, definitely rounded and smooth. The lid is not visible in the intact cocoon, as in the case of the lower family just mentioned. The shape is rounded or elliptical and colored some shade of brown.

*The largest of these glandular spots, namely the dorsal (1) and the lateral (4) may be distinguished in the Megalopygidae and even in the Pyromorphidae. In *Harrisina coracina*, which is before us, there are evidently present a series of paired intersegmental glandular dots and a larger lateral row, showing as whitish patches against the purplish markings. Thus the principal structural characters of the Eucleidae, including the arrangement of the tubules and their modification to bear spines, the depressed areas, as well as the body shape, the retraction of the head and even the peculiar modification of the abdominal feet are all foreshadowed in the two families mentioned. Even the dislocation of the spiracle on joint 5 can be observed in *Harrisina*, though the wart above it is normal. According to the view here adopted these families are close to the ancestral forms of the Eucleidae, leading up from a Tineid-like progenitor.

† We shall illustrate the dorsal and lateral depressed spaces in the plate for *Tortricidia pallida*, the subventral ones under *Eulimacodes scapha*.

Pupa.—This is characterized as follows by Dr. Chapman: Belongs to the Incompleteæ. Less solid and rounded than in the Obtectæ, appendages partially free. Free segments extend upward to the third abdominal; 7th free in the male, fixed in the female. Dehiscence accompanied by freeing of segments and appendages previously fixed; pupa progresses and emerges from cocoon. (Trans. Ent. Soc. Lond. 1893, p. 118.)

Moth.—We shall not treat of the structure or relations of the moth in this series of articles. For the position adopted see Comstock (Wilder Quart. Cent. Book p. 104) Chapman (l. c.) and Dyar (Trans. N. Y. Acad. Sci., vol. XIV, p 54).

Apoda y-inversa Packard.

1864—*Limacodes y-inversa* PACKARD, Proc. Ent. Soc. Phil. Vol. III, p. 341.

1882—*Limacodes y-inversa* GROTE, New Check List, p. 17.

1886—*Limacodes parallela* HY. EDWARDS, Ent. Amer. Vol. II, p. 10.

1891—*Limacodes y-inversa* SMITH, List Lep. p. 28.

1892—*Apoda y-inversa* KIRBY, Syn. Cat. Lep. Het. Vol. I, p. 553.

1894—*Apoda y-inversa* NEUMOEGEN & DYAR, Jour. N. Y. Ent. Soc. Vol. II, p. 74.

LARVA.

1894—*Apoda y-inversa* DYAR, Ann. N. Y. Acad. Sci. Vol. VIII, p. 221 (mature larva).

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space broad, narrowing slightly toward the extremities, ending behind in the broadly quadrate joint 13, not strongly arched. Lateral space broad, oblique, scarcely concave, narrowing a little toward the extremities. Subventral space very small, contracted. Subdorsal ridge at first prominent, later smooth, consisting of the rounded angular change in direction of slope between back and sides. Lateral and subventral ridges moderately prominent, approximate, the lateral at first tubercular, later smooth. Ancestral warts reduced; in stage I the subdorsal setæ ia + ib on joint 4 and i + ii on 5-12 are represented by single spines with a slight central process, which lean in alternating directions on successive segments (Pl. VI, fig. 1); later the warts are represented by tubercles bearing two setæ on subdorsal, one on lateral ridge (Pl. VI, fig. 8); in the last stage obliterated, the rudimentary setæ persisting. Subventral setæ rudimentary. Depressed areas well developed, though not extraordinarily so, rather small, rounded, slightly sunken, not very sharply defined, smooth. The series numbered 1 to 8, inclusive, may be distinguished. Skin at first smooth, later covered with short secondary spines, and finally with closely-crowded, round, clear

granules of somewhat unequal size. After the last molt the specific colorational characters definitely appear, and the setæ are nearly obliterated.

The coloration is uniform green with certain yellow lines, evidently adapted to escape observation.

The larva is a typical Eucleid, not highly specialized, yet without any very generalized characters. The peculiar structure and arrangement of the subdorsal setæ in stage I cannot be congenital in our view,* but may be some special adaptation to this stage, in which the larva does not feed. Later the primitive tubercles appear as reduced and finally rudimentary structures. The spiracles are in line, normal. The depressed areas, characteristic of the family, are in a state of moderate development, while the skin granulation is also intermediate between such extremes as *Sibine* and *Eulimacodes*.

AFFINITIES, HABITS, ETC.

This species is related to the European *Apoda avellana* (*Limacodes testudo*) in a close degree. The larvæ seem not to differ, to judge by Dr. Chapman's description and by a well prepared specimen from Staudinger and Haas. The moths only differ in that *y-inversa* is usually less suffused with brown, while *avellana* is rather smaller, more like our *A. rectilinea*.

We may regard this species as derived from a former circumpolar fauna, whose near allies are not now found in tropical South America,

*These structures appear in *Tortricidia fasciola*, stage I (Packard, Proc. Amer. Phil. Soc., xxxi, pl. ii, figs. 15-16) and in *Apoda avellana* (Chapman, Trans. Ent. Soc. Lond. 1894, pl. vii, figs. 16-18.) Dr. Chapman remarks (l. c., p. 345) "When the larva has completed its development within the egg shell . . . it is free from any spines or processes, but at the period of hatching, certain long spines are rapidly developed." We cannot endorse Dr. Chapman's view that these spines do not correspond to the tubercles. They seem to us to correspond to the warts of subdorsal row, and their apparent alternation, in our species at least, is due to the angle at which they arise from the body, rather than to a dislocation of their bases. In *Tortricidia pallida* (which we hope to reach in due course) these spines of stage I are in a still more interesting condition, being Y-shaped, and thus intermediate between the single knobbed spine of *Apoda* and the three-pronged one of *Adoneta*. (Packard, l. c. p. ii, fig. 8.) It should be remembered that the spined Eucleids are more generalized than the smooth ones, and we should not look for the most generalized condition of stage I in *Apoda* and allies, but in *Adoneta* and *Sibine*. In the latter there are three setæ from each wart, and no sign of alternation on successive segments, thus quite agreeing with our view, but not supporting Dr. Chapman's inference that the primitive arrangement corresponded to that of *Eriocephala*. (l. c., pp. 345-347.)

as we will show to be the case with *Sibine* and *Eulimacodes*, but in the northern temperate regions of both the old and new worlds.

The larvæ of the nearest American allies of *A. y-inversa* (*A. rectilinea* and *A. biguttata**) are unknown. It differs as follows from *Tortricidia fasciola*, which is the only larva at present known at all resembling it: More elongate, less shortly rounded than *fasciola*; sides less concave, the tail the same. Color much less transparent, not the clear yellowish green, but whitish, opaque. Depressed spots blurred in the whitish ground, not indicated by broad pale yellow rings. Setæ obsolete in both, but the skin of *fasciola* is more coarsely and irregularly granular, the incisures marked, cleft-like, while they are obscure in *y-inversa*. The subdorsal line is distinctly bordered above by a dark shade, whereas in *fasciola* there is no other color than the yellowish green and yellow.

The eggs are laid singly, and the larvæ after hatching eat only the parenchyma of the leaf for the first two feeding stages. The manner of feeding is characteristic of the species. *Y-inversa* feeds in a track on the upper side of the leaflet the width of its body. (Plate VI. fig. 19, stage II; fig. 13, stage III.). In the fourth stage and after it eats the whole leaf (Plate VI. fig. 16, 17). At New Windsor, the larva has been found only on the species of hickory; it has occurred on hickory in Van Cortlandt Park, New York City, and near Glendale, L. I.; Dr. Thaxter also reports it on this food-plant. The larva described by Mr. Dyar was found on oak, but the identification is not positive as *y-inversa*.

The larva of *y-inversa* seems to be not commonly found. At New Windsor a few are occasionally taken in the bags placed on the growing trees for the confinement of other hickory feeding larvæ. Near New York City the larvæ occur mostly on low hickory shrubs, always singly. They are subject to the attacks of a number of parasites in consequence of which their numbers are greatly diminished.

There is but a single brood during the year. The moths (Plate VI, fig. 9) fly during the first half of July. The males seek their mates soon after dark, between half-past eight and nine o'clock, flying with unerring instinct directly to that part of the cage where the female is clinging. After pairing the moths remain *in coitu* until about the same time the next evening. The females immediately after begin to lay their eggs, and continue night after night until all are laid.

The mature larvæ may be found early in September, making a period of about two months to complete the seven larval stages.

* We believe the identification of this larva by Dr. Packard (5th Report, U. S. Ent. Com. p. 147) to be founded upon error.

CRITICISM OF PREVIOUS DESCRIPTIONS.

The only notice of this larva, besides the mention of the food plant by Dr. Thaxter (Can. Ent. XXIII, 34), is the one by Mr. Dyar, referred to above. This differs from the larvæ before us in that no mention is made of the yellow line on the anterior portion of joint 3. As the determination was not made positively, it is possible that Mr. Dyar may have had the larva of *A. biguttata* before him. In a letter written in 1891, is the following from Dr. Thaxter: The larvæ of "both the *Limacodes* you mention (*biguttata* and *y-inversa*) are very much alike, green or slightly yellowish, slightly dome-shaped with slight longitudinal ridges and certain lighter dorsal markings. . . . Quite different from *scapha*."

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—With the characters of the family. Reticulations obscure, linear, rounded, scarcely angular, yet not separated into isolated areas, not characteristic. Elliptical, 1.6x1.2 mm. Laid singly in nature. Of the usual yellow color.

Stage I.—Head entirely brownish black, enclosed in joint 2; width .3 mm. (calculated .28 mm.). Rounded elliptical, the subdorsal and lateral ridges prominent, consisting of segmentary tubercular elevations, causing the dorsal area to form a furrow, and the lateral to be concave; ends square, subtruncate. Skin perfectly smooth, no granules of any kind. Primitive tubercles i+ii represented by a series of large, segmentary spines, double on joints 3 and 13, single, but with a small knob-like projection about the middle on the other segments. (Pl. VI, fig. 2.) On the abdomen these spines alternately lean in and out, but their bases are not transposed. They can be traced deep into the skin. Row on the lateral ridge (iii) similar, but shorter and without projections; in line. (Pl. VI, fig. 1.) Color whitish, dorsal space faintly greenish by transparency, subdorsal ridge whitish the spines dark. Length 1.5 mm.

Stage II.—Head green; width .4 mm. (calculated .39 mm.). Shape as before (Pl. VI, fig. 6, for outline). Lateral ridge not reaching beyond the subventral one, which bears two setæ on each segment. Skin covered sparsely with small, clear granules which bear short spines; also some spines from the tubercles of subdorsal row, which consist of two setæ the whole length of the ridge; lateral tubercles with one long and many short setæ. The setæ differ from Stage I in being

double throughout the subdorsal ridge, the primary setæ pointed, some of the secondary a little swollen at tip. Lateral ridge bears three setæ on joints 3 and 4 and a long, slender one on joint 13, its tubercle scarcely larger than the secondary ones. Dorsal and ad-dorsal depressions ill-defined, smooth, the tubercles on the rounded latticed ridges; a single row of lateral impressed areas, the spinose tubercles mostly above them; subventral region finely granular, not setiferous. Color green, a broken whitish stripe along the subdorsal ridge. Length 1.5 to 2 mm.

Stage III.—Width of head .5 mm. (calculated .54 mm.). Shape as before, the dorsum depressed between the prominent subdorsal ridges; lateral ridge also prominent, composed mostly of the large tubercles. Dorsal depressed areas well defined, the colorless tubercles with short secondary setæ on the latticed ridges; the lateral areas defined as far as the central and upper rows, the lower double row not distinguished. Lateral latticed ridges quite well-defined, but rounded, not sharp like the dorsal ones. Secondary tubercles sparse. Primary tubercles large, conical, with two setæ on subdorsal and one on lateral as before. Fine setæ are present on joint 2, four in the region of the cervical shield, one before the spiracle. Color green with a pale yellow subdorsal line below the skin. Length 2 to 3 mm.

Stage IV.—Width of the head .75 mm. Elliptical, rounded at both ends, evenly arched, highest about the middle; ridges moderately rounded, the subdorsal with two long, coarse setæ, the tubercles low, most of the secondary setæ reduced to skin spines, but a few still distinct bristles. Lateral ridge with single large seta and many small ones as before. Dorsal space with sparse clear granules, scarcely setiferous, but spined. The dorsal impressed spaces show as white intersegmental spots, the ad-dorsal as circular hollows; smooth, not discolored. A yellowish white row of spots, alternating with the tubercles. Lateral space rather coarsely granular, the depressed areas smoother, ill-defined, not discolored. Subventral area only sparsely granular, the intersegmental hollows elliptical longitudinally. Length 3 to 4.2 mm.

Stage V.—(Pl. VI, fig. 18, side view; fig. 6, front view; fig. 3, lateral tubercle, figs. 16-18, life size.) Width of head 1 mm. (calculated 1.04 mm.). Elliptical, the posterior end quadrate, evenly arched. Subdorsal and lateral ridges made prominent by segmentary, high, conical tubercles. Green; a distinct yellow line under the subdorsal ridge, slightly waved, not reaching the anterior edge of joint 3, which is yellow to the lateral area. Spines dark. Skin with sparse clear

granules, becoming short clear spines on the ridges, but in small number (Pl. VI, fig. 3). Impressed spots not large, well-defined and smooth, not very deep; the dorsal as before; lateral ones all present, of the two rows above the lateral ridge (Nos. 5 and 6), the segmental are a little higher up than the intersegmental, both small. The two subventral rows small, rounded, the lower a little anterior to the upper, not at all confluent. The color is a leaf green, like the under side of a hickory leaf, neither very yellowish nor whitish. The tubercles seem smaller than in the previous stage, the setæ more slender and less conspicuous. Toward the end of the stage the yellow lines become very distinct, the subdorsal bordered above narrowly, and mainly in the hollows of the undulations with dark clear green. Impressed spaces all yellowish. Length 4.2 to 7 mm.

Stage VI.—Head green, eyes black, jaws brown; width 1.4 mm. (calculated 1.44 mm.). Smooth, rounded, no tubercles on the ridges (Pl. VI, fig. 4 for front view), lateral outline low arched, highest a little before the middle. Setæ black, pointed, two on subdorsal ridge, one on lateral ridge. Color soft green, much as before, a yellow line anteriorly on joint 3, broad and distinct, joining a white line along the subventral edge. A yellow line along the subdorsal ridge, from the middle of joint 3 to the end of the broad tail, incised by the addorsal depressions, the scallops filled in with dark green. All of the dorsal, and two of the lateral (4 and 5) impressed spots pale yellow. A row of intersegmental yellow spots below skin along lateral ridge. Skin closely covered with conical granules, many quite sharp pointed. Dorsal depressed spaces small, smooth, moderately deep; lateral ones obscure, hardly defined. Length 6.5 to 10 mm. Differs from Stage V in having the ridges smooth, except for the short setæ, rounded angular, not elevated.

Stage VII.—(Pl. VI, fig. 5, front view; fig. 10, side view; fig. 11, back view, all $\times 2$; figs. 14, 15, natural size.) Width of the head 2 mm. Very smooth, setæ fine, slender and short, entirely inconspicuous, not long and distinct as before. The setæ representing tubercles *iv+v* along the subventral edge are distinct in comparison with the greatly reduced ones on the subdorsal and lateral ridges. Body quite smooth, no ridges; dorsal space flat, moderately broad; lateral space sloping, not concave; subventral space small, retracted. Lateral ridge slightly waved. Subdorsal line broad and distinct, yellow with dark bordering spots above, the two lines joining on the quadrate tail. Yellow line on joint 3 anteriorly as before. Impressed spots yellowish, body light green. Skin closely covered with large, clear granules,

closely appressed and somewhat irregular (Pl. VI, fig. 7). Impressed spots small, rather deep, the bottom with a transverse groove in the dorsal plates, the rest finely granular; upper and lower segmental lateral spaces not discolored, the latter obscure. A row of small yellow dots beneath the skin of lateral ridge.

Five days after the molt the color is a bright, rather yellowish green with a slight whitish cast. The dark border to the subdorsal line appears continuous to the naked eye.

Six days.—Becoming whiter, like *Packardia geminata*. The lateral ridge is green, but the rest is rather opaque whitish green. Subdorsal line very distinct, pale yellow, spotted with an orange tint intersegmentally, edged above continuously with blackish green, widest segmentally. Yellow line on joint 3 anteriorly not orange shaded, fading into the white subventral line. Depressed spaces marked by faint yellow rings, as the glandular centers are green.

Seven days.—Still whiter. A fine whitish green, shading more translucent down the sides. On the tenth day the larva shrunk up, turned of a pale whitish and lost its hold on the leaf; the next day it had spun its cocoon. Length 9.3 to 15 mm.

Cocoon.—(Pl. VI, fig. 12.) With the characters of the group.

EXPLANATION OF PLATE VI.

(*Apoda y-inversa*.)

1. Stage I, side view, showing the arrangement of the setæ: enlarged.
2. One of the subdorsal abdominal setæ (after Chapman).
3. A tubercle of the lateral row, stage V, showing skin spines $\times 175$.
4. Front view, stage VI.
5. Front view, stage VII.
6. Front view, stage V.
7. A seta of lateral row (same view as fig. 3) in last stage, showing skin granules $\times 175$.
8. Side view, stage V, showing arrangement of setæ.
9. *Apoda y-inversa*, female.
10. Last stage, side view, showing the areas of the body.
11. The same, dorsal view.
12. Cocoon, on a leaf of *Carya alba*.
13. Feeding marks of the larva, stage III.
14. Mature larva, side view.
15. Mature larva, dorsal view.
- 16, 17. Larva in stage V.
18. The same, side view.
19. Feeding marks of the larva, stage II.

(Figures 9, 12 to 19 by Miss Morton; figures 1 to 8, 10 and 11 by Dr. Dyar.)

[NOTE.—The plate has been too greatly reduced so that 8 per cent. should be added to the dimensions of the figures to make the above measurements apply exactly.]

ON THE PROBABLE ORIGIN, DEVELOPMENT AND
DIFFUSION OF NORTH AMERICAN SPECIES
OF THE GENUS *DIABROTICA*.*

By F. M. WEBSTER.

This genus of Coleoptera is almost exclusively confined to the western hemisphere, with its native habitat, seemingly, in the Neotropical Region. In fact South America would appear to have been its original home, from which country the eighteen species known to inhabit North America north of Mexico might almost be supposed to have originally sprung, while one of these species, *balteata*, appears to have unchanged, spanned the borderland, so to speak, being found from Texas southward to Colombia, South America. The species of this genus number something like four hundred, which fact, when compared with the limited number occurring in our own fauna, would of itself suggest that we were on the extreme outskirts of its northern habitat. With this idea of the northern spread from the tropical habitat in mind, we can readily comprehend the evolution of the two species, *12-punctata* and *soror*, the former ranging over the eastern region from Canada to southern California and possibly into Mexico, while the latter ranges from Oregon southward, also into Mexico, and covering Arizona. It is as if from out of the Lower Sonoran of Mexico twin species had been evolved, the one, *soror*, making its way to the west of the great mountain range, while the other, *12-punctata*, spread over the country to the north and northeastward. It is true these two species occupy the same area in Arizona and southern California, but I believe that a careful study of their respective habitats there will show that they do not occupy areas of the same altitude. That *12-punctata* breeds freely in low, alluvial sections there is ample proof. I have found their larvæ in destructive abundance in districts along the Mississippi River where the land was subject to overflow, and Prof. Forbes (18th Report State Entomologist of Illinois, p. 157, foot-note) finds larvæ, supposed to belong to this species, destructively abundant in a field in southern Illinois that had been under water for nearly three weeks in spring. In an earlier publication (*Entomologica Americana*, II, p. 174) this was thought to be the larvæ of *longicornis*, but afterwards referred to *12-punctata*, because

*Read before the Association of Economic Entomologists, at Springfield, Massachusetts, August 28, 1895, and the N. Y. Ent. Soc. November 5, 1895.

the former species was not known to be destructively abundant in that portion of Illinois. I have ample proof that *longicornis* breeds in destructive abundance in bottom lands along the Wabash River in Indiana, which lands are subject to overflow annually, sometimes as late as May or even June, thus indicating that both of these species may breed freely in very low lands. Unfortunately, the earlier stages and habits of the larvæ of *soror* are unknown, and we cannot say whether it breeds in high or low lands, nor can I say whether or not it prefers the higher elevations of cultivated areas.

In the species *vittata* and *trivittata* we have the same phenomena as to distribution, the latter species occurring throughout California and possibly southward, while the former ranges over the whole eastern portion of the United States and into Canada, to the north, while it extends southward into Mexico, where we shall probably find that both species cover the same area, though probably at different elevations. In New Mexico, Prof. Cockerell has found a form intermediate between these species and occurring between the regions occupied by them, which he has called *incerta*, and which extends also southward into Mexico. *D. tricineta*, which occurs from Central America northward to Colorado, might almost be said to occupy the same relation towards *D. 12-punctata* and *soror*, though Prof. Wickham found both at Albuquerque, New Mexico, and Prof. Snow took both at Socorro, N. M., the elevation of both localities being 5,000 feet. Prof. Cockerell writes me that he finds *D. 12-punctata* rarely at Santa Fé, elevation 7,000 feet, while it is abundant in the Mesilla Valley, elevation 3,800 feet; *tricineta* being rare. It certainly looks as though there was somewhere in Mexico or Central America a veritable nursery for species, and where the evolutionist might revel in a scientific paradise. I cannot help feeling that within the borders of Central America and Mexico we may sooner or later discover the key that shall solve the mystery of the origin of many of our species of *Diabrotica*.

To me *longicornis* is above all others the most interesting of the *Diabrotica*, not because of its economic importance, but on account of its extended range and peculiar distribution. Occurring, as it does, from Yucatan northward through Mexico, New Mexico to Colorado, Kansas, Nebraska and Iowa, it sweeps to the northeast through Illinois, Indiana and western Ohio, while it is known to occur abundantly about Buffalo, N. Y., where it has been collected by Mr. Reinecke, and also at Aulac, New Brunswick, by Mr. W. Hague Harrington. With the possible exception of the Boreal, it thus inhabits every Life Zone on

the continent of North America. This species appears to prefer the lower altitudes, as it has not been found above the 5,000-foot level, and over the area of its greatest abundance in the Mississippi valley the elevation is generally less than 2,000 feet, and in Illinois, Indiana and Ohio it is less than 1,000 as a rule. I have previously shown that it can breed freely in low and damp localities, and Mr. Harrington found it in New Brunswick abundantly in the "dyked lands" known as the Big Tantramah Marsh. The rapidity with which this has increased in numbers, in some portions of the country, during quite recent years, is simply astonishing. Where I could scarcely get specimens enough for a series in my collection, twenty years ago, it is now one of the most injurious insects known to the farmer, and this, too, at an elevation of not over 900 feet. Over the western third of Ohio, across Indiana and Illinois to the Mississippi River, through Iowa, eastern Kansas and eastern Nebraska, is largely a prairie country, and such a part of this area as was in cultivation up to 1860 was devoted mainly to wheat growing. From about 1865 onward farmers ceased to raise wheat as a leading crop, and corn became king of the cereals. Sometime between 1865 and 1875 this species of *Diabrotica* seems to have been attracted to the immense corn fields by the inexhaustible supply of food they afforded for the adults, and as later investigations have shown, for the larvæ also, and these immense stretches of corn lands soon became breeding grounds for vast myriads of the insect. So far as we now can see, the centre of this outbreak, if such it might be called, was in central or northern central Illinois, and it is here that appears to have evolved a race not differing specifically or perceptibly, yet whose larvæ develop on the roots of Indian corn, while the adults may subsist alike on the silk and pollen of the corn, the bloom of Solidago, thistle and clover, and the result has been that not only has the species increased enormously in point of numbers and far above what could ordinarily exist in the natural flora, but there seems to have been a sort of overflow of this race, precisely as though a slow but constantly moving wave had spread out over the west, north and east; these directions being governed by the area continually planted with corn. In Ohio this problem offers a fine illustration of the effect of cultivated plants on the spread of insects. The area over which the species occurs, even rarely as my observations of the last four years have shown, is continually being extended to the eastward, it having been found abundantly this year where the most careful search failed to reveal it last year or the year before last. In Ohio more or less of the inland streams flow more or less

directly northward or southward, and the valleys of these streams are largely devoted to corn growing, the land being continually planted year after year, in some places since the beginning of the present century. This species appears to gain access to these valleys from the west, and we find that one after another is being overrun in the eastward march of the species. First it appeared in the valleys of the Little and Big Miami Rivers, then the Upper Wabash and Maumee, and this year it occurs throughout the entire length of the Scioto River and the upper portion of the Sandusky River, thus nearly covering the western third of the State.

The distribution of *D. atripennis* and its varieties is given by Dr. Horn (Trans. Am. Ent. Soc. Vol. XX, p. 95) as extending from Massachusetts* to Dakota, Kansas and Texas. It does not appear in the lists of Coleoptera collected about Buffalo, N. Y., by Reinecke and Zesch, or about Cincinnati, Ohio, by Dury, about Detroit, Mich., by Hubbard and Schwarz, or at Iowa City, by H. F. Wickham. Years ago, when I was engaged in exchanging Coleoptera, this appeared to be one of the species most desired among collectors, though I never failed to find the var. *fossata* in abundance during August and September, in northern Illinois, at an elevation of little more than 800 feet. Prof. Cockerell records it from Gallinas Cañon, New Mexico, at an elevation of 7,000 feet.

Except *vineta*, which is an extreme Southeastern species, all of our Diabroticas appear to have originated in the extreme Southwest, Mexico and Central America, at least such as we cannot trace directly to South America. The Rocky Mountains appear to have formed a divide in the current and sent two species to the west coast, while to the east of these mountains, *vittata*, *12-punctata* excepted, all appear to have worked their way northward along the eastern base of this range, until reaching Colorado and Kansas, when they have swept broadly to the northeast, precisely as has *longicornis*, which Say discovered in 1824, near the base of the Rocky Mountains.

Prof. Cockerell has sent me the following list of *Diabrotica*, found in the West Indies, all being from Cuba. *D. annulata*, *cyanospila*, *imprensa*, *loricata*, *relicta* and *semicyanea*. *D. amenula* and *D. octonotata* are from Pacific islands, and *D. limbata* from the Galapagos group. This may be a good place to call attention to the fact that Jacoby's list of the phytophagous coleoptera of Japan, gives a single

*Specimens collected about Lowell, by Mr. Frederick Blanchard, are much lighter in color than are western specimens.

species, and that, *D. rufotestacea* Motsch., as doubtful as to the genus. Curiously enough, *D. 14-notata* has been described from Madagascar, which, if the genus proves correct, will go to substantiate the statement of Dr. A. R. Wallace, that the fauna of this island is more closely allied to that of South America than to South Africa, to which it lies almost contiguous.

With respect to the food of the species of *Diabrotica*, I have no data except as to species of our fauna. The name means one that gnaws through, and we usually consider them leaf eaters, and, while this is true to some extent, yet they are really pollen eaters and prefer the bloom to the foliage. We know how destructive *12-punctata* and *vittata* are to the young Cucurbs, but as soon as the blossoms appear they largely forsake the leaves and frequent only the flowers, the former I have observed in the woods in October, feeding on the belated bloom of *Aster sagittifolius*, after the Cucurbs had been killed by frost; the adults are probably no more leaf eaters, in general, than they are fruit eaters. I have myself found *vittata*, *12-punctata* and *longicornis* feeding upon ripe apples, melons, squashes and pumpkins, and, too, have observed them all feeding upon the silk and pollen of corn. All three of them are found on the Golden Rod (*Solidago*), Wild Sunflower (*Helianthus*), and I always captured *atripennis* var. *fossata* on the bloom of the Compass Plant (*Silphium*), and the fondness of *longicornis* for the blossoms of thistle has long been observed as a marked characteristic, and we know that they forsake the cornfields as soon as the supply of pollen fails and the silk turns to brown. Mr. Charles Robertson, in his admirable series of papers in the Botanical Gazette on "Flowers and Insects," gives the following as frequented by *12-punctata*: *Nelumbo lutea*, *Impatiens fulva*, *Ceanothus americanus*, *Amorpha canescens*, *Cenothera fruticosa*. Forbes, 18th Report State Entomologist of Illinois, gives also the blossoms of roses, dahlias and cosmos; while I have observed it to swarm on the flowers of *Senecio* or Groundsel, in Louisiana, in early spring. It also attacks the foliage of the following plants: Horse nettle, cabbage, cauliflower and beans, while of trees they are known to eat the leaves of plum, cherry, apricots and also the raspberry. I have found both this *vittata* and *longicornis* feeding upon the unripe kernels of corn, while *12-punctata* was found similarly engaged on unripe wheat. Besides thistle blossoms, *longicornis* has been recorded by Prof. Forbes as feeding on the pollen of smartweed, ragweed, clover and *Helianthus*. Of the food plants of *soror*, I know nothing from personal observation, but Coquillett reports both this and *trivittata* as

frequenting the blossoms of *Yucca whipplei*, while Koebele states that it is destructively abundant on many fruits and vegetables and that he has observed it feeding upon the leaves of young corn, the larvæ having been found by him attacking the roots. From all of the foregoing it will be seen that while the members of this genus in our country feed upon both fruit and foliage, it is the bloom to which they pay particular attention as soon as it is accessible to them. Still, it must be admitted that while *longicornis* has a fondness for the bloom of the cotton plant, yet it can hardly be said to occur in the cotton-growing portion of the country, and I can only suggest that it is primarily a grass insect, feeding in the larval stage upon the roots, and, largely at least, in the adult state on the blossoms of various flowers. Both Schwarz and Lügger have found pupæ of *12-punctata* about the roots of *Rudbeckia*, and Marten found the larvæ among the roots of *Cyperus strigosus* and *Scirpus fluviatellus*, while I have taken the supposed larva of this species feeding on young wheat plants below ground. We only know that the larvæ of *vittata* has been found in the roots of Cucurbs, which does not necessarily imply that it too may not breed among the roots of grass or plants of a kindred nature. The two species, *vittata* and *12-punctata*, appeared to have occupied the country to the east of the Rocky Mountains from an early day, as we hear of their depredations from the earliest settlement of the country, and we may fairly assume that both may have spread over the country from the southwest, supporting themselves in both the larval and adult stages upon the indigenous vegetation, though we can, of course, not say that the cultivated fields of both the Aztecs of Mexico and our own aborigines have not aided in their diffusion. Much less do we know or shall we be able to learn the influence that might have been offered by that extinct race of men, now only known by their stupendous earthworks that are scattered over the country, but of whose daily lives we know absolutely nothing, and therefore cannot measure their influence on the flora and fauna of their time. All facts now in our possession indicate that *longicornis* has spread eastward at a comparatively recent time, and though we only know of one food plant, corn, it is almost certain that there are others. Mr. Reinecke writes me that he collects all of his specimens of the beetle from willows growing near a small stream, not far from Buffalo, while Mr. Harrington calls attention to the lack of corn in the vicinity of where he found these beetles in New Brunswick, and states that the species must breed in the roots of some of the larger grasses. So far as known then, with the possible exception of *vittata*, the species shows a tendency toward the grasses as food plants for the larvæ.

The fact that several species of this genus are literally swarming over large areas of country, and their habits are such as to expose them almost continually during the adult stage to attacks of birds, while in all of the investigations of the food of birds they rarely appear, has raised the question of their being inedible. The colors of our commonest species are black, black and yellow, and green. It is true that a majority of the blossoms frequented by these beetles are more or less of a yellow color, but the black stripes and spots on some species and the almost entire black of others rather leads to the inference that black is in this case a warning and not a protective color. Or, in other words, while the colors of some of our species might be supposed to be protective, their coloration appears to be so only so far as warning colors can be said to constitute protection. The color of *D. longicornis*, being as it is of a uniform green color, or at most but slightly tinged with yellow, would form a protection, provided it fed upon foliage of the same color—but it does not; and its green color only makes it the more conspicuous on the purple bloom of the thistle, or the yellow flowers of the *Solidago*. If *12-punctata*, *soror* or *trilineata* habitually fed upon a yellow background like, for instance, the rays of the flowers of *Helianthus*, and should puncture them with small holes that would at a short distance resemble small black spots, then these species might be supposed to gain protection from their coloration. But neither these or *longicornis* are seemingly in the least protected by their coloration, and their immunity from attacks of birds must be due to other influences. Bates, in his "Naturalist on the River Amazon," states that in the forests along the Amazons "the Eumolopidæ and Galerucidæ were much more numerous than the Chlamydes and Lamprosomas, although being also leaf eaters and having neither the disguised appearance of the one or the hard integuments of the other; but many of them secrete a foul liquor when handled, which may perhaps serve the same purpose of passive defence." It is here that without doubt we shall find the secret of the protection of species of *Diabrotica* against the attacks of birds. Perhaps the most convincing evidence on this point is to be found in a paper by Mr. Charles J. Gahan, in *Trans. Ent. Soc. Lond.* 1891, pp. 367-374, plate XVII, in which, under the title of "Mimetic resemblances between species of the Coleopterous genera *Lema* and *Diabrotica*" seventeen species of the former genus, inhabiting South and Central America and Mexico, shows a remarkably close resemblance to nearly an equal number of species of the latter genus inhabiting the same regions. In the colored plate which accompanies this paper illus-

trations are given of ten of these cases of mimetic resemblances, and it must be confessed that Mr. Gahan has made out an extremely strong point. But one of our North American species of *Diabrotica* is included in this list, *D. vittata*, which is given as the protector of *Lema nigrovittata*. I have strongly suspected this of our *Diabrotica* for several years, but the only case that appeared to me at all probable was that of our *Ceratomya caminea*, some of the collateral forms of which resemble *D. 12-punctata*. But Mr. Gahan in his list gives *C. arcuata* as being mimicked by *Lema crucifera*, in Cayenne, which if correct, as I am inclined to believe, would render any such relation impossible. Of our seventeen species and varieties of *Lema*, as included in Henshaw's list, I have compared ten with an equal number of our eighteen species of *Diabrotica*, but shall be obliged to confess that among our North American species of these genera there does not appear to be any mimetic resemblances whatever, at least so far as my comparisons have carried me.*

Mr. Gahan, with commendable candor, freely admits that fresh observations of the species of the genera *Lema* and *Diabrotica* in their living stage will have to be made before it can be definitely established that the resemblances between them are cases of true mimicry. When this has been done, whether we find similar relationships existing among our North American species or not, we shall have ample proof of the incredibility of the species of *Diabrotica* and thus solved the problem of their protection from attacks of birds, as indicated by the great number of examinations made of the food of many of the most common of our species.

In conclusion, it would seem as though Central America, Mexico and possibly southern Arizona, southern New Mexico, and perhaps also southern Texas, comprised the womb, as it were, within which our North American species of *Diabrotica* had been formed and from out of which they had issued. And may it not be possible for the careful student, located within these boundaries, to still witness in Prof. Cockerell's *incerta*, variety of *D. vittata*, LeConte's *tenella*, variety of *12-punctata*, Harold's *12-notata* or some of the variations of *atripennis*, the actual evolution of species? A study of this genus of beetles over the area indicated will certainly richly reward the student, and not unlikely bring to light some facts that will prove of immense value to the science of biology in general.

*This statement has since been verified by examinations of these genera as represented in the National Museum at Washington and the Philadelphia Academy of Science.

One point more and I am done. Without intending the least disrespect for that veteran worker, Dr. Horn, I wish to say that the distribution of species as usually indicated by him in his writings, and for which collectors are doubtless largely responsible, are almost valueless in studies of this sort, and I wish to emphasize in the strongest manner possible the point made by Mr. L. O. Howard, in his paper on the "Geographical distribution within the United States of certain insects injuring cultivated crops," where the plea was made for an *exact* record of the occurrence of a species—for exact localities, instead of sections of country or States.

FINAL NOTE ON THE PLATYPTERYGIDÆ.

By A. RADCLIFFE GROTE, A. M.

I refer to my paper on this family Can. Ent. XXVII, 133, and wish here briefly to draw attention to what seems to me the true position of our single American species referred to *Platypteryx*, according to Neumøgen and Dyar's arrangement, although I had supposed we had three: *siculifer*, *arcuata*, *genicula*. It may well be these names only apply to races or forms of a single species: *arcuata*. I take it for granted that my argument as to the proper name for the family cannot be gainsaid. Before any idea had been expressed in literature that the genus represented a family, Hübner had fixed the type of *Platypteryx* in the Tentamen and pluralized the name (Platyptericæ), using it for the group afterwards in the Verzeichniss (1818). Stephens adopted this name for the group in 1829, changing the termination to follow Swainson's rule (1827) for families, calling it Platyptericidæ. In 1868 I corrected the writing of the word to Platypteryginæ, regarding the group as a subfamily of Bombycidæ, following Packard. It should now be called Platypterygidæ, if we would respect the rules; it is correctly given in the Philadelphia Check List. No change in this title for the family seems permissible; the terms "Drepanulidæ" and "Drepanidæ" are simply synonyms and should be abated. For the type of Schrank's genus, with mixed contents, of 1802, is not yet indicated. The only certain generic type we have is *Platypteryx hamula* (*binaria*), and this is for Laspeyres' genus. Its designation by Hübner left at least three generic types still in Schrank's original genus, any one of which might be available for *Drepana*. The family type is fixed by Hübner, and the family name must be formed from the genus of this type. From a study of Speyer's excellent popular work it seems to me probable that the type of *Drepana* may be correctly held to be none

of these three left by Hübner's action open to our choice, viz.: *lacertinaria* (*Falcaria*), *glaucata* (*Cilix*), *flexula* (*Aventia*). From this work and the study of the material in the Roemer Museum, there seems to me to be two generic types passing usually indifferently under the names either of Schrank or of Laspeyres. One of these two should be available for *Drepana*. I quote the work for the characters:

A. Hind tibiæ with two pair of spurs. Antennæ* of the ♂ with saw-like teeth or notched.

The species are: *cultraria*, *binaria* (*hamula*), *harpagula*. To this section therefore the term *Platypteryx* irrevocably applies. Of the species I have not yet seen the last named.

B. Hind tibiæ only with terminal spurs. Antennæ of the ♂ shortly pectinate.

The species are: *falcataria*, *curvatula*. I have *falcataria* before me, and it is to this type that we may limit *Drepana*, if, in order to use this earliest name for some member of the group, we would not disturb any one of the three genera above indicated. I believe the characters to be of generic value. It is to this genus that our American species belongs, since it appears to "represent" the European *falcataria*: its correct title is therefore: *Drepana arcuata* Wlk. *Platypteryx* is then not yet found in America.

A NEW DATANA.

BY HARRISON G. DYAR.

Datana chiriquensis, sp. nov.—Allied to *integerrima* G. & R., but larger and without the pale shades bordering the transverse lines.

Light brown, the fore wings thickly and evenly irrorate with dark brown scales; lines and fringe concolorous, dark brown. Transverse anterior line regularly arcuate, distinct; transverse median line also distinct, crossing the cell between the discal spots; transverse posterior line distinct, nearly straight, slightly incurved at vein 1 and at costal edge; between median and t. p. lines three faint lines (forming one more line than in the United States species), quite regularly spaced; apical streak dislocated, obscure. Discal spots pulverulent, dark, the outer narrow, moderate, the inner obsolescent, much as in *integerrima*. Costal portion of the wing scarcely brighter than the rest. Exterior margin entire. Secondaries brown outwardly, pale toward base. Thorax normal. Expanse 60 mm.

Types two ♀♀, Chiriqui, Mexico. (Heyde).

* Note Speyer's use of characters drawn from the female antennæ for taxonomic purposes and the implication of their value. The character given by Speyer, drawn from the hind tibiæ, is one used in the *Geometridæ*, and its use here indicates that there is a true relationship between the families as expressed by Dyar's classification.

SCHRANK'S GENERA.

By A. RADCLIFFE GROTE, A. M.

Before discussing Schrank's genera, mainly those referable to the Agrotidae, I wish to state the case of the Tentamen and give the date which we may accord to it. The Tentamen is of the utmost value to the nomenclator. Alone by this sheet can we trace the origin of certain generic names now in use and fix their types. Such are: *Diphthera*, *Polia*, *Agrotis*, *Plusia*, *Brepfos* and others. The type, for instance, of *Agrotis* is *segetum*, and in this sense the term is now used, after I had pointed out the true type; but for this type we are indebted to the Tentamen. From the mixed character of Ochseneheimer's genera and subsequent authorities, including Boisduval, it would be difficult to find the type of *Agrotis*, and perhaps, without the Tentamen, our researches might lead us wide away. All this disturbance the Tentamen saves us, and its "catalogue genera" are besides the first attempt to arrange the Order in the spirit of modern enquiry. It is the same with *Plusia*; the Tentamen gives us the name and the type: *chrysitis*, and thus fixes for us the group to which the name is referable. This genus is next on the list for disintegration. We have in it at least two types which classifiers must hold fast and be thankful for: *chrysitis* and *gamma*. When we see how gladly, upon the same principle of priority, Prof. J. B. Smith sweeps away generic titles, held for twenty-five years in America, to reinstate names of Walker's, whose correct application is, from the state of the case, doubtful, and even sometimes impossible, we feel some amazement at the prejudice against Hübner's titles. It may have somewhat abated since I show that Ochseneheimer's titles are also "catalogue names" in part, and equally without diagnosis.

The Tentamen is undated. Were it dated the discussion would be avoided. The date fixed by Mr. Scudder, 1806, remains, and without any argument to overturn it having been published to my knowledge. However, Mr. Dyar uses "1810?" I do not think anything is gained, but rather much lost, in stability by quoting dates with a query. These must be ascertained as near as possible and agreed upon. This date of Mr. Scudder's is therefore probable, but it is not certain. Certainty, as to the Tentamen, is only given us by Ochseneheimer, in his fourth volume (1816); I mean that certainty which convinces anyone endowed with reasoning faculties who is willing to use them. [The fact is that the opponents of Hübner adopt, without scruple, synonymy, which is

twenty times as disturbing and doubtful.] Ochseneimer gives us this certainty, and, in my preface to the 2d part of the Buffalo Check List, I give Ochseneimer's words, published in 1816, that the Tentamen only came into this writer's hands long after his third volume (1810) was printed, therefore he could not have used anything out of the Tentamen at an earlier date (than 1816.) And in 1816 Ochseneimer uses the Tentamen names, and this settles the fact that the Tentamen was known in 1816 and used and useful. The fact is further settled that Ochseneimer did not have the Tentamen in 1810. Now, when did he get it? The words used by him: "*daher konnte ich früher nichts davon aufnehmen.*" would seem to imply that if he *had* received it earlier (*früher*), he would have used it; *i. e.*, in his third volume, 1810; and this construction favors Scudder's date of 1806. In fact, the whole of Ochseneimer's remarks, p. viii, vol. iv, produce the effect that Ochseneimer favorably considered the Tentamen; as a whole, regarded it as an equal authority, and, had he thought it necessary, might have ascertained and given its exact date. Whether he knew it or not does not appear. This he does not do, but, in the course of his volume, he uses in the groups he there catalogues the following names, crediting Hübner; Ochseneimer gives (*supra*) the full title of the Tentamen, so that there is no doubt of his citing this publication. Lemoniades (for or under *Melitæa*), Dryades (for or under *Argynnis*), Limnades (*Euplæa*), Hamadryades (*Vanessa*), Najades *Limenitis*, Potamides (*Apatura*), Oreades (*Hipparchia*), Rustici (*Lycæna*), Principes (*Papilio*), Mancipia (*Pontia*), Urbani (*Hesperia*). So much for the butterflies. Ochseneimer uses the plural names out of the Tentamen in the synonymy, the names formed out of the generic title; and hence for assemblages, as I understand Hübner, who uses in the Verzeichniss these very names in this sense as higher than genera. It makes no difference that Ochseneimer makes them synonyms; what is in the synonymy may one day obtain. The point is the recognition of the Tentamen. In the Agrotidæ and Apatelidæ Ochseneimer cites Hübner, and gives priority to the following names: *Diphthera* (p. 63), *Agrotis* (p. 66), *Graphiphora* (p. 68), *Miselia* (p. 72), *Polia* (p. 75), *Xanthia* (p. 82), *Cosmia* (p. 84), *Xylina* (p. 85), *Plusia* (p. 89), *Heliothis* (p. 91), *Anthophila* (p. 93), *Brephos* (p. 96), *Euclidia* (p. 96). Now I would like to know what the critics have to say to this recognition of the Tentamen? In other cases in these families Ochseneimer conscientiously cites the Tentamen names, but refers them to the synonymy. It is clear why he does so in some cases, not clear in others.

Clear when he gives *Jaspidia* as a synonym of *Pæcilia*, not clear when he cites *Heliophila* as a synonym of *Leucania*. All these names must be restored to Hübner and their use in the Tentamen confers the inestimable benefit that we are given their exact types. Hübner, in the Tentamen, does not seem to know of Schrank's Fauna Boica; in the Verzeichniss he uses some of the names.

It is, then, certain, that in 1816 Ochsenheimer adopts the Tentamen; certain, that he says he received it long after his third volume, in 1810, was published. These are the two sure points. It is certain also, that Hübner makes the Tentamen the basis of the Verzeichniss; although he changes the generic titles (*coitus* H.), he uses the higher divisions (*stirps* H.) of the Tentamen. Now the Verzeichniss is later than 1816, from internal evidence, and we give therefore Ochsenheimer's fourth volume the due priority (see Scudder's argument). I give, once for all, 1818 as the date of the Verzeichniss, in order to show this position of the two works and to abate the query in citations and again because, having given Ochsenheimer's fourth volume the *pas*, there is no other work with which the Verzeichniss collides, even if we admit the full dates of the signatures as assigned by Scudder. As to the Agrotidæ (see my Bremen list of 1895) it seems probable that the date of these signatures may be earlier than Scudder supposes, say certainly 1822, as compared with the Zutraege. It must be remembered that the law of priority, at least as to genera, was then, as even now, loosely applied, as compared with its use to species. Subjective notions are freely displayed by writers in dealing with genera, even nowadays, from Boisduval and Guenée on. They consider themselves superior to Hübner, and some, in fact, to all creation. Now, holding these points fast, I would propose to give Ochsenheimer's third volume the same priority over the Tentamen that we give to his fourth over the Verzeichniss. I would date the Tentamen 1811. I prove the Tentamen thus wholly by Ochsenheimer and take its date as being subsequent to 1810, when Ochsenheimer says he received it. This also has the practical value that we save all collision between Ochsenheimer's third volume and the Tentamen, a collision which it is vitally necessary to avoid, in view of the nomenclature in use, the "language idea." We must do it to save *Saturnia* under Ochsenheimer's restriction; this is, of itself, sufficient; for it is Ochsenheimer's restrictions of Schrank, in the third volume, 1810, which are important to preserve. If thereby an inaccuracy is committed, it is one owing to Hübner's peculiar omission, and it is condoned by the practical effect of avoiding the conflict between Hüb-

ner and Ochsenheimer. For there is then no vital conflict left; so far as my researches go there are but two or three corrections necessary in the Agrotidæ, where Ochsenheimer has rejected a few names without apparent reason. He adopts far more than he rejects, and the rejections arise from special causes, in the main, to be studied out by the systematist and nomenclator. All ground for radical disputes would be taken away by this course. There is no reason why we should be better than Ochsenheimer in his fourth volume, and take a different stand as to Hübner. Above all we secure to the nomenclator the great benefit of the undisputed use of the Tentamen in ascertaining the true origin of many names in use and the unfailing designation of their types.

We may now consider certain of Schrank's genera, all those of the Agrotidæ, and a few of the others. They date from 1802; the species are described in Vol. I, 1801.

Saturnia.

1802. Schrank, Faun. Boic. II, 149.—*Pyri, spini, carpini, tau.*

1810. Ochsenheimer, Schm. Europ. III, 1.—*Pyri spini, carpini.* [This restriction of Ochsenheimer's, is that to-day adopted. *Heera* Tentamen 1811, for *carpini* (*Pavonia minor*) becomes a synonym, in the absence of character.]

1895. Grote, Syst. Lep. Hild.—Designates *pyri* (*Pavonia major* L.) as type.

Bombyx.

1802. Schrank, Faun. Boic. II, 150.—*Mori, versicolor.* [This restriction of the Linnean genus *Bombyx* is important, because it fixes the type as *mori*, through Ochsenheimer's erection of the genus *Endromis* for *versicolor*, 1810, III, 15. The generic title *Bombyx* has, then, been misapplied to the Lachneidæ by authors, and its use in Staudinger's Catalogue must be abandoned. I am therefore correct in designating *mori*, which was virtually the type since 1810.]

Pœcilia.

1802. Schrank, Faun. Boic. II, 157.—*Perla, aprilina, runica.* [The name falls because preoccupied.]

Cucullia.

1802. Schrank, Faun. Boic. II, 157.—[Refers here his families G & H, I, 325 et seg.] Fam. G: *artemisia, abrotani, absynthii, verbasci,*

tanacetii, scrophulariæ, linariæ, lactucæ, umbratica. [It is to this "family," that the generic term must be applied and the type sought, since Schrank's translation of the term: "Mönchseule," and his reference to the hooded collar sufficiently indicate his purpose which falls in with the modern use of the term.] Fam. H: *exsoleta, petrificata, margodea, putris rhizolitha, perspicillaris.*

1816. Oechsenheimer, Schm. Eur. IV, 87.—*Spectabilis, gnaphalii, abrotani, absinthii, artemisiæ, argentina, lactea tanacetii, dracunculi, umbratica, chamomillæ, lactucæ, lucifuga, asteris, verbasci, scrophulariæ.* [This restriction accords with the above statement, that a "hooded owlet" must be the type of *Cucullia*. *Tribonophora* Hubn. 1811 (type: *umbratica*) is referred by Oechsenheimer as a synonym.]

1818. Hübner, Verzeichniss, 246.—*verbasci, scrophulariæ.* [This restriction is most useful and enables us to fix the type; which is one of the group with uneven fringes.]

1874. Grote, List N. Am. Noct. 28.—Designates *verbasci* as type.

Hadena.

1802. Schrank, Faun. Boic. II, 158.—[Refers here his "families" M. and N., I, 348 et seq., and translates his term by: Trübeule. Fam. M.; *typica, chenopodii, atriplicis, præcox, pisi, oleracea, hordei, (deaurata), xanthographa, piniperda.* Fam. N.: *lucipara, cucubali.*

1816. Oechsenheimer, Schm. Eur. IV, 71, cites *Hadena* Schrank and includes 28 species, fully as dissonant as Schrank's material, some with hairy, some with naked eyes. But he excludes every species cited under Schrank's family M, and includes both *lucipara* and *cucubali* with Schrank's family N, thus restricting the genus in this sense. Henceforth either *lucipara* or *cucubali* must be type.

1818. Hübner, Verzeichniss, 216.—Includes among seven species, of the two only *cucubali*, leaving out *lucipara*; thus, from 1818, *cucubali* is virtually the type. *Typica* was excluded in 1816.

1895. Grote, Ent. Rec. VI, 78.—Recounts the above and designates *cucubali* as the type. [The genus *Dianthwæcia* Boisd. thus becomes apparently identical, since its type seems not separable on structural grounds, though *cucubali*, the "genuine Trübeule," is hardly a typical *Dianthwæcia*. It is instructive to see, in general early literature, a tendency to use *Hadena* rather for a hairy eyed type. In an old collection, named at least nearly sixty years ago, made in Hilderheim, I find every species of *Dianthwæcia* is ticketed "Hadena" among them *cucubali*.

Catocala.

1802. Schrank, Faun. Boic. II, 158. [Refers here his "family" V, I, 364, and translates his generic term by: Prachteule.] Fam. V: *maura*, *fraxini*, *nupta*, *pacta*, *conjuncta*, *elocata*, *sponsa*, *promissa*, *paranympha*, *parthenias*, *puella*. [It thus contains the types of *Catocala*, *Mania* and *Brephos*. But, as with *Cucullia*, though with somewhat less clearness, we must seek the type within the limits of the modern genus, a species of which seems meant as typical by Schrank, though here, as elsewhere, no "type" is indicated.]

1816. Ochsenheimer. Schm. Eur. IV, 94.—[Restricts the term in consonance with the above idea.] *Fraxini* and 16 other species all referable here, the entire European species, and refers also *Blephara* (*Blepharum*) Hübner. Tent. 1811, 2, as synonymous. [The type of *Blepharum* is *sponsa* and the course of Ochsenheimer should be followed from general considerations.]

1818. Hübner, Verzeichniss, 276, (*Catocalla*). *Fraxini*, sole species and therefore type.

1874. Grote, List N. Am. Noct. 41.—Designates *fraxini* as type. [Since Hübner, in the Tentamen 1811, proposes names for the three original types contained in *Catocala* Schrank: *Lemur maura*, *Blepharum sponsa*, *Brephos parthenias*, Ochsenheimer is justified in taking one for the original genus and his choice is approved by Schrank's manifest intentions. Whether *sponsa* or *fraxini* becomes the type of *Catocala*, may perhaps be disputed. I follow Hübner's Verzeichniss, rather than the indication of the Tentamen, for the sake of greater clearness and because it seems unessential of Hübner's three names, *Lemur* is preoccupied, *Blepharum* a synonym and *Brephos* remains valid.]

Pyrausta.

1802. Schrank, Faun. Boic. II, 163.—*Cingulalis*, *lemnalis*. [*Cingulalis* may be taken as type and this will conform with the use of the term by Prof. Fernald.]

Agrotera.

1802. Schrank, Faun. Boic. II, 163.—*Nemoralis*, sole species and therefore type.

Pyralis.

1802. Schrank, Faun. Boic. II, 162.—*Pinguinalis*, sole species, and this restriction apparently makes *pinguinalis* the type of the Linnean genus. [*Aglossa* Latr. would be synonymous with *Pyralis* under his restriction.]

Polypogon.

1802. Schrank, Faun. Boic. II, 162.—*Barbalis*, *tentaculalis*. [*Tentaculalis* should be taken as type from subsequent restrictions. The name appears to have been neglected and is perhaps not available. See *Erypyzon*.]

Hypena.

1802. Schrank, Faun. Boic. II, 163.—*Proboscidalis*, *rostralis*, *palpalis*.

1818. Hübner, Verzeichniss, 345.—*Palpalis*, *decimalis*, *obsitalis*, *rostralis*. [Excludes *proboscidalis*, leaving the term for either *rostralis* or *palpalis*.]

1874. Grote, List N. Am. Noct. 52.—Designates *rostralis* as type. The term seems to have been taken by Schrank from Fabricius, but the latter is not apparently quoted.

Scopula.

1802. Schrank, Faun. Boic. II, 162.—*Paludalis*, *dentalis*.

Nymphula.

1802. Schrank, Faun. Boic. II, 162.—*Potomagalis*, *nymphæalis*. [I may leave the designation of the type in those two genera to my friend, Prof. Fernald.]

Erypyzon.

1811. Hübner, Tentamen, 2.—*Barbalis*, sole species and therefore type. [This name appears neglected and, instead, *Pechipogon* Hübn., Verz., is used by European authorities, such as Staud. Catalog, Hoffman, etc. Now *Pechipogon* is used in the Verzeichniss for *plumigeralis* (*barbalis* Hübn. Pyr. 18) and *pectitalis* Hübn. Pyr. 122. *Barbalis* seems correctly identified by Hübn. Pyr. 18, and his Verzeichniss name *plumigeralis* a synonym. His identification of his *barbalis* with *tarsicrinalis* Knoch is not followed. This genus, *Pechipogon* Verz., would then be the Verzeichniss substitute for *Erypyzon*. Hübner writes "Pechipogo." The genera are arranged under the group "Herpyzones," taken from the Tentamen. I conclude that *Erypyzon* Hübner, 1811, must clearly be used for *barbalis* Cl.]

This concludes my paper. Since, within the lifetime of a single individual (my own) we have progressed from a state in which we had but a dozen named Apatelidæ and Agrotidæ in our collections to one in which we have upwards of 1,800, it is clear that we are in the beginning of the use of our names, and an erroneous nomenclature is hardly

yet started by means of "Butterfly Books." I would appeal to every thinking lepidopterist to discountenance the use of erroneous generic names such as *Acronycta*, *Xylina*, *Erastria*, *Teniocampa*, in order to spare future students from the necessity of a more troublesome change. It has come to such a pass in Europe that the names for genera are largely wrong, and that in England one set of names (Guenée's in the main) are used, on the Continent another (Lederer's in the main). I have made the effort from the first, and as soon as I saw (1873-4) that the nomenclature was improperly founded, to restore the proper generic titles. A heavy responsibility rests on those who, unable to furnish any but subjective and erroneous arguments, try to overturn this work. For it must ultimately obtain, but not, perhaps, until the wrong names have permeated literature and produced confusion. The authors of this confusion are then Messrs. Lintner, Smith and their followers, and time will place them in this position if they persist. But it is yet time. Nothing but the most tentative work has yet been published on these families. The species have been barely covered with titles. All the "Revisions" are so faulty in almost every respect that they will soon be revised. Let us then clear the track of wrong generic titles and refuse to enter into the inheritance which modern European literature offers us. Each genus must have its exact type, and the oldest generic names, irrespective of persons, must prevail.



EARLY STAGES OF SOME BOMBYCINE CATERPILLARS.

By A. S. PACKARD.

The following observations were made during the summer of 1894, and I desire to express my indebtedness to Mr. William Dearden, of Providence, who kindly furnished me with the eggs of certain of the species.

***Perophora melsheimerii*.**

The eggs were received from Mr. H. Meeske, of Brooklyn; they hatched in Providence, R. I., June 21, 22.

Larva, Stage I.—Length 3 mm. Head and prothoracic shield of the same width, being as wide as the body in front, which slightly tapers toward the end from the middle of the body; they (head and

shield) are dark pitchy blackish chestnut, and the surface rough. The body is dark chestnut brown, behind a little paler, and beneath paler. The antennæ are long and blackish-brown, as are the thoracic legs. The sides of the abdominal segment are swollen, and the segments appear as if frosted over, the skin being rough as if shagreened with fine white granulations. There are faint traces of a slight dorsal line on the posterior half of the abdominal region.

In a few days, nearly a week, after hatching, a median yellowish dorsal line becomes distinct.

When first beginning to feed after hatching it simply loosely fastens two leaves together with silk threads, and feeds like a Tineid larva, not making a case. The specimens died before molting.

Clemensia albata.

The eggs were sent me from Providence July 26, by Mr. Dearden. They hatched at Brunswick, Maine, Aug. 8, in the morning. The food plant is unknown; the larvæ would not eat willow, poplar or lichens. The eggs are oval, covered with white hair and are laid in groups of five or six.

Larva, Stage I.—Length 1.8 mm. Head a little wider than the body, the vertex convex on each side, the two halves of the epicranium being like two contiguous orbicular pieces, and dark, dusky amber in color, the head in front, lower down, paler. Body moderately long, cylindrical, the segments unusually convex, whitish greenish in front. The hairs, which arise from minute one-haired tubercles, are of nearly uniform length on the back and sides of the body; they are two-thirds as long as the segments are thick, finely spinulate.

Hypercompa fucosa.

The eggs were laid at Providence July 20, and hatched at Brunswick July 30.

Larva, Stage I.—Length 2 mm. Head a little wider than the body, dark chestnut. Body white, moderately stout, with small one-haired tubercles of the same color as the body. The hairs are rather thick, of uniform length, not quite so long as the body is thick, and both dark and light. The sublorsal row of tubercles are double, or rather there are two contiguous tubercles on each abdominal segment in this row, each sending off a hair.

Callimorpha lecontei.

The eggs were received from Mr. Dearden. It feeds on the apple; the larvæ hatched June 28—30 at Brunswick.

Larva, Stage I.—The larvæ when first hatched were almost undistinguishable from those of *Spilosoma congrua*, which hatched at the same date. The head is wider than the body, which is quite hairy and white. The head is pale amber with two brown spots on each side, or rather, nearly all are pale horn-brown. The tubercles all bear but a single hair, and are as long as the body is thick. It molted July 11.

Stage II.—Length at first 4 mm. Now the body is of the same general shape as before, but the head is black and the tubercles are black. The prothoracic plate is divided, and the other dorsal and lateral tubercles give rise to from five to six short black hairs, with some white ones.

Stage III.—(Described July 21-22). Length 7 mm. Body whitish with black tubercles and hairs much as before. There are now two faint straw yellow broad lateral bands extending down to the base of the abdominal legs. Also a double row of subdorsal dark brown spots on each side of the back, at the sutures, the central part of each segment being clear of markings.

August 14. The body is now 12 mm. in length, and above is much blacker; the straw yellow band on the side being now very conspicuous. The tubercles are dark metallic blue, and there are four dorsal black bands on a livid ground. It molted August 14.

Stage IV.—Length 12 mm. The body is now entirely black, with metallic blue tubercles; the hairs are of unequal length and black. There is a lateral row of straw yellow spots, the continuous band of the previous stage being broken in the middle of each segment. It is now a very handsome caterpillar. It molted September 1.

Stage V.—Length 14 mm. It has the same markings as in the previous stage, and the only difference is a slight increase in size.

Stage VI.—It molted again September 12-15, but presented no difference either in markings or size.

Spilosoma congrua.

The eggs were received from Mr. Dearden June 27. The larva had in part hatched and were hatching June 30.

Larva, Stage I.—Body at first white except two dark spots on the head, but in a few minutes the latter became dark. Head wider than the body. The setiferous chitinous plates or flattened tubercles dusky and contrasting with the white body. Prothoracic plate divided. Under a $\frac{1}{2}$ inch objective the dorsal and lateral tubercles of the abdominal segments bear but a single hair, which is finely spinulate, and as long as the body is thick.

Arctia anna (persephone).

The eggs were deposited by a female, collected June 11, and sent me by Mr. Dearden. I identified the moth from the Edwards collection in the American Museum of Natural History, New York. The eggs hatched about July 10 or 12. The female had a broad black margin on the hind wings, and a discal crescentiform spot, otherwise it was normal. Stage I was described July 13.

Larva, Stage I.—Length 2 mm. Body of the usual shape. Head dull amber, with two dusky spots on the vertex. Tubercles dark chestnut brown, those of the four dorsal rows of the abdominal segments bearing two setæ; the other tubercles, *i. e.*, those of the two lower rows, 1-haired. The hairs all dark, spinulate, about one-third as long as the whole body. The prothoracic plate is crescentiform. Thoracic legs amber-colored. It molted July 30, 31.

Stage II.—Length 6.5 mm. The tubercles now bear from 8 to 10 black setæ. Body pale; the large dorsal tubercles black, with minute black non-setiferous ones in front near the front edge of each abdominal segment. Lateral tubercles pale, of the color of the body, but with black setæ. Prothoracic shield small, dark, not conspicuous. Two long black hairs project beyond the others from the end of the body, and two similar ones from the side of the 8th abdominal segment. Head dark chestnut above, in front pale. Ground color of the body greenish, the tubercles yellowish. Thoracic and abdominal legs pale.

August 8th, it had not molted; length 10 mm. Now all the tubercles are black, and the skin is livid, with faint traces of two dorsal lines between the two rows of large dorsal tubercles, the lines enclosing the minute anterior tubercles.

After second molt, August 14. Length 10 mm. The body is now nearly concealed by the dense hairs. Head black. The hairs along the back black, those low down on the sides arising from the lowest row of tubercles snuff yellow.

Arctia phyllira.

The eggs were laid about June 17 at Providence and with the moth was given me by Mr. Dearden. The ♀ specimen was compared with those in the Edwards's collection in the American Museum of Natural History, and were nearly of the normal form. The eggs hatched June 20-21, and the larvæ were reared at Brunswick, Me.

Larva, Stage I.—Length 3 mm. They had been eating perhaps two days. The head was not so wide as the body and shining black. The body is deep, amber colored, the tubercles darker, dark brownish,

and rather large. The two median tubercles are minute, and the two subdorsal ones large. The two rows of small dorsal tubercles one-haired; those of the subdorsal row (or 3d row from below of the abdominal segments with legs) bearing each two hairs; the second dorsal row of 2d and 3d thoracic segments bearing each two hairs, but the next row beneath with one on the segments provided with legs. Hairs nearly twice as long as the body is thick; the dorsal hairs black and the lateral ones grayish. Thoracic legs dark amber brown. Abdominal legs amber, with an external dark piece. A distinct subcrescentiform dark conspicuous prothoracic plate. It molted July 7-8.

Stage II.—Length 6 mm. Head black. Dorsal tubercles black, with from ten to twelve black spinulated hairs. A dorsal median row of whitish spots beginning on the second thoracic segment, and a similar subdorsal line. The lateral tubercles dusky amber colored. The general hue of the skin dark amber. Prothoracic plate not very large, with dark dorsal tubercles. It molted July 10.

Stage III.—Length 7 mm. Head black, shirring, not so wide as the body. The body now uniformly, with all the tubercles, shining black. A conspicuous median dorsal white band, the spots separate in stage II, being now smaller in proportion and connected, beginning as before on the 2d thoracic segment. A faint dark livid subdorsal line, at first not visible. About twelve spinulated pairs arise from the dorsal tubercles, and, like those of the others are all black, except an occasional small white one. It molted again July 17.

Stage IV.—Length 10 mm. Much as before though thicker, the body entirely black, with a whitish dorsal stripe; no definite subdorsal line, but the sides of the body between the tubercles are dull livid, the livid band enclosing three rows of tubercles, *i. e.*, the 2d, 3d and 4th from the dorso-median one.

July 21, it was 15 mm. long, though it had apparently not molted.

July 22, the pale subdorsal lateral band is whiter than before; this band extends underneath around the body, enclosing four rows of tubercles on each side, thus making a broad black band on each side of the median dorsal line. It molted July 25.

Stage V.—Length 15-16 mm. It is now deep black; the dorsal stripe now distinctly whitish yellow and narrow, with a broad black band on each side. The sides of the body are darker livid than before, the livid hue less apparent. The upper row of subdorsal tubercles are pale, shining, glistening at the end, and black below. Thoracic legs black; abdominal legs pale. It molted again July 31.

Stage VI.—Length 16–17 mm. Same as in stage V; described August 1st. The three lateral rows of tubercles are now dull amber brown, and of the same hue as the abdominal legs. It molted again August 15.

Stage VII.—Length 20–22 mm. Of the same appearance as before but the three rows of dorsal and subdorsal tubercles on each side are pale whitish clay color; the dorsal median hue is conspicuous, being yellow as before.

PRELIMINARY HAND-BOOK OF THE COLEOPTERA OF NORTH EASTERN AMERICA.*

(Continued from page 76.)

By H. F. WICKHAM.

Myas Dej.

With most of the characters of *Pterostichus* this genus differs by having the terminal joint of the palpi dilated. There are no dorsal punctures. Two North American species are known which separate thus:

Synopsis of Species.

Larger, elytral striæ punctured,.....**coracinus.**
Smaller, elytral striæ not or very obsoletely punctured.....**cyanescens.**

M. coracinus Say.—Black, elytra purplish; thorax large, transversely quadrate, front angles rounded, hind angles rectangular, margin purplish. Elytra broad with acute striæ which are finely punctured. Length, .72—.80 in.=18–20 mm.

Habitat: New York, New Jersey, Ohio.

M. cyanescens Dej.—Smaller than *coracinus* and with smoother striæ. Thorax not depressed at sides as in that species and with deeper basal impressions. Length, .52—.60 in.=13–15 mm.

Habitat: New York, New Jersey, Wisconsin. Found under logs in deep woods in July.

* Mr. Wickham kindly consented to aid us with the Hand-Book, as has also Mr. Roland Hayward, who will furnish a synopsis of the genus *Bembidium* for the March number. (W. B.)

Pterostichus *Bon.*

Antennal grooves wanting beneath, two supra-orbital setæ, scrobe of mandible without setigerous puncture. Hind coxæ contiguous, margin of elytra with postero-lateral interruption, three basal joints of antennæ smooth, head not greatly constricted behind the eyes. Terminal joint of labial palpi not dilated and not shorter than the penultimate which is bisetose anteriorly. Anterior tarsi of ♂ transversely dilated.

Usually black shining species, sometimes with metallic or purplish luster. Form elongate, more or less depressed. They are common in woods under logs, stones or leaves, while many are to be found in the spring under all kinds of shelter. From its great size the genus is quite difficult to handle. The essentials used in the following table are in the main those suggested by Dr. LeConte, whose papers have been freely used.

Synopsis of Species.

Dorsal punctures wanting.....	2
Dorsal puncture single.....	5
Dorsal punctures two or more.....	11
2. Head of moderate size.....	3
Head greatly enlarged.....	4
3. Prosternum margined at tip.....	congestus.
Prosternum not margined at tip.....	adoxus.
4. Hind trochanters acute at tip.....	grandiceps.
Hind trochanters rounded at tip.....	rostratus.
5. Basal foveæ of prothorax double or bistrate.....	6
Basal foveæ of thorax single.....	9
6. Hind angles rectangular, longer and prominent.....	7
Hind angles subobtuse or very small.....	8
7. Legs black anterior transverse thoracic line evident.....	substriatus.
Legs reddish transverse line obsolete or wanting.....	incisus.
8. Elytral striæ punctulate.....	vincatus.
Elytral striæ smooth.....	apalachius.
9. Hind angles of thorax rectangular, prominent. Elytral striæ deep, small species (.32 in.).....	honestus.
Hind angles nearly rectangular, large species (.75 in.).....	unicolor.
Hind angles rounded or obtuse.....	10
10. Larger (.75 in.) Elytral striæ very fine.....	rotundatus.
Smaller (.41 in.) Elytral striæ profound, thorax without anterior impressed line.....	obsoletus.
Small (.40 in.) Internal elytral striæ deep, thorax with deep anterior impressed line near margin.....	approximatus.

11. Last joint of palpi cylindrical, truncate at tip, mostly larger species 12
 Last joint of palpi elongate oval, scarcely truncate, smaller species..... 38
12. Metathoracic episterna short..... 13
 Metathoracic episterna long..... 25
13. Prosternum not margined behind 14
 Prosternum margined, thorax broader posteriorly..... 24
14. Outer striæ of elytra finer; prothoracic margin fine..... 15
 Outer striæ of elytra nearly or quite as deep as inner 16
15. Striæ of elytra smooth **obscurus.**
 Striæ punctured..... **ventralis.**
16. Prothorax narrower behind. 17
 Prothorax nearly quadrate, elytral striæ subcatenate. 22
 Prothorax broader behind, elytral striæ normal. 23
17. Two dorsal punctures. 18
 Four dorsal punctures. 21
18. Basal foveæ deep linear..... **lachrymosus.**
 Basal foveæ large, broad..... 19
19. Hind angles carinate..... 20
 Hind angles not carinate, fovea not tuberculate..... **relictus.**
20. Fovea not tuberculate..... **coracinus.**
 Fovea with tubercle **stygicus.**
21. Purplish, hind angles carinate..... **superciliosus.**
 Dull black, hind angles not carinate. **mæstus.**
22. Basal foveæ broad, deep, punctured, thoracic margin broader at base, hind
 angles obtuse **punctatissimus.**
23. Side margin and basal foveæ punctured..... **sculptus.**
 Side margin and basal foveæ not punctured..... **fallax.**
24. Above iridescent, thorax flattened, narrowed anteriorly..... **permundus.**
 Above black, thorax convex more quadrate..... **hamiltoni.**
25. Basal joints of antennæ distinctly carinate..... 26
 Basal joints of antennæ simple..... 27
26. Legs black; above green, polished dorsal punctures two, body beneath
 impunctured **sayi.**
 Legs usually reddish; body above green or blue not polished, beneath
 punctured **lucublandus.**
27. Dorsal punctures two; form depressed, thorax broad, narrowed behind, rounded
 at sides, hind angles rounded, basal impressions broad, punctured, elytral
 striæ deep, finely punctured, interstices nearly flat..... **submarginatus.**
 Dorsal punctures three or four..... 28
 Dorsal punctures five or six, foveate..... 36
28. Hind angles of thorax carinate, basal foveæ bistrate... 29
 Hind angles of thorax not carinate, basal foveæ single..... 32
29. Thorax much narrowed posteriorly, angles rectangular and prominent..... 30
 Thorax less narrowed posteriorly, angles smaller slightly prominent, basal foveæ
 punctured 31
30. Basal foveæ not punctured, elytral striæ fine **ebeninus.**

- Basal foveæ punctulate, elytral striæ deeper.....**caudicalis**.
31. Larger species (.60 in.) less slender.....**corvinus**.
Smaller species (.38 in.).....**luctuosus**.
32. Ligula obtusely carinate, thorax strongly margined.....33
Ligula not carinate, thorax very finely margined.....35
33. Hind thoracic angles obtuse, elytra ♂ dull.....**gravis**.
Hind angles rectangular.....34
34. Very brilliant (♂, ♀). Middle tibiæ ♂ with acute subapical tooth and feeble
obtuse apical process.....**scrutator**.
Moderately brilliant (♂) or duller (♀); sides of thorax distinctly sinuate be-
hind.....**tartaricus**.
Less brilliant, ♀ dull; thorax scarcely sinuate near base.....**haldemani**.
35. Purplish above, thoracic impressions not punctured.....**purpuratus**.
Black above, thoracic impressions punctured.....**mutus**.
36. Hind angles of thorax small, dentiform, elytra shining.....**pennsylvanicus**.
Hind angles rectangular, elytra ♀ dull.....**vitreus**.
Hind angles obtuse, elytra ♀ dull.....37
37. Sides of prothorax broadly depressed.....**orinomum**.
Sides of prothorax narrowly depressed.....**luczotii**.
38. Metathoracic episterna long.....39
Metathoracic episterna short.....41
39. Scutellar stria long.....40
Scutellar stria wanting, thorax nearly square, rounded at angles, color black, legs
reddish.....**erythropus**.
40. Elytral striæ smooth; antennæ and legs reddish.....**patruelis**.
Elytral striæ punctured in anterior half, antennæ and legs reddish, thighs usually
darker.....**femoralis**.
Elytral striæ obsolete punctured, antennæ and legs bright ferruginous, surface
iridescent.....**corrusculus**.
41. Prothorax not margined at base near hind angles, scutellar stria long, elytral
striæ fine, surface brassy.....**vindicatus**.
Prothorax with base margined near hind angles.....42
42. Outer basal fovea wanting.....43
Both foveæ present, the outer one small.....**hudsonicus**.
43. Medium-sized, hind angles of thorax more or less prominent.....**empetricola**.
Smaller, prothorax broader, more narrowed behind sides suddenly sinuate, hind
angles prominent.....**mandibularis**.

P. congestus *Min.*—Black, thorax longer than broad, narrowed and sinuate posteriorly, basal margin straight, not margined toward the sides. Elytral striæ deeper behind. Length, .47-.70 inch = 12-17.5 mm.

Habitat: Alaska, California (San Diego). The Wisconsin record, on the strength of which it is here inserted should be carefully verified.

P. adoxus *Say.*—Black, antennæ and palpi dark rufous, legs and abdomen piceous. Thorax gradually narrowed behind, sides excurved

near hind angles, basal lines strong, elytral striæ not punctured. Length, .53-.60 in. = 13-15 mm.

Habitat: Canada to Georgia, west to Wisconsin and Wyoming.

P. grandiceps *Chaud.*—This and the following species are easily known from their allies by the very large head and prominent mandibles. Length, .56-.68 in. = 14-17 mm.

Habitat: Georgia, North Carolina and Tenn.

P. rostratus *Newm.* Pl. VII, fig. 3.—Length, .56-.67 in. = 14-16.3 mm.

Habitat: Canada, New York, south and westward.

P. substriatus *Lec.*—Black, shining, thorax broad, much narrowed behind and rounded on the sides. Striation of elytra variable, sometimes quite deep, often nearly effaced. Length, .48-.57 in. = 12-14 mm.

Habitat: New Jersey, New York, southward: Missouri to New Mexico.

P. incisus *Lec.*—Resembles the preceding, differs in the anterior transverse line of prothorax being nearly effaced, the legs reddish, the hind angles of prothorax smaller. Length, .40-.48 in. = 10-12 mm.

Habitat: Illinois, Missouri River to Colorado.

P. vinctus *Lec.*—Black, shining, thorax not transverse, anterior transverse line wanting, elytral striæ deep. Length, .43 in. = 11 mm.

Habitat: Georgia, Tennessee, Pennsylvania.

P. unicolor *Say.*—Black, opaque, thorax not transverse, sides subsinuate posteriorly, basal impressions single, rather long, elytra finely striato-punctate. Length, .75 in. = 19 mm.

Habitat: New York to Georgia.

P. rotundatus *Lec.*—Black, somewhat shining; the thorax is broader than long and the hind angles obtuse. Basal striæ short, elytra finely striate. Length, .75 in. = 19 mm.

Habitat: New York and Georgia.

P. obsoletus *Say.*—Black, elytral striæ deep; legs reddish. Length, .41 in. = 10 mm.

Habitat: Ohio, Illinois, Alabama, Texas and Florida.

P. approximatus *Lec.*—Allied to *obsoletus*, differs especially in the presence of an anterior thoracic line. Length, .40 in. = 10 mm.

Habitat: Pennsylvania and District of Columbia.

P. apalachius Horn.—Blackish, shining, slightly iridescent, thorax about equal in length and breadth, slightly narrowed posteriorly. Body beneath smooth except for a few punctures on the sides of the sternum and anterior abdominal segments. The male has a broad oval excavation near the posterior margin of the anal segment. Length, .48 in. = 12 mm.

Habitat: Canada, New York, Illinois, Pennsylvania and Maryland.

P. honestus Say. Pl. VII, fig. 4.—A rather small and easily recognized species; the thorax is much narrowed and abruptly sinuate at sides behind, the elytra more oval than usual with very deep striæ and much broader than the thorax. Length, .32 in. = 8 mm.

Habitat: Widely distributed in the Eastern States, especially northward.

P. obscurus Say.—This and the following species are of a peculiar appearance, more elongate than usual, the second dorsal puncture situated in the third stria. The thorax is narrowed behind, trapezoidal in shape, the hind angles very obtuse, rounded. Length, .42 in. = 10.5 mm.

Habitat: Pennsylvania, Ohio, south and westward.

P. ventralis Say.—Separable from *obscurus* by the characters given in the table. Length, .35 in. = 9 mm.

Habitat: Louisiana, Florida, Missouri, Illinois and Kansas.

P. lachrymosus Newm.—Black, thorax much narrowed behind, elytral striæ deep, interstices convex. Length, .60 in. = 15 mm.

Habitat: New York, southward and westward.

P. coracinus Newm. Pl. VII, fig. 5.—Black, thorax quadrate somewhat narrowed behind, sides broadly rounded. Elytral striæ deep, impunctured. Length, .60-.70 in. = 15-17.5 mm.

Habitat: Canada and Wisconsin to Tennessee and Virginia.

P. stygicus Say.—The tubercle in the thoracic fovea easily distinguishes this from the preceding. Length, .57 in. = 14 mm.

Habitat: Canada to Illinois and Georgia.

P. relictus Newm. Sufficiently distinguished by the characters given in the table. Length, .64 in. = 16 mm.

Habitat: New York, Pennsylvania and Michigan.

P. superciliosus Say.—Black, shining, elytra purplish. Thorax wide in front, much narrower behind, hind angles broadly rounded. Elytral striæ deep, impunctured. Length, .60 in. = 15 mm.

Habitat: Michigan, Pennsylvania and New York.

P. mæstus Say.—Size of preceding, differs as noted in table.

Habitat: New York, New Jersey, Pennsylvania and West Virginia.

P. punctatissimus Raud.—Black, polished, thorax quadrate, but slightly narrowed behind, posterior angles obtuse. Elytral striæ deep, the alternate interstices interrupted and foveate. Length, .57 in. = 14 mm.

Habitat: Massachusetts, New Hampshire, Maine and Canada.

P. fallax Dej.—Body elliptical, polished. Elytra deeply striate, abdomen not punctured at sides. Length, .65 in. = 16 mm.

Habitat: Tennessee, Arkansas and southward.

P. sculptus Lec. Pl. VII, fig. 6.—Narrowed and more shining than *fallax*, abdomen punctured at sides. Length, .55-.70 in. = 14-17.5 mm.

Habitat: New York and southward.

P. permundus Say.—Elliptical, black, shining with iridescent reflections, elytral striæ very finely punctured. Length, .60 in. = 15 mm.

Habitat: Ohio, Indiana, Iowa, Missouri, Illinois and Nebraska.

P. hamiltoni Horn.—Resembling *permundus* in general form but differs by characters given in table. Length, .54 in. = 13.5 mm.

Habitat: Pennsylvania, East Ohio, Maryland and West Virginia.

P. sayi Brullé.—Usually bronzed above, sometimes nearly black. Body oblong, somewhat flattened, thorax narrowed anteriorly, hind angles rectangular, elytral striæ deep. Length, .40-.50 in. = 10-12.5 mm.

Habitat: Northeast America, abundant.

P. lucublandus Say. P. VII, fig. 7.—Lacks the brilliantly polished surface of the preceding which it resembles in form. Legs usually reddish though varying to black. Common over a great part of the country. Length, .40-.55 in. = 10-14 mm.

Habitat: United States east of Rocky Mountains.

P. submarginatus Say.—Length, .50 in. = 12.5 mm.

Habitat: Illinois, southward and westward.

P. ebeninus Dej. This and the three following species are members of a small group in which the hind angles of the thorax are carinate, the foveæ deep, broad and bistrate. Elytra with three dorsal punctures and long scutellar stria. Humeri dentiform, posterior tarsi with first joint feebly grooved externally. The characters used in the

table for specific identification are those selected by Dr. LeConte.
Length .44-.54 in. = 11-13.5 mm.

Habitat: New York, Illinois, Louisiana, Texas and Ohio.

P. caudicalis Say.—Length, .41-.50 in. = 10-12.5 mm.

Habitat: Canada to Maryland, Ohio, Dakota, Montana, Nevada and Oregon.

P. luctuosus Dej.—Smaller and more slender than the others of the group. Length, .37 in. = 9 mm.

Habitat: Canada, Wisconsin, New York and Pennsylvania.

P. corvinus Dej.—Thorax rather short, sides not sinuate, hind angles very slightly prominent or subobtusate. Length, .57-.60 in. = 14-15 mm.

Habitat: Canada to Wisconsin to Nebraska, New York to Georgia.

P. haldemani Lec.—Black, elytra opaque, at least in the ♀, striæ fine. A very large species. Length, .87 in. = 22 mm.

Habitat: New York and south to Alabama.

P. tartaricus Say. Pl. VII, fig. 8.—Aside from the characters given in the table, may be known from the preceding species by having deep elytral striæ. A specimen (♀) in my cabinet from Iowa City exceeds all the recorded measurements, reaching 24 mm. Length, .63-.96 in. = 16-24 mm.

Habitat: New York, Canada, south and west to Illinois and Iowa.

P. scrutator Lec.—Smaller and very brilliant. Length, .60 in. = 15 mm.

Habitat: Canada, New York, Illinois and Iowa.

P. gravis Lec.—Length, .76 in. = 19 mm.

Habitat: Pennsylvania, rare.

P. purpuratus Lec.—Purplish above, body rather elongate, thorax moderately narrowed behind. Posterior tarsi with three joints grooved. Elytral striæ deep, impunctured. Length, .53-.56 in. = 13-14 mm.

Habitat: New York to Pennsylvania and Ohio.

P. mutus Say. Pl. VII, fig. 9.—Black, hind angles of thorax more distinct. Length, .40-.52 in. = 10-13 mm. A common species in the Atlantic and Middle States.

Habitat: Atlantic region generally and west to Nevada.

P. pennsylvanicus *Lec.*—Commences a series of four species in which the dorsal punctures of the elytra are very large, foveate. The species are distinguished with difficulty, the chief points of difference (as developed by Dr. LeConte) being given in the table. Length, .44 in. = 11 mm.

Habitat: Northeastern America.

P. vitreus *Dej.*—Length, .46 in. = 11.5 mm.

Habitat: New Hampshire, California and Alaska.

P. luczotii *Dej.*—Length, .40–.50 in. = 10–12.5 mm.

Habitat: Northern portion of North America from Massachusetts and New York to British Columbia.

P. orinomum *Kirby*. Pl. VII, fig. 10.—Very close to the preceding. Length, .45 in. = 11 mm.

Habitat: Nova Scotia, Canada, Lake Superior, Oregon, British Columbia.

P. erythropus *Dej.* Pl. VII, fig. 11.—A small black shining species, with reddish legs, thorax subquadrate, angles much rounded. Posterior tarsi with four joints grooved externally. Length, .33–.54 in. = 8–8.5 mm.

Habitat: Northeastern America, west to Colorado.

P. patruelis *Dej.*—With *femoralis* and *corrusculus* forms a small group in which the scutellar stria is long, the prothorax feebly narrowed behind and the basal impressions single. The hind tarsi have three joints grooved on the outside. Length, .30 in. = 7.5 mm.

Habitat: Northeastern America, west to Wisconsin and Iowa, north to Alaska.

P. femoralis *Kirby*.—Differs from the preceding by characters given in table. The variety *desidiosus* *Lec.*, has the striæ more strongly punctured than in the type. Length, .30 in. = 7.5 mm.

Habitat: Illinois and Missouri (var. *desidiosus*). New York, Canada, Pennsylvania, Wisconsin and Iowa.

P. corrusculus *Lec.* Smaller than either of the preceding, hind angles of prothorax obtuse. Length, .20 in. = 5 mm.

Habitat: New York, Massachusetts.

P. vindicatus *Mann.*—Oblong-ovate, above cupreous, shining, beneath black, thorax subquadrate, moderately narrowed behind. Basal impressions single, impunctate, hind angles somewhat obtuse. Elytral striæ shallow, finely obsolete punctured, dorsal punctures

three or four. First antennal joint rufous at base. Legs blackish-piceous, trochanters and base of femora rufescent. Length, .36-.40 in. = 9-10 mm.

Habitat: New Hampshire, Alaska (Island of Kadjak).

P. hudsonicus *Lec.*—Elongate, black, highly polished, thorax subcordate, not wider than long, hind angles rectangular. Legs obscurely ferruginous. Length, .28-.38 in. = 7-9.5 mm.

Habitat: New Hampshire, Labrador, British Columbia, Alaska, Lake Superior Region, Colorado (Red Cliff).

P. empetricola *Dej.*—Black, slightly bronzed or brownish above, thorax cordate; elytra oblong-ovate, finely striato-punctate, dorsal punctures four. Base of antennæ and legs rufous. Length, .28 in. = 7 mm.

Habitat: New Hampshire, Hudson's Bay Territory, Alaska.

P. mandibularis *Kirby.*—Black, above somewhat bronzed. Legs and base of antennæ reddish or brownish. Thorax cordate, hind angles punctured. Elytral striæ punctulate. Length, .25-.28 in. = 6-7 mm.

Habitat: New Hampshire, Massachusetts, Canada, Wisconsin, Hudson's Bay, Alaska.

Evarthrus *Lec.*

Resembling *Pterostichus*, especially that group in which there is a single dorsal puncture. Prosternum margined behind, elytra with one dorsal puncture. Posterior tarsi not grooved externally; labial palpi with the last joint shorter than the penultimate which bears several long setæ in front. This last character separates it most readily from *Pterostichus* in which there are but two of these setæ.

Synopsis of Species.

Prothorax subquadrate, not constricted at base, prosternum deeply sulcate.

Elytral striæ strongly punctured.

Margin of prothorax narrow, nearly uniform..... **sigillatus.**

Margin of prothorax wide, especially at base..... **seximpressus.**

Elytral striæ finely punctured.

Prothorax wider than long, no true scutellar stria..... **americanus.**

Prothorax as long as wide, scutellar stria rather long..... **orbatus.**

Prothorax strongly constricted behind, posterior angles rectangular.

Hind angles of prothorax very prominent..... **colossus.**

Hind angles less prominent, shorter.

Sides of prothorax much rounded..... **sodalis.**

Sides of prothorax less rounded, more oblique..... **furtivus.**

E. sigillatus Say.—Black, ♀ dull opaque, ♂ sometimes less so. Thorax subquadrate, sides rounded, hind angles obtuse, margin fine, reflexed. Elytral striæ deep. Length, .60-.68 in. = 15-17 mm.

Habitat: New Jersey, south and west, to Maryland, Missouri, Kansas and Texas.

E. seximpressus Lec.—Close to the preceding, differing in the characteristics given in the table. Length, .58-.62 in. = 14.5-15.5 mm.

Habitat: Illinois, Missouri, Louisiana, Iowa, Kansas, Texas.

E. americanus Dej.—Thorax slightly narrowed anteriorly, margin fine, not reflexed. Length, .60-.80 in. = 15-20 mm.

Habitat: Texas, Florida, Louisiana, Ohio, Pennsylvania, Wisconsin.

E. orbatus Newm.—Thorax not broader than long, and little narrowed behind, margin narrow and scarcely reflexed. Length, .65-.68 = in. 16-17 mm.

Habitat: Illinois, Kentucky, Georgia, Alabama, Missouri, Wisconsin, Iowa, Nebraska, Texas.

E. colossus Lec.—Black, thorax transverse, sides much rounded and sinuate posteriorly, hind angles prominent. Length, .64-.88 in. = 16-22 mm.

Habitat: Illinois, Missouri, Nebraska, Louisiana.

E. sodalis Lec.—Separable by the less prominent hind angles of the prothorax from *colossus*. It is also smaller. There is a good deal of variation in the development of the posterior thoracic angles. Length, .60-.68 in. = 15-17 mm.

Habitat: Pennsylvania, Ohio, Illinois, Iowa, Wisconsin, Missouri, Kansas, Texas, Tennessee.

E. furtivus Lec.—The thorax is different from the preceding species in being more broadly and obliquely rounded on the sides which are slightly sinuate near the hind angles. The chief reliance must be placed on the table which follows, for the last three species, that of Dr. LeConte. Length, .60 in. = 15 mm.

Habitat: Michigan, Ohio, Pennsylvania, Maryland.

EXPLANATION OF PLATE VII.

Fig. 1. *Panagæus fasciatus* Say.

Fig. 2. *Patrobus longicornis* Say.

Fig. 3. *Pterostichus rostratus* Newm.

Fig. 4. *Pterostichus honestus* Say.

Fig. 5. *Pterostichus coracinus* Newm.

Fig. 6. *Pterostichus sculptus* Lec.

Fig. 7. *Pterostichus lucublandus* Say.

Fig. 8. *Pterostichus tartaricus* Say.

Fig. 9. *Pterostichus mutus* Say.

Fig. 10. *Pterostichus orinomum* Leach.

Fig. 11. *Pterostichus erythropus* Dej.

(To be continued.)

**CORRECTION OF A MISIDENTIFICATION—
ATTACUS SPLENDIDUS.**

By HARRISON G. DYAR.

In the revision of the genus *Attacus* by Mr. Neumoegen and myself (Journ. N. Y. Ent. Soc. II, 122), we recognized two species as possibly occurring in the United States, *erycina* (*splendidus*) and *zorulla*. Recently in comparing Cramer's plate 68 A with Maassen and Weymer's figs. 32 and 34, both of which are given by Kirby under the references for *erycina*, I find that the species is an entirely different one from that which we had before us and described under that name. The misidentification is an old one. In the first volume of *Entomologica Americana* is a comparison of the two species in question, from which it is obvious that the "*splendidus*" there referred to is the same as the one in the Neumoegen collection, namely *orizaba* Westwood. Later in the same journal, Mr. Neumoegen is quoted as stating that *splendidus* and *orizaba* were identical; but Mr. Neumoegen had never seen the figures of *splendidus*, and depended upon his collection. Probably the inclusion of *splendidus* in Mr. Grote's list of 1882 is based on the same misidentification, and it may even prove traceable back to Clemens in 1860. Our species should stand:—

***Attacus orizaba* Westwood.**

- 1853—Westwood, Proc. Zool. Soc. Lond. p. 158, pl. 32, fig. 2.
- 1860—? Clemens, Proc. Acad. Nat. Sci. Phil. 160 (as *splendidus*.)
- 1882—Grote, Check List, p. 20 (as *splendidus*.)
- 1884—Murtfeldt, Can. Ent. XVI, 131 (as *cinctus*.)
- 1885—Hulst, Ent. Amer. I, 78 (as *splendidus*.)
- 1885—Neumoegen, Ent. Amer. I, 160 (as *splendidus*.)
- 1891—Smith, List Lep. p. 31 (as *splendidus*.)
- 1894—Neumoegen and Dyar, Journ. N. Y. Ent. Soc. II, 122 (as *erycina*.)

As to our other *Attacus*, recorded from Arizona, *A. zorulla* Westw., I believe that it has a much more extended synonymy than that given by us. *A. betis* Walk., *A. arethusa* Walk., *A. bolivar* Maass. & Weym., *A. maurus* Burm., *A. cinctus* Tepp., and *A. speculum* Maass. & Weym., are among the forms which seem to be synonyms or local forms of *zorulla*. This matter will, however, find a more suitable place of treatment when the whole genus is monographed.

LOCAL ENTOMOLOGICAL NOTES.

Members of the New York Entomological Society and all others are solicited to contribute to this column their rare captures, local lists and other items of interest relating to the insect fauna of New York City and vicinity.

EGG-CAPSULES OF *CHRYSOCHUS AURATUS* (FAB.).

By J. L. ZABRISKIE.

On July 2, 1895, a few imagos of *Chrysochus auratus* were taken on a small patch of the Spreading Dogbane, *Apocynum androsaemifolium*, growing beside a certain street in Flatbush, L. I. On the 9th of the same month, while examining the same plants, a specimen of *Chrysochus* was discovered ovipositing in the opening at the summit of a little black cone, on a fence post close by the plants. In the open crater of the little cone was an egg, evidently just deposited, and close by the first cone was situated a similar little black cone entirely closed. Similar little black masses were found on the stems and especially on the under surface of the leaves of the plants near at hand.

These black masses are evidently the egg-capsules of *Chrysochus*. On the 20th of the same month two of these collected capsules were opened, one of which contained what appeared to be four empty egg shells, and the other contained two plump apparently living eggs. None of these, however, hatched in captivity.* The capsules measure about 3 mm. in length by 2 mm. in height, although frequently two capsules are joined and partly overlap each other. Their substance is composed of a thin but firm layer of minute brown and black pellets, moulded in a conical or irregular ovoid form—probably the excrement of the imago. Under the microscope the macerated and crushed material shows no particular structure, but spores of saprophytic fungi, such as are commonly attached to decaying vegetation, and minute grains of sand are frequently in the field of view.

* The larvæ after hatching drop to the ground and live on the roots of the plant.—H. B.

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Announcement.

AUCTION SALE OF INSECTS.

THE NEW YORK ENTOMOLOGICAL SOCIETY for the past few years has held regular auction sales of insects for the benefit of the JOURNAL. These sales have proven not only of value to the members of the Society, but also of great assistance towards defraying the cost of publishing the JOURNAL. In order to give all parties not residing in New York, or those who cannot attend the sales, a chance to purchase, it has been decided to publish from time to time a list of the rarer species on hand, so as to enable interested parties to send in their bids. The following is a list of the species now on hand.

THE PUBLICATION COMMITTEE.

Lepidoptera.

Papilio eurymedon.	Notodonta stragula.
Argynnis montinus.	Oedemasia badia.
Colias var. ariadne.	Alypia langtonii.
Chionobas semidea.	Nerice bidentata.
Pieris oleracea.	Pheosia rimosa.
Seirarctia echo.	Hepialus 4-maculatus.
Arctia virgo.	Euchætes oregonensis.
Euprepia americana.	Euchætes englenensis.
Spilosoma prima.	Hepialus gracilis.
Spilosoma antigone.	Composita fidelissima.
Cerura borealis.	Burtia belæ.
Cerura occidentalis.	Hyparpax auristriata.
Hypprepia fucosa.	Hyparpax auristriata var. tyria.
Schizura apicalis.	Gortyna purpurissata.
Ichthyura brucei (or vau.).	Anarta schonherri.
Parorgyia parallela ♂.	Plusia epigea.
Platoeceticus gloveri.	Plusia viridisignata.
Oiketicus abbotii.	Smerinthus cerisyii.
Lophopteryx elegans.	Triptogon modesta.

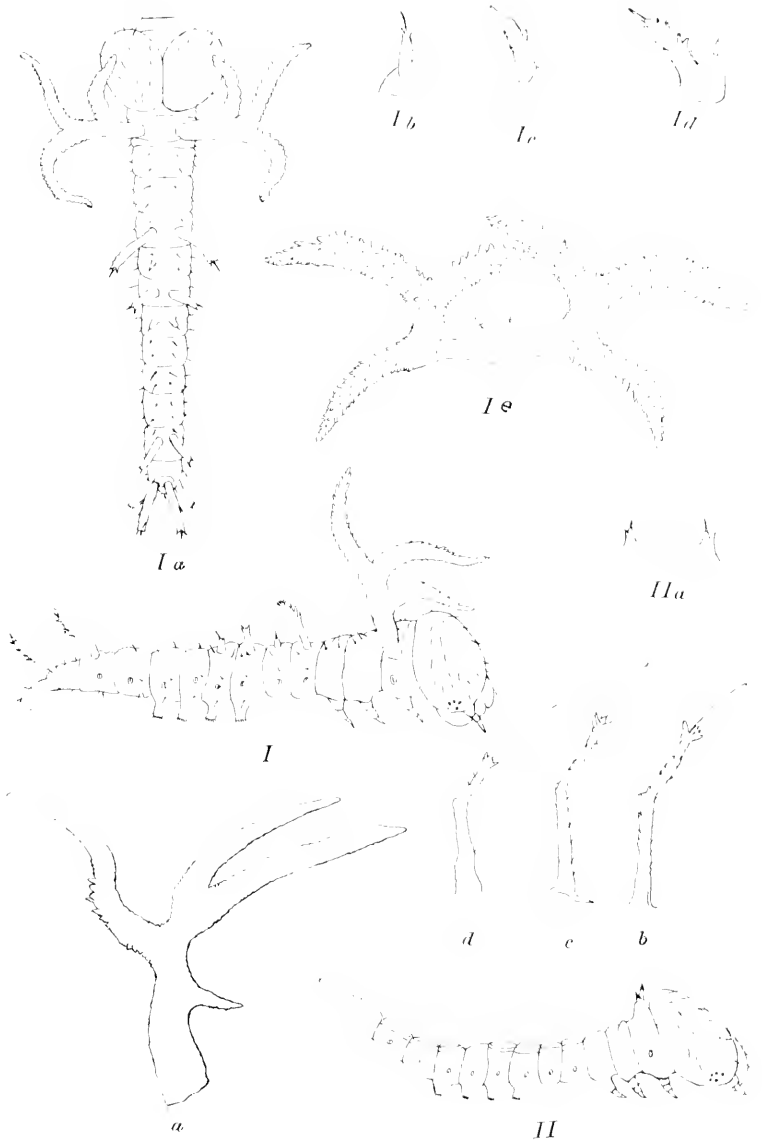
Coleoptera.

<i>Cicindela longilabris.</i>	<i>Cryptohypnus abbreviatus.</i>
<i>Cicindela tortuosa.</i>	“ <i>sanborni.</i>
<i>Cychrus lecontei.</i>	“ <i>restrictus.</i>
“ <i>viduus.</i>	“ <i>exiguus.</i>
<i>Carabus chamissonis.</i>	<i>Anthophilax attenuatus (rare).</i>
<i>Pasimachus subsulcatus.</i>	<i>Elaphidion truncatum?</i>
<i>Nebria sahlbergi.</i>	<i>Bellamira scalaris.</i>
<i>Pterostichus hudsonius.</i>	<i>Leptura 6-maculata.</i>
<i>Pterostichus sculptus.</i>	<i>Leptura chrysocoma.</i>
<i>Amara hypeborea.</i>	<i>Rhopalopus sanquiniicollis.</i>
<i>Lebia furcata.</i>	<i>Acmaeops pratensis.</i>
<i>Batrisus globosus.</i>	<i>Euryptera lateralis.</i>
<i>Staphylinus tomentosus.</i>	<i>Neoclytus muricatulus.</i>
<i>Languria marginipennis.</i>	<i>Pogonocherus penicellatus.</i>
<i>Brachyacantha 10-pustulata.</i>	<i>Cryptocephalus bivius.</i>
<i>Saprinus ferrugineus.</i>	<i>Cryptocephalus obsoletus.</i>
<i>Hyperaspis lugubris.</i>	<i>Bassareus croceipennis.</i>
<i>Hyperaspis bigeminata.</i>	<i>Colaspis costipennis.</i>
<i>Pytho americana.</i>	<i>Prasocuris varipes.</i>
<i>Byrrhus geminatus.</i>	<i>Monoxia consputa.</i>
<i>Anthicus scabriceps.</i>	<i>Amphicoma vulpina.</i>
<i>Georyssus pusillus.</i>	<i>Polypleurus nitidus.</i>
<i>Ditoma 4-guttata.</i>	<i>Phlaeodes diabolicus.</i>
<i>Lemophilacus modestus.</i>	<i>Epitragus tomentosus.</i>
<i>Corymbites virens.</i>	<i>Cteniopus murrayi.</i>
“ <i>nudianus.</i>	<i>Thanasimus undulatus.</i>
“ <i>cruciatus.</i>	<i>Eugnampus striatus.</i>
“ <i>resplendens.</i>	<i>Balaninus uniformis.</i>
<i>Elatер apicatus.</i>	<i>Anchonus floridanus.</i>
<i>Elatер rubricus.</i>	<i>Dryocætes autographus.</i>

Send bids to

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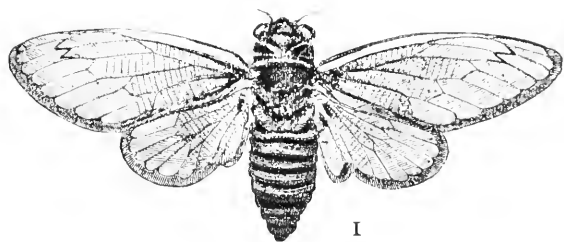
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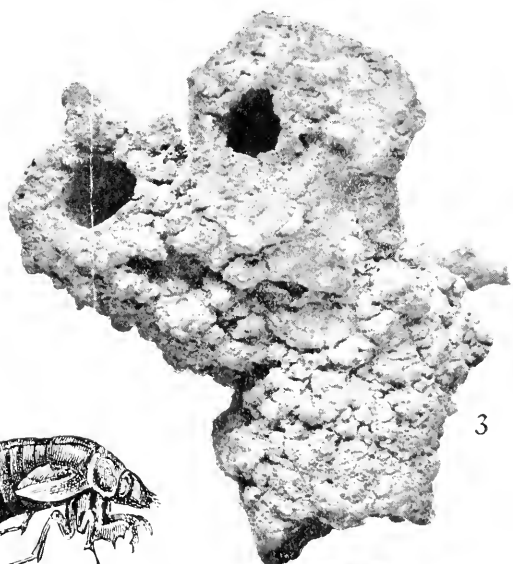
Early stages of *Heterocampa obliqua*
and *H. guttivitta*.



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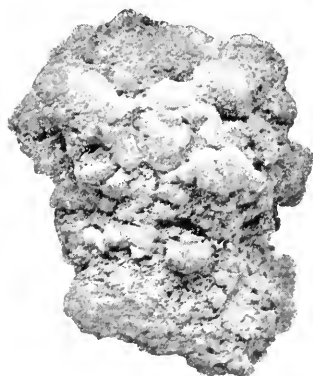
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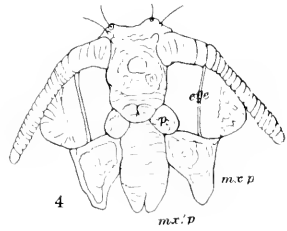
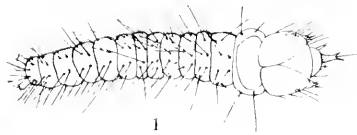
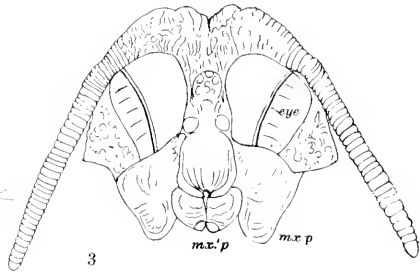
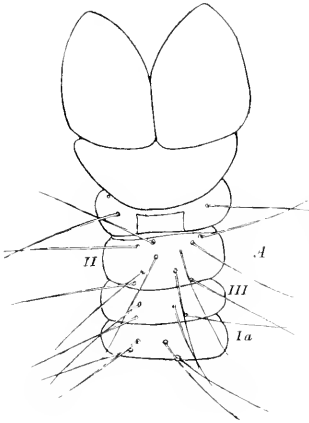
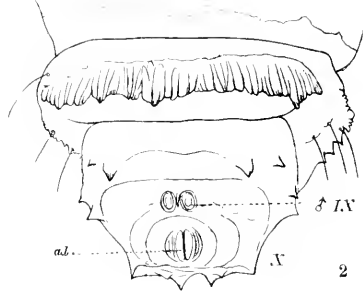
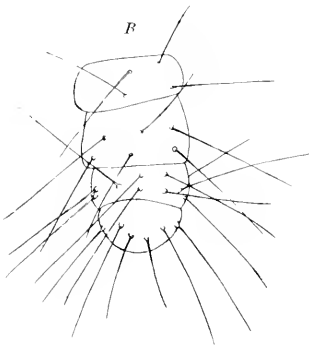


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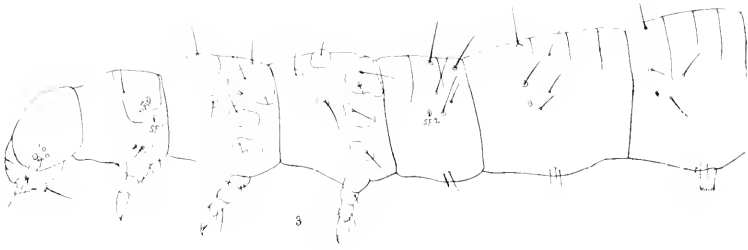
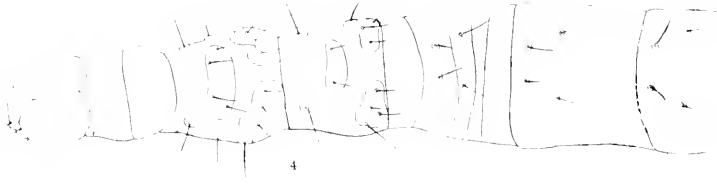


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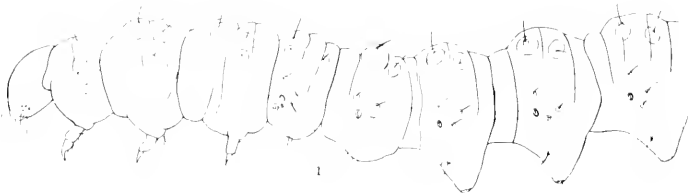
Domes of *Cicada septendecim*.



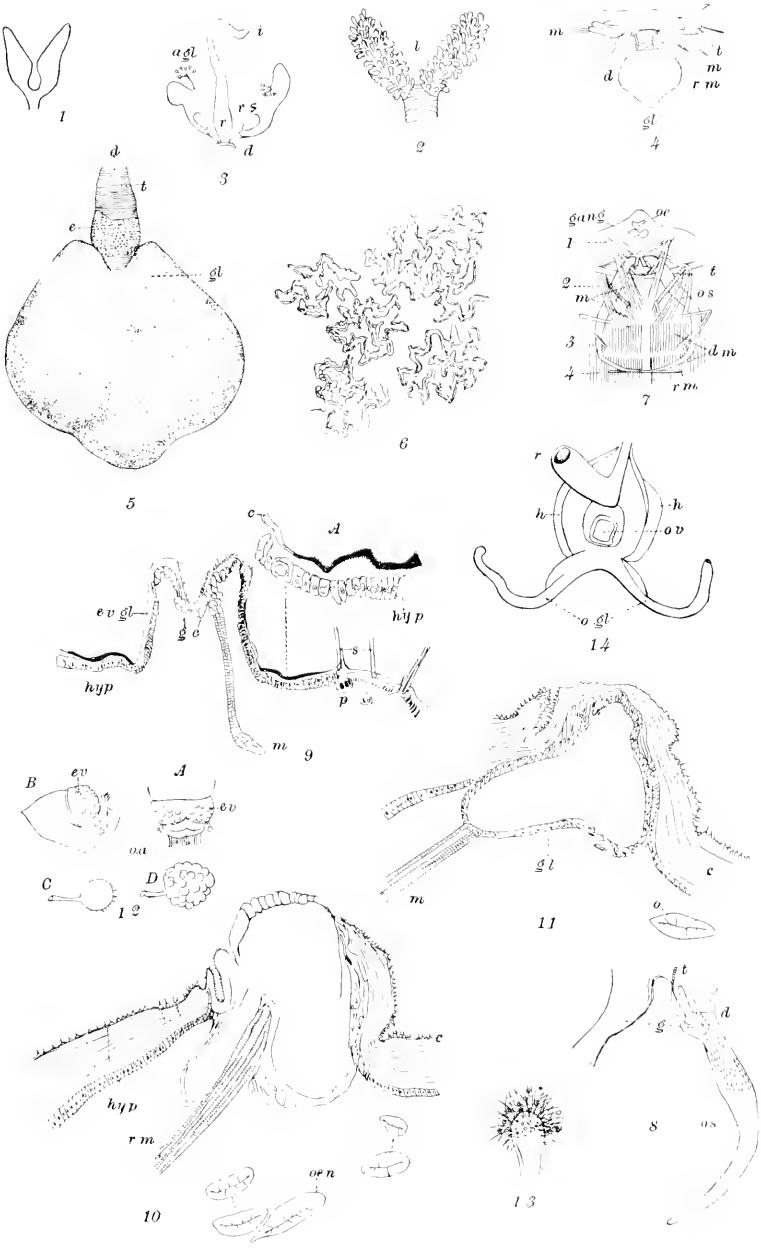
Larva and Pupa of Hepialidæ.



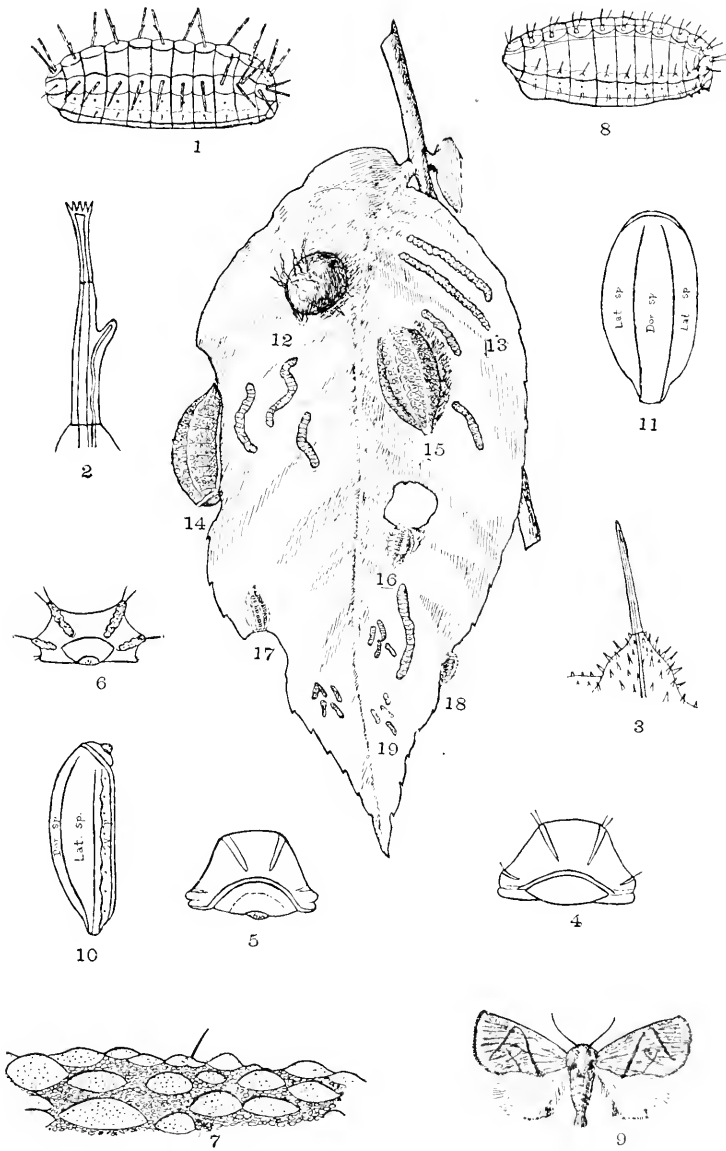
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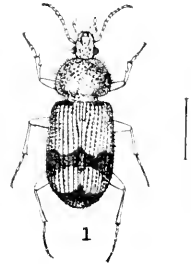
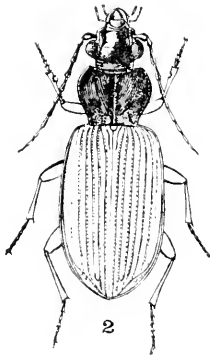
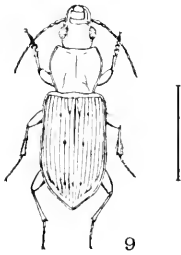
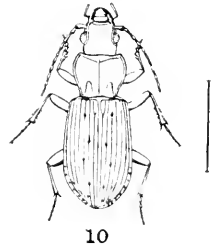
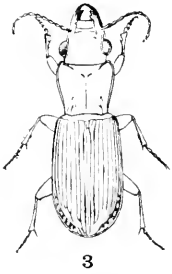
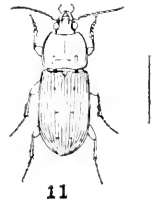
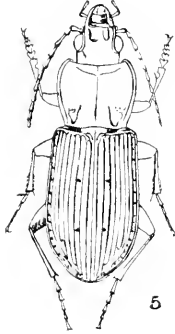
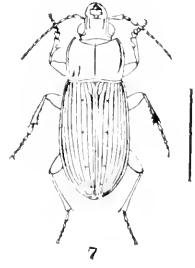
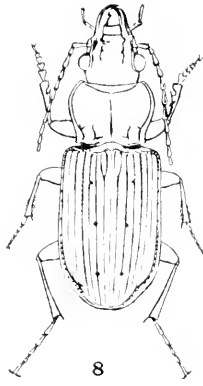
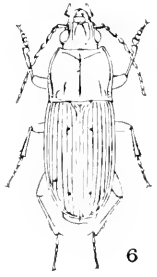
Larva of *Hepialus humuli* and *hectus*.



Scent Glands of Insects.



Life-History of *Apoda Y-inversa*.



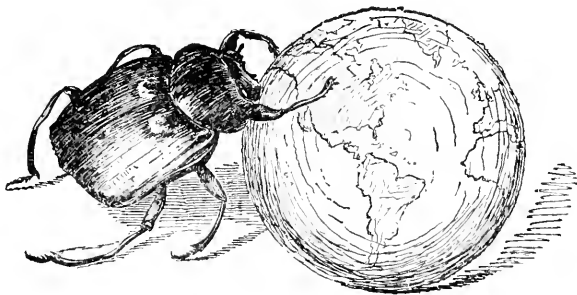
Carabidæ N. E. America.

VOL. III.

No. 1.

JOURNAL
OF THE
NEW YORK
Entomological Society.

Devoted to Entomology in General.



MARCH, 1895.

Edited by WM. BRITENMILLER.

Published Quarterly for the Society.

NEW YORK.

1895.

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OF THE

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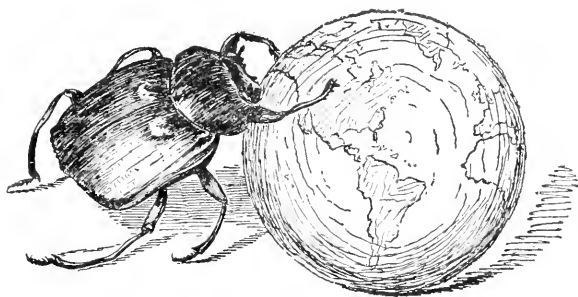
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Edited by WILLIAM BEUTENMÜLLER.

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NEW YORK.

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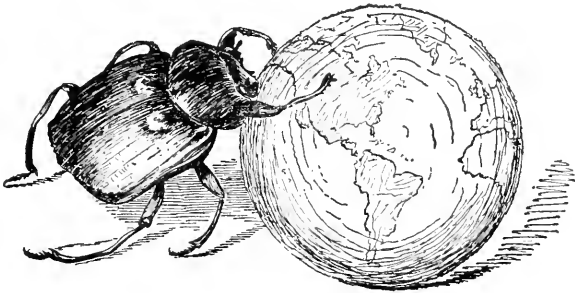
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SEPTEMBER, 1895.

Edited by WILLIAM BEUTENMÜLLER.

Published Quarterly for the Society.

NEW YORK.

1895.

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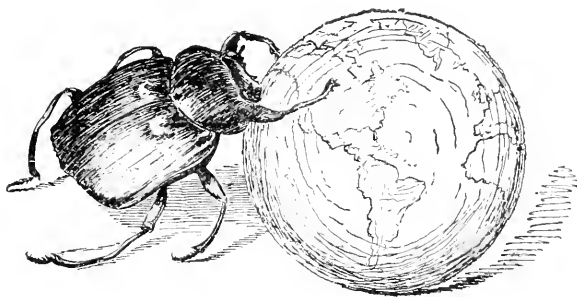
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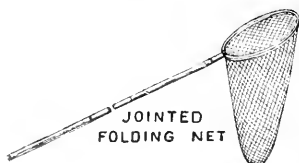
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