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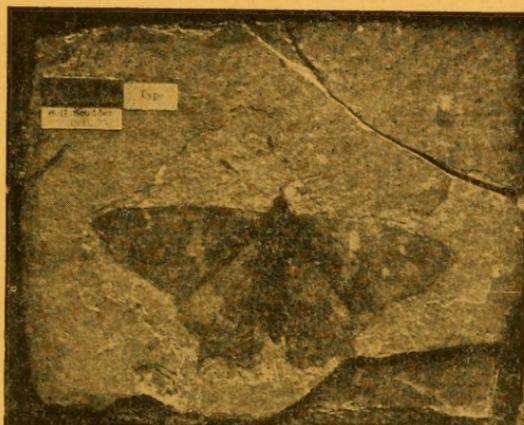
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CONTENTS.

The Immature Stages of <i>Tropidosteptes cardinalis</i> Uhler (Capsidæ, Hemiptera). <i>M. D. Leonard</i>	1
Prothetely in the Elaterid Genus <i>Melanotus</i> . <i>J. A. Hyslop</i>	3
Two New Thysanoptera from West Africa, with a Note on the Synonymy of the Phlæothripidæ. <i>J. Douglas Hood</i>	6
A Preliminary List of the Odonata of Concord, Mass. <i>R. Heber Howe, Jr.</i>	12
Elateridæ and Throscidæ of the Stanford University Expedition of 1911 to Brazil. <i>J. A. Hyslop</i>	16
A Psyllid Gall on <i>Juncus</i> (<i>Livia maculipennis</i> Fitch). <i>Edith M. Patch</i>	21
The Coccidæ of New Jersey Greenhouses. <i>Harry B. Weiss</i>	22
The Host of <i>Zelia vertebrata</i> (Diptera, Dexiidæ). <i>J. A. Hyslop</i>	24
Dr. Frederick William Russell	25
Exchange Column	26



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VOL. XXIII

FEBRUARY, 1916

No. 1

THE IMMATURE STAGES OF *TROPIDOSTEPTES CARDINALIS* UHLER (CAPSIDAE, HEMIPTERA).¹

BY M. D. LEONARD,
Ithaca, New York.

On June 10, 1908, Prof. C. R. Crosby first noticed that the leaves of an ash tree near the Cornell Insectary were being slightly injured by a Capsid which by that date had become adult. In the early spring of 1910 he prepared descriptions of the stages from nymphs reared on twigs forced out in the insectary, but no adults were obtained. In the spring of 1913 Professor Crosby called the writer's attention to the problem and the study of the immature stages of the insect was again taken up. The nymphs were redescribed and adults were obtained which were identified as *Tropidosteptes cardinalis* Uhler.

Detailed observations have not been made on the length of time required for the nymphs to complete their growth on the trees but on May 23, 1914, two first-stage nymphs were still present and, on June 4, the first fifth-stage nymph was observed. The insect spends the winter in the egg stage. The eggs are probably inserted during late summer into the smaller twigs but have not been definitely located. The following descriptions of the nymphal stages are based on notes made during the spring of 1914 and of 1915. The drawings were made by the writer with the exception of that of the fourth nymphal stage which was made by Miss Anna C. Stryke. The injury to the foliage consists of a yellow spotting or stippling which in more severe cases causes the leaves to crumple in places.

Stage I (Fig. 1): Length, .85 mm.; greatest width of abdomen, .45 mm. Ground color reddish; head strongly suffused with dusky; thorax with a large

¹ Contribution from the Department of Entomology of Cornell University.

dusky spot on each segment, not reaching the lateral margin and interrupted by a median red line running the length of the thorax. This latter crosses, for a short distance, a procurved line of red on the vertex which extends almost to the cephalic border of the eyes. Abdomen red, sometimes mottled with red of a darker shade; opening of dorsal gland indicated by a small dusky spot. Eyes dark reddish; antennæ pale, suffused slightly with dusky, paler at the tip of the segments, whole of last segment reddish and slightly swollen. Legs pale, suffused slightly with dusky, tarsi slightly darker. Beak same as legs, extreme tip somewhat darker.

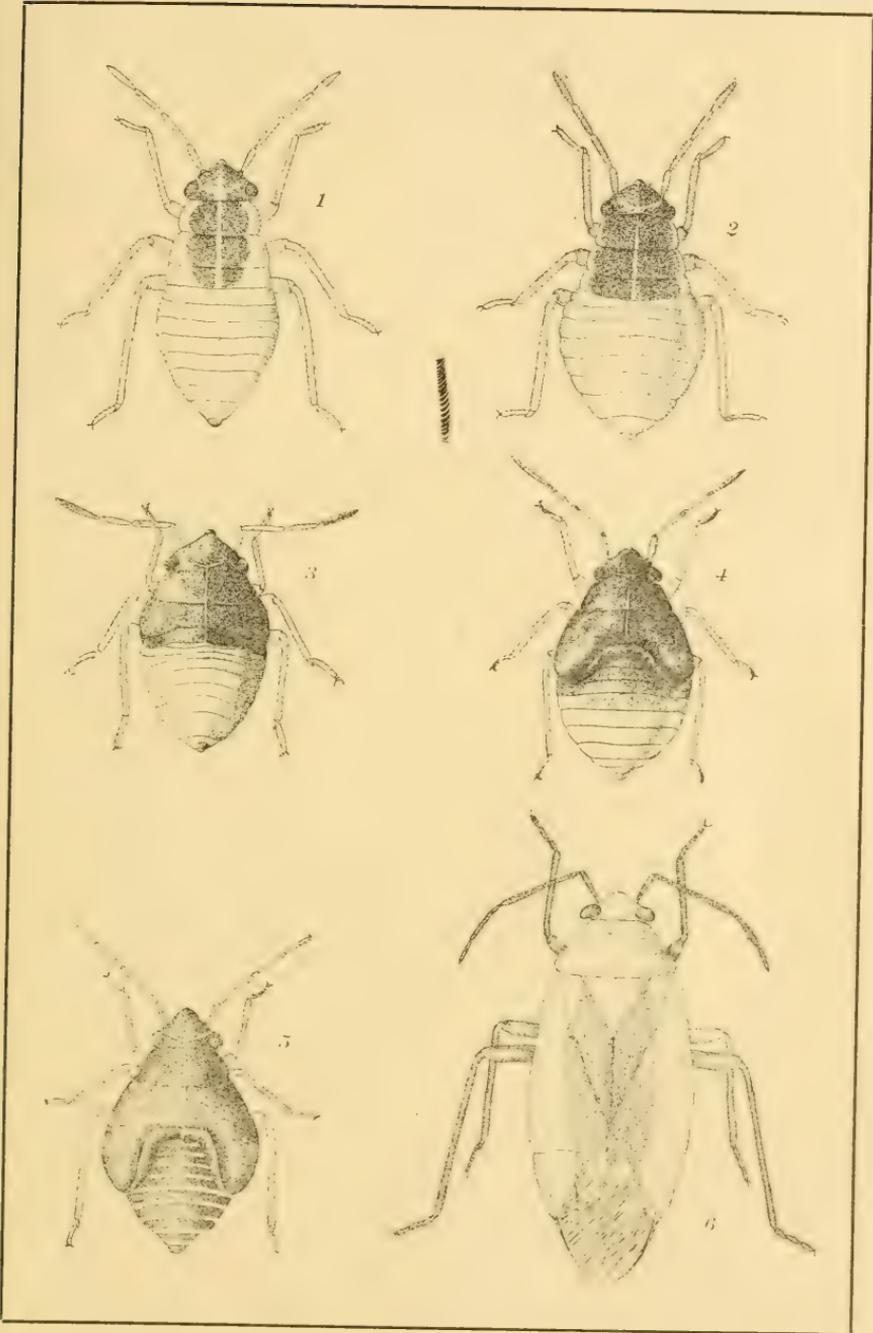
Stage II (Fig. 2): Length, 1.3 mm.; greatest width of abdomen, .7 mm. Ground color of head and thorax shining dark red, but strongly suffused with blackish, except the lateral margins, narrowly, of the thorax and a narrow median line which is as in preceding stage. Abdomen shining dark red, opening of dorsal gland indicated by a dusky spot. Eyes dark reddish; antennæ, beak and legs about the same as in preceding stage.

Stage III (Fig. 3): Length, 1.85 mm.; greatest width of abdomen, .975 mm. Head and thorax now wholly suffused with blackish except for a narrow reddish median line which terminates on the vertex in a procurved line extending towards either eye. Abdomen shining dark red, opening of dorsal gland indicated by a blackish spot. Eyes dark reddish, antennæ pale yellowish, slightly grayish distally, terminal segment wholly reddish. Legs pale yellowish washed with grayish, much as in preceding stages; tarsi slightly dusky. Wing-pads just becoming apparent on meso- and meta-thorax.

Stage IV (Fig. 4): Length, 2.2 mm.; greatest width, across wing-pads, 1.42 mm., giving body a very broad appearance. Head and thorax as in preceding stage. First three abdominal segments and a transverse spot on fourth segment on either side of the gland blackish. Rest of abdomen red. Eyes dark reddish. Antennæ as in preceding stage. Legs pale yellowish, terminal segment of tarsi suffused with dusky; hind femora with two rather faint dusky rings near the tip. Under side of insect dark red; basal segment and extreme tip of beak blackish, remainder slightly tinged with pinkish. Wing-pads extend back to third abdominal segment.

Stage V (Fig. 5): Length, 2.8 mm.; greatest width, across wing-pads, 1.8 mm. Head and thorax, including wing-pads, now shining black, except for the narrow, red, median line which meets a procurved line of the same color on the head, as in the preceding stages. Abdomen shining black, hind border of each segment broadly red. Eyes very dark reddish. First three segments of the antennæ, yellowish, suffused with dusky, especially at center of first segment and at tip and base of segments two and three; fourth segment red. Legs yellowish, the second segment of the tarsi, tip of tibiæ, a band on tibiæ, and two more or less distinct bands on femora, dusky. Wing-pads extend back almost to sixth abdominal segment.

Adult (Fig. 6)—*Female*: Length, about 5.5 mm.; greatest width, about 2.5 mm. Dark red with a broad black stripe extending from hind border of pronotum, but not including scutellum, to tip of wings. A small whitish spot on membrane where it meets tip of cuneus. Dorsum bare, finely punctate. Head shining, not punctate. Front of head with a black median stripe starting about even with antennal tubercles and running a short distance onto first segment of beak. Eyes black. Antennæ shining black, clothed with fine, short, golden hairs. Legs, except coxæ and trochanters, shining black; fore and middle femora with a brownish



LEONARD—*Tropidosteptes cardinalis*.

yellow band near tip; base of tarsi slightly lighter; coxæ and trochanters yellowish or pinkish. Thorax beneath pinkish; venter reddish. First segment of beak brownish yellow, remainder blackish.

Male, about 5 mm. in length; similar to female.

PROTHETELY IN THE ELATERID GENUS *MELANOTUS*.

BY J. A. HYSLOP,

Bureau of Entomology, Washington, D. C.

Two papers on the abnormal phenomenon termed prothetely appeared last year in *PSYCHE*. In one of these papers¹ six bibliographical references were given on the subject and in the other paper² a seventh was added to this list. Dr. Adam Böving brought another interesting paper on the same subject, published in 1914,³ to my attention, and in looking over the literature two more papers were located.^{4,5}

The present paper deals with a very striking case observed at the United States Entomological Laboratory in Hagerstown. The subject was *Melanotus communis* Gyll.

On May 18, 1915, Mr. J. J. Davis sent the writer fifty-eight living larvæ of *Melanotus communis* Gyll., collected near Cincinnati, Ohio, with the note that they were found damaging corn on river bottom land. These larvæ were shipped in salve boxes filled with moist Sphagnum moss, and when received were isolated in similar boxes partly filled with moist earth and fed seed corn. The boxes were all placed in galvanized iron trays and the contents examined, cast skins removed, soil moistened when necessary, and new food supplied, weekly.⁶

Strickland⁷ suggested as an explanation of the phenomenon of prothetely that it "is usually caused by keeping the larvæ at an abnormally high temperature." The temperature to which this particular larva was subjected could not have varied to any appre-

¹ Williams, F. X., 1914, *PSYCHE*, Vol. XXI, p. 126.

² Barber, H. S., 1914, *PSYCHE*, Vol. XXI, p. 190.

³ Kemner, A., 1914, *Ent. Tidsk.* (Swedish), Vol. XXV, pt. 1-2, pp. 87-95.

⁴ Tragardh, L., 1912, *Fauna och Flora*, pp. 245-255.

⁵ Peyerimhoff, P. de, 1911, *Bull. Soc. Ent. France*, p. 327.

⁶ The writer was ably assisted in this work by Messrs. H. L. Parker and W. E. Pennington of the Station staff.

⁷ Strickland, E. H., 1911, *Biol. Bull.*, Vol. 21, pp. 313-327.

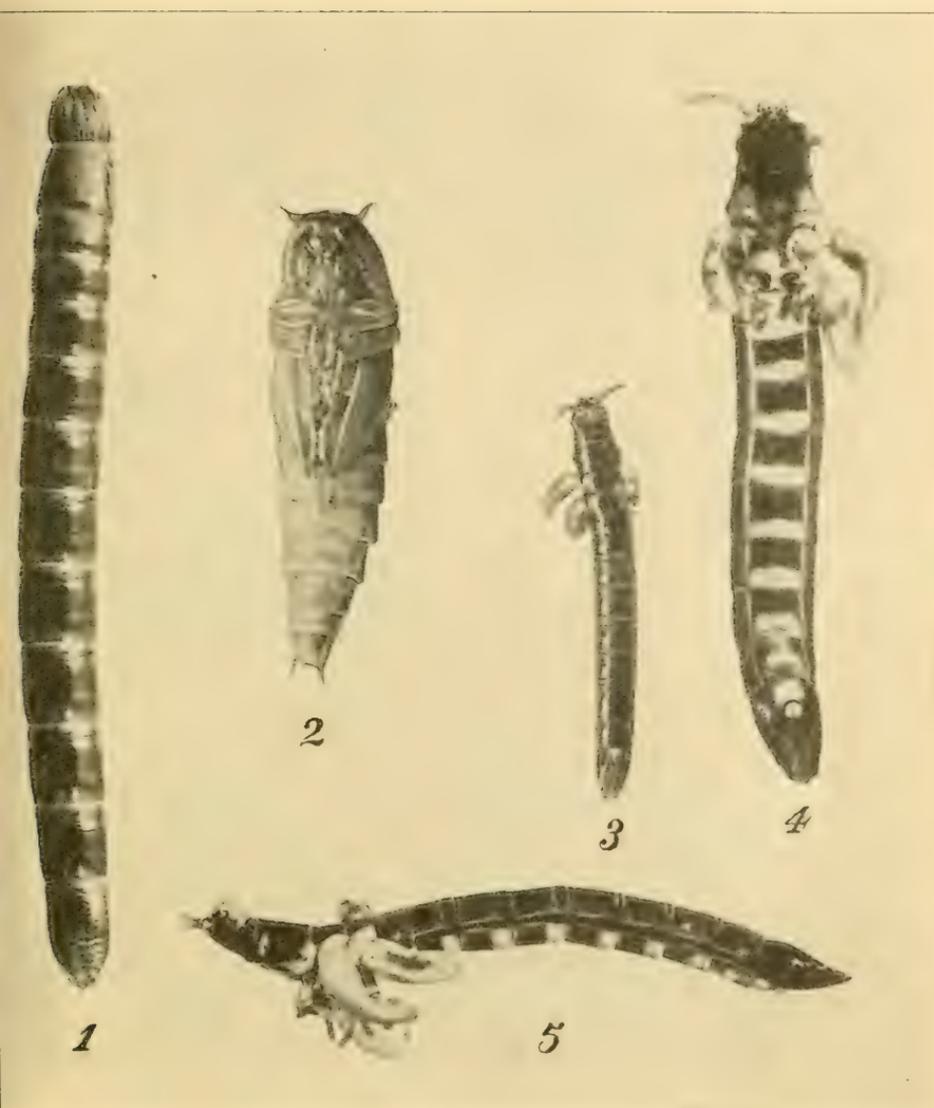
cial extent from that of the fifty-seven other larvæ of the same series in the same trays. Up to the date of writing, September 23, 1915, three adults have emerged from this material, all of which appear to be perfectly normal, only seven of the larvæ have died and the remainder are moulting normally and feeding freely. In this same type of cage and in the same insectary, we have been carrying on experiments with about 2,000 Elaterid larvæ from all parts of the United States and the West Indies.

However, this is the only instance of prothetely that we have ever observed. The soil with which these cages are filled is all

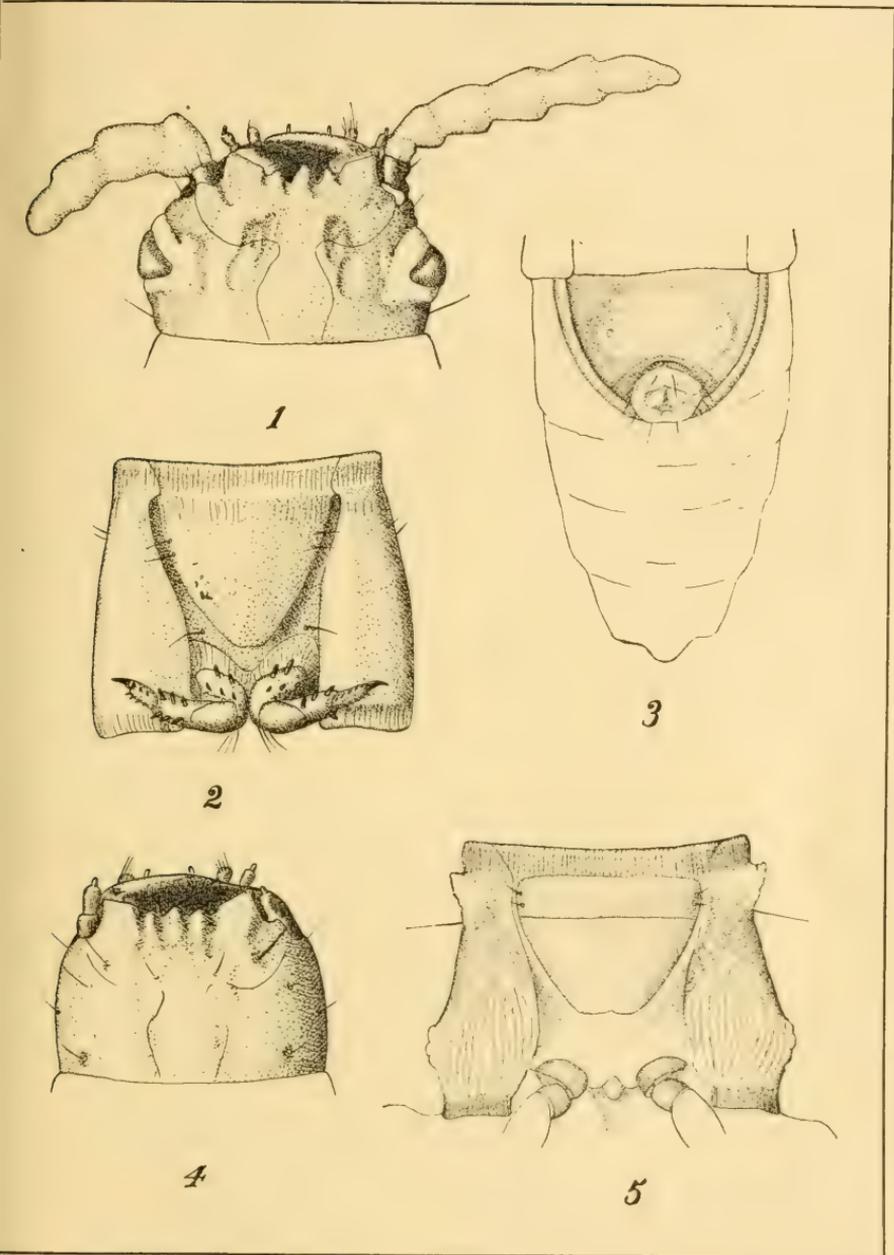


Fig. 1. Plotted curve of *Melanotus* molting periods. Cross indicates point at which prothetelous larva appeared. The dotted lines connect actual record points.

taken from one potting bench. The amount and kind of food, I believe, can be eliminated as a factor in this particular instance as our larvæ are always supplied with an excess of food. The lids of the boxes, which we use as cages, fit with varying degrees of tightness and the rate of evaporation is, therefore, very inconstant in any given series of cages. On account of this, the cages are only watered when, in the judgment of the examiner, it is necessary. This introduces a large personal factor and could easily result in a cage becoming much more dry or moist than the other cages of the same series. As this seems to be the only variable, I am inclined



1 and prothetelous larva and normal pupa of *Melanotus communis*. Fig. 1, dorsum of normal pupa. Fig. 2, ventron of pupa. Fig. 3, dorsum of prothetelous larva. Fig. 4, ventron of prothetelous larva. Fig. 5, lateral aspect of prothetelous larva.



Me'anothus communis normal and prothelous larva. Fig. 1, dorsum of the head of prothelous larva. Fig. 2, prosternum of normal larva. Fig. 3, 9th and 10th abdominal segments of prothelous larva. Fig. 4, dorsum of head of normal larva. Fig. 5, prosternum of prothelous larva.

to believe that an abnormal humidity factor at or shortly before the time of pupation is the causative stimulus of this phenomenon.

The accompanying plotted curve (Fig. 1) indicates the period in the activity of the series, when the individual in question transformed to the abnormality herein described. The cages had all been examined on September 3. In examining the cages September 8, the prothetelous larva was discovered. This was a period of minimum moulting immediately preceding a very abrupt and extensive moulting period. The moulted skin of this larva was perfectly normal in every respect and, by careful comparative measurements, was found to be very nearly identical with the last larval skin; that is, the skin shed when a pupa is formed under normal conditions. The table (Fig. 2) shows the measure-

	Penultimate Instar.	Ultimate Instar.	Larval Skin of Prothetelous Larva.
Length of dorsum of 9th abdominal segment . .	2.782	3.103	3.156
Width of dorsum of 9th abdominal segment..	1.979	2.193	2.193
Length of dorsum of 1st thoracic segment. . .	1.498	1.819	1.712

Fig. 2. Table showing comparative measurements of larval skins of penultimate instar, ultimate instar and prothetelous larvæ.

ments of this cast skin as compared with a larval skin from the ultimate and penultimate instar.

This prothetelous larva is (Plate II, Figs. 3, 4, and 5) predominantly larviform. The abdomen is typically so and normally chitinized, with the exception of a pair of membranous papilliform areas on the posterior margin of each sternite except the ninth (Plate III, Fig. 3). The thoracic sterna are membranous except a triangular area on the prosternum (Plate III, Fig. 5), which is normally chitinized. The membranous areas are decidedly protuberant. The coxæ and trochanters are larviform with typical pupiform femora, tibiæ and tarsi. The ventral part of the protergite is membranous and very much expanded posteriorly. A pair of anterior and a pair of posterior papillæ are borne on the spiracular

area of the protergum (Plate III, Fig. 5). The mouthparts are all larviform. The basal joint of the antennæ is larviform and chitinized; the remainder of the antennæ is membranous and typically pupiform. The eyes are typically pupiform with a membranous area surrounding them, which connects the eye with the larviform cheeks. The wing pads are well developed, but the elytral pads do not bear the normal striation found in typical pupa. The base of the wing pads is surrounded by a membranous area and the pads seem to arise in the spiracular area. The specimen measures 23 mm. in length, the dorsum of the ninth abdominal segment measures 2.996 mm. in length, and 2.14 mm. in width. The first thoracic tergite is 1.498 mm. long.

This particular case of prothetely seems to be a carrying forward of larval characters into the pupal stage rather than a carrying back of pupal characters into the larval stages. Such being the case, it is possible and even probable that by the successful emergence of such a pupa some larval characters would be carried into the adult stage, and if such characters were of some material advantage to their possessors natural selection might here find variations which could lead to the production of such species with larviform adults as do exist in certain other Coleopterous genera.

TWO NEW THYSANOPTERA FROM WEST AFRICA,
WITH A NOTE ON THE SYNONYMY OF THE
PHLÆOTHIRIPIDÆ.

By J. DOUGLAS HOOD,

United States Biological Survey, Washington, D. C.

The new species described below were sent to me in October, 1915, from Ossidinge, Kamerun, by Lieut. A. W. Jobbins-Pomeroy, of the Nigeria Regiment, West African Frontier Force. Partly in recognition of his devotion to entomology under such adverse circumstances, and partly as a mark of personal regard, I have taken great pleasure in naming one of the species in his honor.

Suborder TUBULIFERA Haliday.

Family PHLÆOTHIRIPIDÆ Uzel.¹

1836. *Tubulifera* ("Stirps et Fam.") Haliday, Ent. Mag., Vol. III, p. 441.
 1895. *Phlæothripidæ* Uzel, Monogr. Ordn. Thys., p. 223.
 1896. *Tubuliferidæ* Beach, Proc. Iowa Acad. Sci., Vol. III, p. 214.
 1912. *Ecacanthothripidæ* Bagnall, Ann. Mag. Nat. Hist., Ser. 8, Vol. X, p. 222.
 1915. *Eupathithripidæ* Bagnall, Journ. Linn. Soc., Zool., Vol. XXXII, No. 220,
 p. 200.

In explanation of the above synonymy, it may be said that on the accompanying plate are given several detail drawings, which show the close similarity obtaining between *Phlæothrips*, *Acanthothrips*, and *Pselaphothrips*, and, consequently, the relationship of all with *Eupathithrips* and *Sedulothrips*. They are discussed below under the species headings.

Acanthothrips nodicornis Reuter, Fig. 7. (Drawn from a specimen ex collection O. M. Reuter, from Helsingfors, Finland.) It will be noted that the eyes of this species differ in no essential features from those of *Pselaphothrips* (Fig. 2); they are as finely and closely faceted, fully as prominent, very nearly as contiguous anteriorly and show almost as great a tendency to surround the ocelli; while on the ventral surface, it may be added, they are just as well separated.

Acanthothrips albivittatus Hood, Fig. 6. The antennæ of this species are very similar to those of *Pselaphothrips*, in color, form, and chaetotaxy. With but few exceptions, every bristle and every sense cone finds its analogue in *Pselaphothrips* (Fig. 3). Furthermore, the antennæ are inserted more on the ventral than on the dorsal surface of the head; and the latter, while not crested dorsally, is nevertheless slightly elevated along the median line.

Acanthothrips magnafemoralis Hinds, Fig. 5. The third antennal segment is in this more slender than in the other species of the genus, and approaches the *Pselaphothrips-Eupathithrips-Sedulothrips* type very closely.

Phlæothrips coriaceus Haliday, Fig. 4. (Drawn from a specimen ex collection R. S. Bagnall, from Balsall Common, Warwickshire,

¹ The names *Æolothripidæ*, *Thripidæ*, and *Phlæothripidæ* were proposed by Uzel in 1895, and should be credited to him, instead of to Haliday. The latter proposed three family names—*Coleoptrata*, *Stenoptera*, and *Tubulifera*,—the last being employed also as a subordinal term. According to modern ideas, Haliday's names are invalid, because not formed from the oldest genus of the family by the addition of -idæ to the root.

England.) Here, again, the same general type of chaetotaxy prevails, the number and arrangement of sense cones and bristles being almost identical.

This disposes of all the characters used in the separation from the Phlœothripidæ of the genera allied to *Eupathithrips*, with the exception of that of the long mouth cone. This character, however, frequently varies in closely allied species of the same genus; and in the genera grouping themselves about *Liothrips*, the mouth cone is sometimes as elongate as here.

These are, in detail, the reasons for the sinking of Bagnall's recently diagnosed family Eupathithripidæ as a synonym of the Phlœothripidæ. It will be seen that the twelve or thirteen differences given by him for the separation of this group are broken down in a most interesting manner by the new genus described below as *Pselaphothrips*, which is in nearly all respects intermediate between *Eupathithrips* Bagnall and *Acanthothrips* Uzel¹; and the last genus is very closely allied indeed to *Phlœothrips* Haliday, the type of its family. *Eupathithrips* and its allies, then, for the present, at least, are best considered part of a moderately large complex represented by *Phlœothrips*, *Ecacanthothrips* and *Sedulothrips*. The last two are the extremes of two different lines of specialization; and to separate either from the parent stem with the rank of family would, I believe, be a step backward, and one away from our ideal of a true phylogenetic classification.

Genus *Podothrips* Hood.

1913. *Podothrips* Hood, Ins. Insc. Menstr., Vol. I, p. 67.

Body depressed, glabrous. Head longer than wide, much narrowed toward base, widest behind eyes, about equal in length to prothorax, evenly declivous in front; cheeks nearly smooth, without spiniferous tubercles. Ocelli placed far forward, the median one between basal segments of antennæ; posterior ocelli widely separated. Antennæ eight-segmented, the last two segments not compactly united. Mouth cone blunt, much shorter than its width at base. Prothorax about as long as head, about twice as wide at base as at apex, lobed behind, with median dorsal thickening, lateral outline concave, only the two pairs of bristles at posterior angles well developed. Legs of moderate length, stout; fore femur nearly as long and broad as head; fore tibia with a stout tooth at tip in both sexes; fore tarsus armed with a

¹Karny's *Acanthothrips grandis* described from Argentina (Zoöl. Ann., Vol. IV, p. 324, 1912), is almost certainly a *Eupathithrips*, though a more extensive description or an examination of the type specimen will be necessary before this point can be determined. There is nothing in the description to exclude the species from *Eupathithrips silvestrii* (Buffa).

long hooked tooth. Wings slender, narrowed at middle; fringe sparse and weak, on fore wing not double along posterior margin near apex.

Type: Podothrips semiflavus Hood.

The new African species described below has made necessary two or three slight changes in the original description of the genus. The two known species are strictly congeneric, though differing abruptly in color and certain details of structure.

KEY TO SPECIES.

- a. Yellow, with head, sides of metathorax, and last three abdominal segments abruptly dark brown; cheeks rounded behind eyes, not toothed
Podothrips semiflavus Hood.
- aa. Dark blackish brown, with antennal segments 3-7, the fore tibiæ, all tarsi, and first abdominal segment yellow; cheeks with a distinct, lateral, acute tooth behind eyes. *Podothrips denticeps* Hood.

Podothrips denticeps sp. nov.

Female: Length about 1.8 mm. Surface shining. Color dark blackish brown, with antennal segments 3-7, fore tibiæ, all tarsi, and first abdominal segment, pale lemon yellow; wings pale yellowish, darker toward base.

Head 1.35 times as long as wide, with a distinct, lateral, acute, and more or less forwardly directed tooth just behind eye, thence arcuately converging to near base, where there is a slight neck-like constriction; vertex rounded and evenly declivous; dorsal surface without sculpture; cheeks very slightly roughened, sparsely and briefly spinose; postocular bristles slightly knobbed, two-thirds as long as eyes, situated close to lateral margins of head. Eyes one-third as long as head and three-fourths as wide as their interval, not protruding, ventral extent very slightly less than dorsal. Ocelli anterior in position, the posterior pair near the anterior angle of eyes, the median ocellus between basal segments of antennæ. Antennæ nearly 1.5 times as long as head, moderately slender; segment 1 slightly broader at base than ventral length; 2 narrower than 1, nearly twice as long as wide; 3 elongate-oval, pedicellate, with a slight notch on inner surface at basal third, nearly twice as long as wide; 4-6 elongate-oval, subequal in length and successively decreasing in width, briefly pedicellate, 4 slightly broader than 2 and 3; 7 slender, very slightly longer than 6, about 2.4 times as long as wide; 8 fusiform-truncate, very slender and nearly 0.9 as long as 7, about four times as long as greatest width; sense cones and bristles unusually short and weak; segments 1, 2, and 8 nearly concolorous with head, 2 yellow in outer apical half; intermediate segments clear lemon yellow, except 7, which is lightly washed with brown.

Prothorax about five-sixths as long as head and (inclusive of coxæ) twice as wide at base as at apex and 0.7 as long as wide; lateral outline concave; surface smooth; median dorsal line distinctly chitinized; all usual bristles present, the anterior marginal pair visible only under highest magnifications; the anterior angular and mid-lateral pairs only slightly larger; the two pairs near the posterior angles and the coxal pair knobbed, nearly as long as postoculars. Pterothorax about as wide as

base of prothorax, sides nearly straight and parallel. Legs moderately stout; fore femur nearly as long as head and about twice as long as greatest width; fore tibia stout, scarcely as long as width of femur, with a stout, prominent tooth on inner side of apex, just basal to which is a setose tubercle; fore tarsus with a long, strong, hooked tooth about two-thirds its length, the inner surface of tooth with a setose tubercle at apical two-fifths. Wings long, slender, weak, slightly suffused with yellowish (particularly toward base), without double subapical fringe.

Abdomen slender, slightly wider than pterothorax. Tube nearly 0.6 as long as head, basal fourth slightly swollen, nearly 2.5 times as wide as apex; terminal bristles brown, about 1.5 times as long as tube; all other abdominal bristles pale, in great part knobbed.

Measurements of holotype (female): Length 1.81 mm.; head, length 0.252 mm., width 0.186 mm.; prothorax, length 0.205 mm., width (inclusive of coxæ) 0.300 mm.; pterothorax, width 0.288 mm.; abdomen, width 0.307 mm.; tube, length 0.144 mm., width at base 0.074 mm., at apex 0.030 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	39	52	51	48	46	47	48	42
Width (μ)	40	28	28	29	27	25	20	11
Total length, 0.373 mm.								

Described from a unique female collected by Lieut. A. W. Jobbins-Pomeroy, on grass, near Ossidinge, Kamerun, in October, 1915.

Genus *Pselaphothrips* nov.

(ψηλαφσω, to feel¹; Θριψ, a wood worm.)

Body not depressed. Head much less than twice as long as wide, and more than twice as long as prothorax, compressed and subcarinate above; cheeks nearly parallel, not at all swollen toward base, and with a few small spiniferous tubercles; vertex sulcate and nearly overhanging in front of anterior ocellus. Eyes moderate in size, finely and closely faceted, scarcely prominent or protruding, well separated anteriorly, slightly reniform, exhibiting little tendency to surround the ocelli. Ocelli anterior, not set on an elevation, the median one directed nearly forward, the posterior pair approximate. Antennæ eight-segmented, nearly twice as long as head, scarcely "set on ventral surface of head," moderately slender, intermediate segments stout (that is, for the group; in the genotype scarcely three times as long as wide), clavate, distally abruptly narrowed; sense cones long and slender. Mouth cone very long and slender, attaining base of mesosternum. Prothorax broadly arcuate (scarcely emarginate) in front, its median dorsal length more than one-third the width across coxæ. Legs moderately slender; fore femora not swollen, with an acute tooth on inner surface near apex; fore tarsi armed. Wings slender, of equal width throughout; fore pair with a subbasal dark band and many accessory hairs on posterior margin.

Type: Pselaphothrips pomeroyi sp. nov.

¹ In reference to the apparently very sensitive antennæ,—although the function of the conidia is presumably olfactory instead of tactile.

This genus is closely allied to *Acanthothrips*, *Eupathithrips*, and *Sedulothrips*, but differs from the last two in a number of characters which Bagnall considers of family importance. From *Acanthothrips* it may be separated by the long mouth cone and the compressed and subcarinate dorsum of the head. It is the only member of the *Eupathithrips* group occurring outside the Neotropical region.

Pselaphothrips pomeroyi sp. nov.

Female: Length about 3 mm. Color dark blackish brown, with purple hypodermal pigmentation in head, thorax, and abdomen; antennæ and legs concolorous with body; tube paler in apical half.

Head 1.44 times as long as wide, compressed and subcarinate above; cheeks nearly parallel, not at all swollen toward base, anteriorly roundly converging to eyes, set with a few small spiniferous tubercles; vertex sulcate and nearly overhanging in front of anterior ocellus; postocular bristles short, scarcely one-fourth as long as eyes, dilated at tip. Eyes very finely and closely faceted, not at all protruding, nearly 0.4 as long as head, well separated anteriorly, slightly reniform, showing little tendency to surround the ocelli. Ocelli anterior, not set on an elevation, the median one directed nearly forward and distinctly removed from the approximate posterior pair. Antennæ about 1.9 times as long as head, moderately slender, uniform dark blackish brown in color; segments 3-6 clavate, abruptly narrowed apically, urn- or vase-shaped, 3-5 about 2.7 and 6 about 2.4, times as long as wide; 7 fusiform-truncate, closely united to 8, which is conical; 4 slightly longer than 3; sense cones long, slender, broad at base, those on segment 3 more than half the length of segment; formula: 3, 1-2; 4, 2-2⁺¹; 5, 1-1⁺¹; 6, 1-1⁺¹; 7 with one on dorsum near apex. Mouth cone and palpi very long, the former acute and attaining metasternum.

Prothorax broadly arcuate (scarcely emarginate) in front, its median dorsal length about 0.43 of that of head and 0.37 of the width across coxæ; pronotum nearly smooth, with faint anastomosing lines in posterior third and at sides, and with rather conspicuous short pubescence; median line slightly chitinized; all usual bristles present, and with an additional accessory pair arising mediad and cephalad to the base of the outer posterior pair, all short, dilated at tip, equal to or longer than postoculars, the outer pair at posterior angles longest. Pterothorax about equal in width to prothorax, sides nearly straight, slightly converging posteriorly. Wings long, closely fringed, fore pair with about 35 accessory hairs on posterior margin, and of equal width throughout; fore wings with the scale dark brown and in costal half reticulated similarly to the mesonotum; a dark brown, stippled, granulate, cross band occupies the second sixth, and a lighter brown cloud the apical two-fifths of fore wing, these connected and at least partially traversed by the dark median vein, and in addition connected along both margins of wing by a brown line; third basal spine of fore wing, dark brown, long, slender, and slightly knobbed at tip, set in a small, isolated, stippled, brown spot; first and second basal spines pale, short, stout, and rather strongly dilated at tip, surrounded by an obscurely darkened and sparsely stippled area. Legs moderately slender; fore femora not swollen, with an acute

tooth on inner surface near apex, and with numerous minute spines, stouter on inner surface; fore tibiæ with slender spines; fore tarsi with a blunt tooth on inner surface.

Abdomen slender, about equal in width to the pterothorax. Tube about three-fourths as long as head and a little less than half as wide at apex as at base, paler in apical half. Marginal abdominal bristles (excepting those on segment 9, which are pointed and about equal in length to tube) moderately short, blunt, yellowish; terminal bristles slightly longer than tube, brown, pointed.

Measurements of holotype: Length 2.93 mm.; head, length 0.468 mm., width 0.324 mm.; prothorax, length (along median dorsal line) 0.204 mm., width (inclusive of coxæ) 0.558 mm.; pterothorax, width 0.552 mm.; abdomen, width 0.552 mm.; tube, length 0.348 mm., width at base 0.122 mm., at apex, 0.066 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	78	87	165	174	154	94	78	47
Width (μ)	49	41	60	63	57	39	33	18
Total length, 0.877 mm.								

Described from one female taken in flight, by Lieut. A. W. Jobbins-Pomeroy, at Ossidinge, Kamerun, in October, 1915.

EXPLANATION OF PLATE IV.

(Minute pubescence not shown.)

Fig. 1. *Podothrips denticeps* sp. nov., head and prothorax, female, holotype.

Fig. 2. *Pselaphothrips pomeroyi* gen. et sp. nov., head and prothorax, female, holotype.

Fig. 3. *Pselaphothrips pomeroyi*, segments 3 and 4 of right antenna, female, holotype.

Fig. 4. *Phlæothrips coriaceus* Haliday, segments 3 and 4 of right antenna, female.

Fig. 5. *Acanthothrips albivittatus* Hood, segment 3 of right antenna, female.

Fig. 6. *Acanthothrips magnafemoralis* Hinds, segment 3 of right antenna, female.

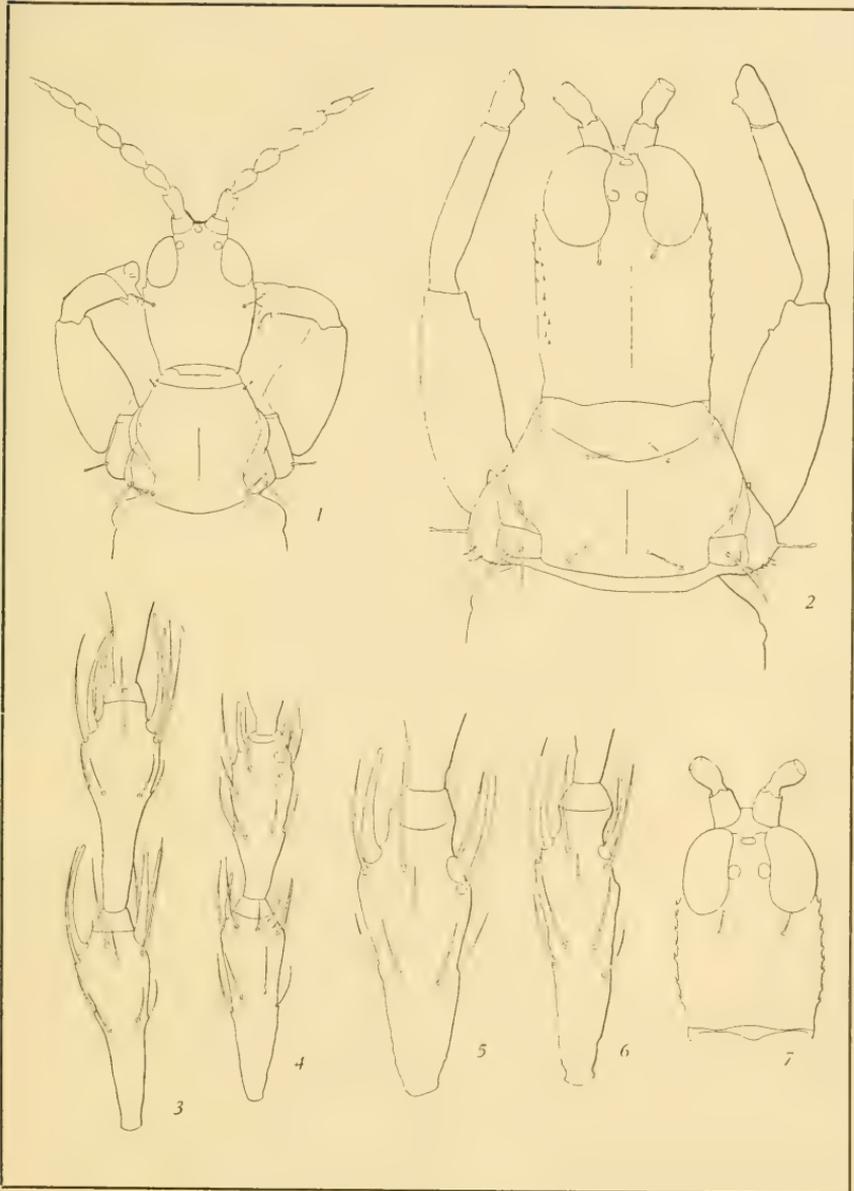
Fig. 7. *Acanthothrips nodicornis* Reuter, head, female.

A PRELIMINARY LIST OF THE ODONATA OF CONCORD, MASS.

BY R. HEBER HOWE, JR.,

Concord, Mass.

Two years ago I interested one of my students in making a collection of the local dragon flies of Concord for the Thoreau Museum of Natural History of the Middlesex School. This stu-



HOOD—New *Thysanoptera*.

dent, Mr. E. L. Peirson, Jr., collected on occasional afternoons from April until early June, and his material was determined through the kindness of Dr. P. P. Calvert. Mr. Peirson published in the Proceeding of this Museum (Vol. I, p. 41, 1915) a list of twelve species, a few of which had been collected preceding his work and which had been determined by Mr. C. W. Johnson. Mr. Peirson published this list largely because he had secured the second capture of *Williamsonia lintneri* in New England (see also Ent. News, 26, p. 238, 1915), a species never before recorded from these states.

During the past summer, because of continued residence in Concord, I have had the opportunity to collect almost daily, and have visited practically all the ponds and the river valleys, with the result that I am now able to publish a considerable list of species. No doubt further collecting in April and May will add many species in the Gomphinae. Throughout the summer I had the help of my daughter, Miss Susan A. Howe, and in my determinations I have had the continual aid of Mr. Edward B. Williamson, and also occasionally that of Mr. Richard A. Muttkowski and Dr. E. M. Walker. To these gentlemen I extend my sincere thanks.

In the present list I have made my comparisons of distribution with Dr. Calvert's List of the *Odonata* of New England (Occas. Papers Bost. Soc. Nat. Hist., 7, 1915).

ZYGOPTERA.

AGRIONIDÆ.

CALOPTERYGINÆ.

1. *Calopteryx aquabilis* Say. Collected by Peirson. ♂. May.
2. *C. maculata* (Beauvois) Burm. Common. ♂ and ♀s. May to August 19.

LESTINÆ.

3. *Lestes eurinus* Say. Common. ♂ and ♀s. July.
4. *L. congener* Hagen. Not uncommon. ♂ and ♀s. September 5 to 30. New to Massachusetts.
5. *L. disjunctus* Selys. Three specimens. ♂. September 5 to 18. New to Massachusetts.
6. *L. unguiculatus* Hagen. Very common. ♂ and ♀s. August 15 to September 5. New to Middlesex County.
7. *L. forcipatus* Rambur. Rather uncommon. ♂s. August 31 to September 5.
8. *L. vigilax* Hagen. Rather uncommon. ♂ and ♀s. August 15 to September 5. New to Middlesex County.
9. *L. rectangularis* Say. Uncommon. ♂ and ♀s. August 23 to September 15.

AGRIONINÆ.

10. *Argia violacea* (Hagen) Selys. Common. ♂ and ♀ s. May to September 10. New to Middlesex County.
11. *Enallagma laterale* Morse. Rare. ♂'s. May to July. Recorded also by Peirson.
12. *E. calverti* Morse. Recorded by Peirson.
13. *E. ebrium* (Hagen) Selys. Common. ♂ and ♀ s. August 1 to 15. New to Middlesex County.
14. *E. civile* (Hagen) Selys. Common. ♂ and ♀ s. May to September 5.
15. (?) *E. minusculum* Morse. One specimen. ♂.
16. *E. aspersum* (Hagen) Selys. One specimen. ♂. August to September 5.
17. *E. triviatum* Selys. Rather rare. ♂'s. August 1.
18. *E. geminatum* Kellicott. A few specimens. ♂ and ♀ s. August 1 to September 10. New to Massachusetts.
19. *E. signatum* (Hagen) Selys. Common. ♂'s. July to September 5. New to Middlesex County.
20. *E. pollutum* (Hagen) Selys. A few specimens. ♂. August 4. This species has never been recorded south of Maine, and is, therefore, new to Massachusetts.
21. *Ischnura verticalis* (Say) Selys. Uncommon. ♂ and ♀ s. August 23 to September 5.

ANISOPTERA.

ÆSHNIDÆ.

GOMPHINÆ.

22. *Gomphus exilis* Selys. Recorded by Peirson. ♀.
23. *G. borealis* Needham. One specimen. ♀. May 1915. New to Massachusetts.
24. *G. spiniceps* (Walsh) Selys. Recorded by Peirson.
25. *G. spicatus* Hagen. Common. ♂ and ♀ s. May.
26. *Dromogomphus spinosus* Selys. Rather common. ♂'s. July. New to Middlesex County.
27. *Anax junius* (Drury) Selys. Common. ♂ and ♀ s. August to September 19.
28. *Æschna clepsydra* Say. Two specimens. ♂. September 10 to September 30.
29. *Æschna constricta* Say. Common. ♂ and ♀ s. August to September. New to Middlesex County.
30. *A. umbrosa* Walker. Four specimens. ♀. May to October 17. New to New England.
31. *A. canadensis* Walker. One specimen. ♂. September 5. New to New England.
32. *Epiæschna heros* (Fabricius) Hagen. Recorded by Peirson. ♀. May. New to Middlesex County.
33. *Basiæschna janata* (Say) Selys. Not uncommon. ♂ and ♀ s. May. Recorded also by Peirson.
34. *Gomphæschna fuscillata* (Say) Selys. Recorded by Peirson. ♀. May. New to Middlesex County.

LIBELLULIDÆ.

CORDULINÆ.

35. *Didymops transversa* (Say) Hagen. Common. ♂s. May.
 36. *Tetragoneuria cynosura* (Say) Selys. Recorded by Peirson. May.
 37. *Williamsonia linteri* Hagen=*Cordulia linteri* Hagen Recorded by Peirson.
 May. New to New England.

LIBELLULINÆ.

38. *Libellula cyanea* Fabricius. Rather rare. ♂ and ♀s. August.
 39. *L. incesta* Hagen. Abundant. ♂ and ♀s. July to September 10.
 40. *L. exusta* Say. Rare. ♀. May to July. Recorded by Peirson.
 41. *L. luctuosa* Burm. Common. ♂ and ♀s. July to August 15. New to New
 England.
 42. *L. pulchella* Drury. Common. ♂s. August 18 to September 8.
 43. *Plathemis lydia* (Drury) Hagen. Common. ♂s. July to September 3.
 44. *Sympetrum rubicundulum* (Say) Kirby. Abundant. ♂ and ♀s. August 7
 to September 30.
 45. *S. semicinctum* (Say) Kirby. Rare. ♂ and ♀s. August 25 to September 18.
 New to Middlesex County.
 46. *S. vicinum* (Hagen) Kirby. Common. ♂ and ♀s. August 15 to November
 7.
 47. *S. costiferum* (Hagen) Kirby. Rare. ♂ and ♀s. September 5 to 18. New
 to Middlesex County.
 48. *Celithemis elisa* (Hagen) Walsh. Recorded from Concord in Dr. Calvert's
 New England list.
 49. *C. eponina* (Drury) Hagen. Common. ♂s. July to August.
 50. *Perithemis domitia tenera* (Say). Very common. ♂ and ♀s. July to August
 3.
 51. *Erythemis simplicicollis* (Say). Not uncommon. ♂ and ♀s. July to August
 23.
 52. *Pachydiplax longipennis* (Burm.) Brauer. One specimen. ♂. August.

SUMMARY.

Number of species formerly known from New England.....	140
Number added.....	4
Number of species formerly known from Massachusetts.....	101
Number added.....	9
Number of species formerly known from Middlesex County.....	44
Number added.....	20
Number now known from Middlesex County.....	64
Number here listed.....	52

ELATERIDÆ AND THROSCIDÆ OF THE STANFORD UNIVERSITY EXPEDITION OF 1911 TO BRAZIL.

BY J. A. HYSLOP,

Bureau of Entomology, Washington, D. C.

Through the kindness of Dr. W. M. Mann, of the Bussey Institution, Harvard University, I have been accorded the great pleasure of examining the *Elateridæ* and the single Throscid collected on the Stanford expedition of 1911 to Brazil.

The collection is small and, contrary to most tropical collections, contains excellent series of several species. It contains three new species, two in the genus *Monocrepidius* and one which I tentatively place in the genus *Drasterius*. The types of these species have been deposited in the Museum of Comparative Zoölogy at Harvard University. The Madeira River collections are remarkably interesting as the fauna of this region is bound to throw light on the relationship between the Andean and Amazonian basin faunæ, and thus to the relationship between the South and Central American faunas. Following is a list of the specimens collected. The *Elateridæ* were all collected by W. M. Mann, Fred Baker and Harold Heath.

THROSCIDÆ.

*Drapetes plagiatu*s (Boh.) Gerst.

Abuná, Rio Madeira, Brazil. (Mann & Baker).....1 specimen

Previously recorded from several parts of Central and South America, and Boheman has recorded the species from San Francisco, Cal.

ELATERIDÆ.

Chalcolepidius candezei Dohrn.

forma typica

Abuná, Rio Madeira, Brazil (Mann & Baker).....2 ♀ specimens

Madeira-Mamoré R. R. Co. Camp 39.....2 ♀ specimens

var. a. elytra as in *forma typica*, vestiture of pronotum and ventron green.

Porto Velho, Rio Madeira, Brazil (Mann & Baker).....1 ♀ specimen

var. b. vestiture of elytral striæ ferruginous yellow, pronotum and ventral vestiture green.

Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker)

7 ♀ specimens

- Madeira-Mamoré R. R. Co. Camp 35, Rio Madeira, Brazil (Mann & Baker)
1 ♀ specimen
- Madeira-Mamoré R. R. Co. Camp 41, Rio Madeira, Brazil (Mann & Baker)
2 ♀ specimens
- Madeira-Mamoré R. R. Co. Camp 43, Rio Madeira, Brazil (Mann & Baker)
1 ♀ specimen
- Chalcolepidius limbatus* Esch.
Maranguape Mountains, Ceará, Brazil (W. M. Mann) 1 ♂, 1 ♀ specimen
Independência, Parahyba, Brazil (Mann & Heath) 1 ♀ specimen
- Semiotus furcatus* (F.) Lap. var.
Abuná, Rio Madeira, Brazil (Mann & Baker) 1 specimen
- Semiotus ligneus* (Linn.) Westwood.
Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker)
1 specimen
- Semiotus suturalis* (F.) Lap.
Rio Madeira, Brazil (Mann & Baker) 1 specimen
- Ischiodontus nigrita* Cand.
Pará, Brazil (W. M. Mann) 1 specimen
- Ischiodontus ichthydius* Cand.
Manaos, Brazil (Mann & Baker) 1 specimen
Previously only recorded from Central America and Mexico.
- Ischiodontus subsericeus* Cand.
Pará, Brazil (W. M. Mann) 1 specimen
- Pyrophorus noctilucus* (Linn.) Esch.
Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker)
1 ♂, 1 ♀ specimen
Common in all parts of intertropical America.
- Pyrophorus amplicollis* Cand.
Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker)
1 ♀ specimen
- Cardiorhinus bilineatus* (Fab.) Germ.
Pará, Brazil (W. M. Mann) 1 specimen
- Cardiorhinus cuneatus* Cand.
Manaos, Brazil (Mann & Baker) 1 specimen
- Cardiorhinus castanipennis* Germ.
Manaos, Brazil (Mann & Baker) 1 specimen
- Trichophorus crassus* (Cand.) Schw.
Abuná, Rio Madeira, Brazil (Mann & Baker) 1 specimen
- Horistonotus elegans* (Sol.) Cand.
Natal Brazil (W. M. Mann) 2 specimens
- Monocrepidius brunnipectus* Cand.
Independência, Parahyba, Brazil (Mann & Baker) 1 specimen
- Monocrepidius stigmaticus* Germ.
Independência, Parahyba, Brazil (Mann & Heath) 1 specimen
- Monocrepidius maderiensis* sp. nov.
Rio Madeira, Brazil (Mann & Baker) 1 specimen

<i>Monocrepidius bakeri</i> sp. n.	
Rio Madeira, Brazil (Mann & Baker)	1 specimen
<i>Acolus testudineus</i> Champ.	
Itacoatiara, Amazonas, Brazil (Mann & Baker)	1 specimen
The only other locality known is that of the two cotypes; Paso Antonio, Guatemala, (Champ.).	
<i>Acolus biplagiatus</i> Cand.	
Independência, Parahyba, Brazil (Mann & Heath)	8 specimens
Ceará-mirim, Rio Grande do Norte, Brazil (W. M. Mann)	1 specimen
<i>Heteroderes laurentii</i> (Guer.) Cand.	
Porto Velho, Rio Madeira, Brazil (Mann & Baker)	52 specimens
Rio Madeira, Brazil (Mann & Baker)	3 specimens
Itacoatiara, Amazonas, Brazil (Mann & Baker)	1 specimen
Pará, Brazil (W. M. Mann)	1 specimen
<i>Drasterius manni</i> sp. n.	
Independência, Parahyba, Brazil (Mann & Heath)	4 specimens

The single specimen of *Semiotus furcatus* (Fab.) Lap. (Fig. 1, b) is a remarkable variety, as it is undoubtedly the intermediate between typical *furcatus* (Fig. 1, a) which inhabits eastern Amazonas, Venezuela, Guiana, etc., and *S. bilineatus* Cand. (Fig. 1, c) which is indigenous to Colombia. *S. fulvicollis* Blanch. (Fig. 1, d) is but a variety of *furcatus*, separated on the furcation of the marginal black vitta being carried to the tip of the elytron, thereby making a submarginal vitta. In typical *furcatus* the marginal vitta is furcate to beyond the middle and the thoracic vitta is narrowly fusiform. In *S. bilineatus* the vitta is completely fused and the thoracic vitta is oval, and covers more than one third of the notum. The specimen in this collection and another similar specimen in my collection, taken at Pebas, Peru, the lateral marginal vittæ are similar to those of *furcatus* but the dorsal vittæ are similar to *S. bilineatus*.

The series of specimens of *Chalcolepidius candezei* Dohrn. include two very distinct varieties and one intermediate. The typical form collected at Abuná and Camp 39 has the striae thickly beset with whitish colored scales, and the prothorax and ventral surfaces with bronze purple scales.

Var. b. collected at R. R. Camps 35, 39, 41, and 43 has the elytral interstitial spaces clothed with metallic green scales and striae beset with deep ferruginous scales, the thorax and ventron clothed with metallic green scales. Var. a. collected at Porto Velho is

intermediate between the other two. It has elytra like the *forma typica* and the rest of the vestiture similar to var. b.

Ischiodontus ichthydius Cand. is quite common in Mexico and Central America, but this is the first record I have seen of the collection of the species in continental South America. The collecting of *Acolus testudineus* Champ. from Amazonas is remarkably interesting, inasmuch as this species is unknown in literature, except for the two cotypes mentioned by Champion¹ from Guatemala.

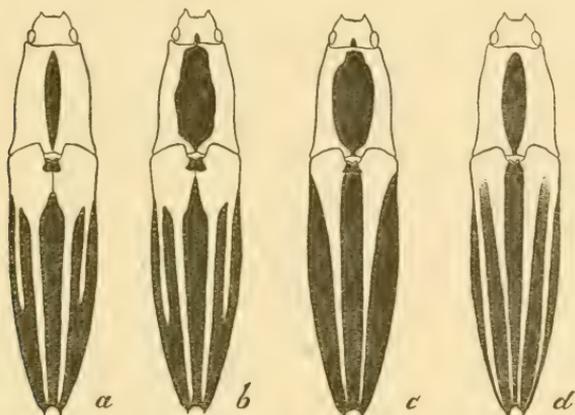


Fig. 1. Species of *Semiotus*; a. *S. furcatus*; b. *S. furcatus*, var.; c. *S. bilineatus*; d. *S. fulvicollis*.

Horistonotus elegans (Sol.) Cand. is recorded only from Chilki by Candèze.

Drasterius manni sp. nov. (Pl. V, Fig. 1a).

Piceous black, moderately densely greyish pilose, pile long. Anterior part of front, anterior angles of the prothorax, anterior angles and tip of elytra, obscurely reddish brown, under parts castaneous, legs dusky yellow, antennæ yellowish ferruginous. Front strongly umbilicate punctate, pronotum densely on sides and sparsely on disc umbilicate punctate (Pl. V, Fig. 1b). Posterior angles very short and almost rectangular, not carinate. Deep incision on posterior margin of pronotum near posterior angles. Propluræ moderately densely umbilicate-punctate, punctures elongate near the sutures (Pl. V, Fig. 1d) becoming round as they approach the side margins. Prosternum with but few scattered simple punctures almost without punctuation. Scutellum pentagonal. Posterior coxal plates (Pl. V, Fig. 1c) very abruptly widened near middle but without median tooth, outwardly incomplete. Elytra punctate striate, striae punctures elongate and about as dis-

¹ Biol. Centr. America, Vol. III, Coleop., p. 362, 1895.

tantly placed as the interstitial spaces. Interstices almost flat, not punctate, feebly rugose. Joints of tarsi (Pl. V, Fig. 1e) gradually decreasing in length from first to fourth. Ungues with basal angles strongly produced (Pl. V, Fig. 1f) Antennal joints two and three sub-equal, cylindrical, three almost as long as four. Joints four to ten elongate triangular, joint eleven suboval not strongly constricted.

Length, 3 to 4 mm.

Type locality: Independência, Parahyba, Brazil.

Type: No. 9048 deposited in Mus. Comp. Zool., Harvard University.

Paratypes: Three specimens from type locality.

Type and paratypes collected by Messrs. W. W. Mann and Harold Heath.

This species, which is named in honor of Dr. W. M. Mann, will fall near *Drasterius pullatus* Cand. in Candèze's Monograph.

***Monocrepidius madeirensis* sp. nov. (Pl. V, Fig. 2a).**

Moderately elongate, depressed, length four and two-third times width, moderately dense and finely yellow pubescent. General color reddish yellow or amber. Head concolorous with body, marked by two parenthesis-shaped infusate vittæ on vertex, eyes dark brown; pronotum with a pair of parenthesis-shaped dark brown vitta which attain the anterior margin. Elytra slightly darker than the prothorax with two brown transverse bands, one before the middle and the other halfway between this band and the apex, and a median longitudinal vitta which extends from the scutellum to the anterior transverse band. Scutellum and humeral angles yellow. Ventron brownish yellow. Legs and antennæ yellow. Front slightly convex, finely punctate, anterior margin feebly rounded, terminal joint of maxillary palpi securiform. Antennal joints two and three small, together not quite equal to four, joint three longer than two (Pl. V, Fig. 2b). Prothorax longer than broad, sides feebly rounded, convergent anteriorly from middle, quite depressed, pronotum with slightly unequal punctuation; posterior angles very slightly divergent, uncarinate, carina almost fused with lateral margin to base of posterior angles where they diverge, carina not much longer than angles. Elytra two and one-fourth times length of prothorax, almost as wide as latter, punctate striate, interstices slightly convex, not spinose at tips. Fourth tarsal joint (Pl. V, Fig. 2c) bearing a large broad lobe easily seen from above.

Length, 7 mm.

Type locality: Rio Madeira, Brazil.

Type: No. 9047 Mus. Comp. Zool. Harvard University.

Type collected by W. M. Mann and F. Baker.

This species is named from the type locality and is near *depressipennis* Cand.

***Monocrepidius bakeri* sp. nov. (Pl. V, 3a).**

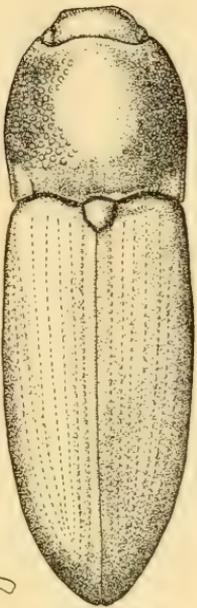
Elongate, slender, three and one-half times as long as broad, moderately convex, vestiture yellow, dense and very fine. General color infusate amber; head black, labrum black, antennæ amber, under parts of head and palpi yellow; pronotum



1b



1c



1a



1d



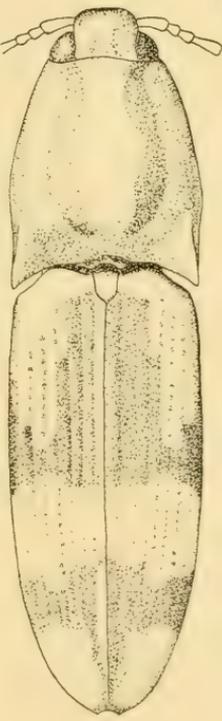
1e



3b



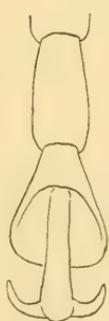
1f



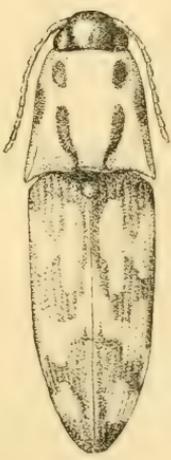
2a



2b



2c



3a

HYSLOP—New species of Elaterida.

amber with four black fascia on disc and another pair near middle of sides almost attaining the lateral margins, the anterior discal fascia do not attain the anterior margin and are bluntly oval, the posterior pair are convergent posteriorly and are produced to attain the posterior margin. Elytra amber colored with black areas disposed as follows: humeral angles and scutellum and its cavity forming an irregular transverse band across the base; elongate area on each side margin near middle with a sinuate band connecting them with the median vitta which extends backward from the scutellum; posterior third except for two lateral rounded spots. Prosternum and flanks amber, prosternal sutures black, remainder of ventron dark brown, legs except coxæ yellow. Front convex, anterior margin broadly rounded, moderately punctate. Antennæ with joints two and three subequal, together equal to four. Pronotum not tuberculate at base, moderately evenly sparsely punctate; posterior angles unicarinate, carina distinct to apex of posterior angles where it joins the lateral margin. Elytra not spinose at tip. Prosternum finely punctate, flanks coarsely punctate. Last abdominal segment similar in punctuation to preceding segments. Tarsal joint four (Pl. V, Fig. 3b) with a moderately long slender lobe, not visible from above.

Length, 5 mm.

Type locality: Rio Madeira, Brazil.

Type: No. 9046 Mus. Comp. Zoöl. Harvard University.

Type collected by W. M. Mann and F. Baker.

This species which I have named in honor of Dr. Baker is near *Monocrepidius pictus* Cand. but is easily distinguished from this species by the absence of the basal pronotal tubercle.

EXPLANATION OF PLATE V.

Fig. 1. *Drasterius manni*; a. dorsum of adult; b. pronotal sculpturing; c. posterior coxal plate; d. propleural sculpturing; e. tarsus; f. tarsal claws.

Fig. 2. *Monocrepidius madeirensis*; a. dorsum of adult; b. second, third, and fourth antennal joints; c. third, fourth, and fifth tarsal joints.

Fig. 3. *Monocrepidius bakerei*; a. dorsum of adult; b. tarsus.

A PSYLLID GALL ON JUNCUS (*LIVIA MACULIPENNIS* FITCH).¹

BY EDITH M. PATCH.

Since 1857 when Fitch described this beautiful little insect, nothing more definite in regard to its habits has been recorded than that it is found in swampy places. Thomas in 1879 said that it was "found on the sweet-flag," but there is nothing in his account which would indicate that it fed upon that plant.

¹ Papers from the Maine Agricultural Experiment Station: Entomology, No. 82.

This past summer, however, the secret of its habitation was discovered by Miss Cora H. Clarke of Boston, who made an interesting collection of *Juncus* galls near Magnolia Village, Mass., on August 17, which she shared with the writer. At this date the galls contained only unknown nymphs of a Psyllid but they were about ready to wing and the adults began to emerge in large numbers on August 20-21. These proved to be *Liria maculipennis* Fitch.

The accompanying photograph gives the enlarged abnormal growth of the galled-specimen in contrast to the normal rush, and makes a description unnecessary.

Did Fitch, nearly sixty years ago, pick a stem of rush with its monstrous tassel deserted by its colony and wonder "What did that?" while the little "spotted wings" were flitting about the marsh or resting perchance upon sweet-flag near by?

THE COCCIDÆ OF NEW JERSEY GREENHOUSES.

BY HARRY B. WEISS,
New Brunswick, New Jersey.

While greenhouse coccids are not strictly a part of the New Jersey fauna, yet many of them are more or less permanently established and are a constant source of annoyance and expense to various growers. Except for the "mealy bugs" and a few species of "soft" and "armored scales," many of them are difficult to control and most of the insecticides recommended for greenhouse use are ineffective. Many of them will kill larvæ but here their usefulness ends. Many have been recommended by hearsay, on the basis of too little investigation, or after experimentation of a meager kind which neglected to include atmospheric conditions and other factors of a more or less variable nature which have an important bearing on the success or failure of the material.

As a result, the most effective work in combating scale insects in greenhouses is done when the plants are overhauled and repotted. At this time badly infested plants are destroyed, infested leaves pulled off, and men and girls are placed at work scrubbing the leaves with tooth brushes, erasers and soft cloths or using pointed sticks to dislodge the scales in cracks and crevices. In other words,



Two stems of rush, one with normal inflorescence contrasted with the large galled specimen showing the work of *Livia maculipennis*.

laborious hand methods are still the fashion in many greenhouses, not from choice but of necessity.

The following list consists of species which have been definitely found infesting various plants in New Jersey greenhouses. No attempt has been made to give a complete list of food plants, and only those on which the insects were found are recorded. To Mr. E. R. Sasser, I am indebted for various identifications during the past several years.

ICERYA Sign.

I. purchasi Mask. On acacia, orange, lemon.

ORTHEZIA Bosc.

O. insignis Dougl. On coleus, gardenia, verbena, citrus, chrysanthemum, tomato and other plants.

PSEUDOCOCCUS Westw.

P. citri Risso. On bouvardia, coleus, citrus, fuchsia, croton, ferns, bay trees, tomato, palms, geranium and many others.

P. longispinus Targ. On ferns, citrus, palms, dracena, coleus and many others.

P. pseudonipæ Ckll. On *Kentia* sp. and *Cocos* sp.

CEROPLASTES Gray.

C. cirripediformis Comst. On citrus.

C. floridensis Comst. On citrus, oleander.

EUCALYMNATUS Ckll.

E. tessellatus Sign. On palms.

COCCUS Linn.

C. hesperidum Linn. On bay trees, oleander, crotons, begonias, palms, ficus, citrus, cyclamen, orchids, camellia and many others.

C. longulus Dougl. On citrus, ficus, euphorbia, ferns and others.

C. pseudoesperidum Ckll. On orchids (*Cattleya* and *Dendrobium* spp.)

SAISSETIA Depl.

S. hemispharica Targ. On palms, ferns, oleander, croton, orchids, citrus camellia and many others.

S. oleæ Bern. On camellia, citrus.

DIASPIS Costa.

D. boisduvalii Sign. On palms, orchids.

D. bromeliæ Kern. On pineapple, *oleo fragrans*, latania.

AULACASPIS Ckll.

A. zamiae Morg. On *cycas revoluta*.

HEMICHIONASPIS Ckll.

H. aspidistræ Sign. On ferns, *aspidistra*, pandanus, orchids.

FIORINIA Targ.

F. fioriniæ Targ. On camellia, palms, ficus, orchids and others.

ASPIDIOTUS Bouché

A. britannicus Newst. On bay trees.

A. cyanophylli Sign. On palms, orchids, ficus.

A. hederæ Vall. On orchids, palms, cycads, oleander, citrus, ivy and many others.

A. rapax Comst. On bay trees, palms, camellia.

CHRYSOMPHALUS Ashm.

C. aonidum Linn. On palms, pandanus, ficus, bay trees, camellia, citrus.

C. aurantii Mask. On citrus, palms, pandanus.

C. dictyospermi Morg. On palms, pandanus, latania.

C. perseæ Comst. On orchids.

C. rossi Mask. On orchids.

TARGIONIA Sign.

T. bififormis Ckll. On orchids.

LEPIDOSAPHES Schimer.

L. beckii Newm. On citrus, croton.

L. gloverii Pack. On palms, citrus.

ISCHNASPIS Dougl.

I. longirostris Sign. On palms, pandanus.

PARLATORIA Targ.

P. pergandii Comst. On citrus.

The above list verifies most of the records furnished by Dr. W. E. Britton for Smith's 1909 list of "The Insects of New Jersey," and increases the number of greenhouse species from nineteen to thirty-two.

 THE HOST OF *ZELIA VERTEBRATA* (DIPTERA, DEXIIDÆ).

BY J. A. HYSLOP,
Bureau of Entomology.

In the April number of this JOURNAL, Volume 22, No. 2, the writer published some observations on the life history of *Mercanthera contracta* Beauv. At that time two parasites of this insect were recorded. A third parasite has since been reared, namely, *Zelia vertebrata* (Say). Mr. W. R. Walton in determining this

insect said: "The habits of this fly have hitherto been unknown though it is very common in the woods, in fact, one can hardly go into the forest anywhere in this part of the country (about Washington, D. C.), particularly during the months of July and August, without finding this fly sitting around on tree trunks. The females are quite different in appearance from the males." I therefore think it advisable that what little data we have relative to the habits of this *Dexiid* be published.

On April 6, 1915, two larvæ of *Meracantha* were collected under the club moss, *Polytrichum ohioensis*. A parasite emerged from one of these larvæ and pupated on May 10 and the adult fly emerged on June 7.

The other larva moulted on May 15 and appeared to be in good health. However, on June 22 a parasite emerged from this larva and pupated. On July 9 an adult *Zelia vertebrata* emerged. These parasitic larvæ had spent at least six weeks within their hosts, and the puparium stage covered from seventeen to twenty-seven days.

DR. FREDERICK WILLIAM RUSSELL.

Dr. Frederick W. Russell, a former member of the Cambridge Entomological Club, died at the residence of his son-in-law, Dr. Frank J. Hall, Dallas, Texas, November 20, 1915, aged seventy-one.

He graduated from Harvard in 1869 and from the Medical Department of the New York University in 1871. A resident of Winchendon, Mass., for many years, he frequently attended the meetings of the club even from that distance. As a member of the Boston Society of Natural History he took a great interest in the work of building up the New England collection of insects and contributed many rare and interesting moths—the group in which he was especially interested. He was a genial friend and companion and the club wishes to express its sorrow in the loss of a friend and fellow-worker.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

Will exchange insects of various orders for Parasitic Hymenoptera from any part of the world.—C. T. Brues, Bussey Institution, Forest Hills, Mass.

Wanted. Ants from all parts of the world.—W. M. Wheeler, Bussey Institution, Forest Hills, Mass.

Florida insects of all orders, also Fish, Batrachians, Reptiles, Shells and Marine Invertebrates sold by A. G. Reynolds, Gulfport, Florida.

New England Orthoptera identified. I wish to examine adult Orthoptera of all families from all parts of New England. Material will be identified for the privilege of retaining desired examples, for which good exchanges will be given, subject to approval of owner.—A. P. Morse, Wellesley College, Wellesley, Mass.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. F. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. VIII, No. 265 (May, 1898); No. 267 (July, 1898); No. 268 (August, 1898); Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinae of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

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PSYCHE

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ESTABLISHED IN 1874

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APRIL, 1916

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Prodryas persephoné Scudder.



CONTENTS.

Further Studies on the Platypezidæ. <i>C. W. Johnson</i>	27.
Two New Texan Parajueli. <i>R. V. Chamberlain</i>	33
The Pupa of <i>Boreus brunalis</i> Fitch. <i>F. X. Williams</i>	36
A Nematode Parasite of Root Aphids. <i>J. J. Davis</i>	39
Some New Formicid Names. <i>W. M. Wheeler</i>	40
New Encyrtidæ from North America. <i>A. A. Girault</i>	41
Three New North American Species of the Genus <i>Agromyza</i> . <i>J. R. Malloch</i>	50
A New Species of <i>Thripoctenus</i> . <i>L. T. Williams</i>	54
Exchange Column	62

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No. 2

FURTHER STUDIES ON THE PLATYPEZIDÆ.

BY CHARLES W. JOHNSON.

Boston Society of Natural History, Boston, Mass.

Since publishing a "Revision of the Species of *Agathomyia*" (*PSYCHE*, Vol. 17, p. 7, February, 1910) material has accumulated which I have put aside year after year, hoping that in time I should have sufficient material to show satisfactorily the positive relation of the sexes of what are probably the male and female of the same species. The notes appended to the following description will show the difficulties attending this work, the results of which, after six seasons of careful collecting, being rather discouraging. It is therefore with great misgivings that I name some of the described forms, but by so doing, if synonyms should arise, they can be more clearly and readily relegated to their proper standing, than by referring them doubtfully to described species.

Agathomyia Verrill.

Table of Species

- | | |
|--|--------------------------|
| 1. Thorax and abdomen fulvous | 2 |
| Thorax and abdomen largely black | 4 |
| Thorax and abdomen cinereus (females) | 8 |
| 2. Without black on the abdomen, ♀ (Me., N. H.) | <i>fulva</i> Johns. |
| With black on the abdomen | 3 |
| 3. The last two segments of the abdomen and halteres black, ♂
(N. Y.) | <i>perplexa</i> sp. nov. |
| The last segment of the abdomen, pleura and metanotum
black; halteres yellow, ♂ (Mass.) | <i>dubia</i> sp. nov. |
| 4. Abdomen broadly banded with yellow | 5 |
| Abdomen not banded with yellow | 7 |

5. Scutellum yellow, ♂, ♀ (N. H., Vt., Mass., R. I.) *pulchella* Johns.
Scutellum black. 6
6. Posterior metatarsi broad, oblong, ♂ (N. Y., Me.)
vanduzeei sp. nov.
Posterior metatarsi broad, ovate and truncate, ♂ (N. H.,
N. Y.) *cushmani* sp. nov.
7. Thorax and abdomen both maculated with greenish white,
halteres black (N. H., Mass., N. Y., N. J., Pa., Kan.)
notata Loew
Thorax only maculated with greenish white, halteres yellow
(Pa., D. C.) *divergens* Loew
Thorax and abdomen without maculations, tip of the abdomen
in the female cinereous, knobs of the halteres black (N. H.,
Mass.) *talpula* Loew
8. Abdomen grayish on a yellow ground, with broad black tri-
angles. *vanduzeei* sp. nov.
Abdomen grayish on a blackish ground (Mass.)
var.? *obscura* var. nov.

Agathomyia dubia sp. nov.

♂. Head black, mouth parts and antennæ yellow, aristæ brown. Thorax and scutellum yellow, pleura and metanotum black, pronotum with three rows of black hairs, the outer rows curving towards the humeri, a post-humeral, four notopleural, two supra-alar and one dorsocentral bristles, scutellum with three small lateral and two large apical bristles. Abdomen fulvous, the terminal segment and genitalia black. Legs light yellow, posterior metatarsi not enlarged, scarcely as wide as the tibiæ. Halteres fulvous. Wing hyaline with a long pale yellow stigma. Length, 3 mm.

One specimen, Austen's Brook, Chester, Mass., August 4, 1911. Type in the collection of the Boston Society of Natural History. I have long hesitated in describing this, and since collecting it have made four additional trips to the locality, hoping thereby to get more material. That it may prove to be the male of *A. fulva* is not unlikely, but the black pleura and terminal segment of the abdomen make it very doubtful, while the presence of another equally closely related form leaves only the one alternative to avoid confusion.

***Agathomyia perplexa* sp. nov.**

♂. Head black, mouth parts and base of the antennæ yellowish. Third joint and arista blackish. Thorax: dorsum and pleura fulvous, with rows of hairs and bristles similar to those of *A. dubia*, scutellum fulvous with four large marginal bristles. Abdomen fulvous, the last two segments and genitalia black. Legs yellow, the posterior metatarsi enlarged, slightly wider than the tibiæ, under side of the anterior and posterior femora with a large black bristle near the base. Halteres dark brownish-black. Wings hyaline, stigma very pale, a large black bristle near the base of the costa. Length, 3 mm.

One specimen, Elma, Erie County, N. Y., August 24, 1913, collected by Mr. M. C. VanDuzee. Type in the author's collection.

In general appearance this could also be referred to as the male of *A. fulva*, but the color of the antennæ, halteres and the last two segments of the abdomen would seem to separate it from that species.

***Agathomyia fulva* Johnson.**

A female identical with the type from Capens, Me., was collected in Tuckerman's Ravine, Mt. Washington, N. H., July 21, 1915.

***Agathomyia vanduzeei* sp. nov.**

♂. Face black, grayish pruinose, mouth parts and antennæ yellowish, third joint and arista black, eyes similar to the following species. Thorax with a dorsal line and the central area behind the transverse suture black, the rest of the dorsum, pleura and scutellum brownish. Abdomen, first segment brown, second and third yellow except for a dorsal spot of brown, the rest of the segments velvety black. Halteres dark brown, base of the stalk yellow. Legs yellow, tip, of the posterior femora brown above, posterior metatarsi slightly dilated, apex rounded (Fig. 2). Wings hyaline. Length, 3.5 mm.

♀. Face and front black, grayish pruinose, a bristle on each side of the front just below the ocelli and a vertical bristle on each side of the ocelli, two small ocellar bristles and a row of small bristles on the posterior orbits. Thorax light gray, with three conspicuous rows of black hairs, the middle row abbreviated poster-

iorly, the others curved outward in front to the humeri; the hairs become gradually larger and end with a large bristle in front of the scutellum, the latter with four large marginal bristles, humeri, postalar callus and scutellum yellow. Abdomen yellowish, grayish pruinose, with wide triangular markings of black on the posterior margins of the second, third and fourth segments, fifth and sixth with a narrow dorsal line of black. Halteres yellow, posterior metatarsi not dilated, in other respects resembling the male.

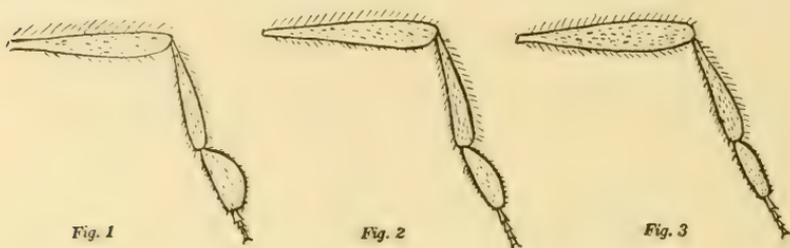


Fig. 1. Portions of hind legs of *Agathomyia* and *Callimyia*. Fig. 1, *A. cushmani* sp. nov.; Fig. 2, *A. vanduzeei* sp. nov.; Fig. 3, *C. velutina* sp. nov.

Holotype and allotype, Niagara Falls, N. Y., October 6, 1912 (M. C. VanDuzee), in the author's collection. Paratypes, two females, Colden, N. Y., September 7, 1913, in the collection of Mr. M. C. VanDuzee. One male, Liberty, Me., September 9 (J. A. Cushman) in the collection of the Boston Society of Natural History. The latter measures 4 mm. and has a dorsal stripe of black on the second and third abdominal segments. An imperfect female collected at Hammond's Pond, near Brookline, Mass., September 25, 1913, I am referring doubtfully to this species under the varietal name *obscura*. It lacks the yellow humeri and scutellum, the antennæ are entirely black, and the third joint more attenuated. The abdomen is injured so that the markings are obliterated but no yellow is apparent. Length, 3.5 mm. A number of trips have been made to try and secure more specimens of this interesting form, but in vain.

Agathomyia cushmani sp. nov.

♂. Face black, grayish pruinose, mouth parts and antennæ yellow, third joint and arista dark brown, eyes with a deep median transverse depression, facets of the lower half about one half the

size of those of the upper half. Thorax black with three narrow pruinose stripes, bearing rows of fine hairs, the outer rows curving towards the brownish humeri. Scutellum yellowish, pleura black, grayish pruinose. Abdomen, first, second and third segments yellow, a large dorsal spot on the posterior of the third and the remaining segments velvety black. Legs yellow, all of the tarsi and the tips of the posterior femora and tibiæ brownish, posterior metatarsi broadly dilated and truncate, the tarsi short (Fig. 1). Halteres yellow, the knobs brownish. Wings hyaline. Length, 4 mm.

Holotype collected by Dr. J. A. Cushman, on Mt. Passaconaway, N. H., 3,800 feet, September 12, 1912, in the collection of the Boston Society of Natural History. Paratype, Boston, Erie County, N. Y., September 5, 1911 (M. C. VanDuzee), in the author's collection.

This species resembles *A. vanduzeei* but is readily separated by its broader and somewhat truncated metatarsi.

Agathomyia pulchella Johnson.

Since 1910 this species has been collected at Chester, Mass., August 7, 1912; Bretton Woods, June 28, 1913; Mt. Washington carriage road below the second mile post, elevation about 2,400 feet, July 24, 1915, and along the Osgood Trail, near the Glen House, N. H., July 20, 1915.

Callimya Meigen.

Table of Species

- | | |
|--|--------------------------|
| 1. Abdomen entirely velvety black, ♂ (N. H., Mass., Ont.) . . . | |
| | <i>velutina</i> sp. nov. |
| Abdomen broadly banded with yellow | 2 |
| 2. Abdomen without silvery gray spots, ♂ (N. M., N. H., Me.) | |
| | <i>venusta</i> Snow. |
| Abdomen with silvery gray spots | 3 |
| 3. Sides of the 1st, 2nd, and 5th segments silvery gray, ♀ . . . | |
| | <i>venusta</i> Snow. |
| Sides of the 1st, 2nd, 3rd and 4th and the entire 6th segment
silvery gray, ♀ (N. H.) | <i>proxima</i> sp. nov. |

Callimya velutina sp. nov.

♂. Face dull grayish black, antennæ black. Thorax, scutellum and abdomen deep velvety black, pleura grayish black. Legs black, anterior and middle tibiæ and tarsi brown, posterior tibiæ and metatarsi somewhat enlarged (Fig. 3). Halteres fulvous, stems brown. Wings hyaline. Length, 4 mm.

This species was collected by the writer along the Mt. Washington carriage road between 2,500 and 3,500 feet, also on the Raymond Path at similar elevations, July 6 to 8, 1914, and July 24 to 28, 1915; at Bretton Woods, N. H., June 28, 1913, and at Chester, Mass., August 5, 1914. A specimen was also received from Mr. M. C. VanDuzee, collected at Brule Lake, Ontario, August 3, 1911. The Chester specimen measures 3.25 mm. and the Ontario specimen, which is about the same size, has the abdomen somewhat shiny, probably owing to its having become damp or greasy.

Holotype (Mt. Washington, July 24) and four paratypes in the collection of the Boston Society of Natural History. One paratype in the Museum of Comparative Zoölogy, one in the collection of Mr. VanDuzee and one in the author's collection.

Callimya proxima sp. nov.

♀. Front and face black grayish pruinose, antennæ black. Thorax and scutellum black, humeri, a large spot in front of the scutellum and the metanotum grayish pruinose. Abdomen, posterior half of the fifth and all of the second segment except a narrow dorsal line, yellow, the remaining segments black, a large spot on the sides of the second, third, fourth, and all of the sixth segment pearl gray. Halteres yellow. Legs including the coxæ yellow, tips of the anterior and middle tarsi and posterior femora and the entire posterior tibiæ and tarsi black. Wings hyaline. Length, 3 mm.

Two specimens collected on the Mt. Washington carriage road between the two and three mile post, elevation about 3,000 feet, July 16, 1915.

That this may prove to be the female of *C. velutina* is possible, but the bright yellow segments of the abdomen and the legs, which in *C. venusta*, a closely related species, are the same in both sexes, seems to preclude the placing of the two-together.

Callimya venusta Snow.

A male and female of this species previously recorded from Shackford Head, near Eastport, Me., was collected along the Mt. Washington carriage road, above the two mile post, elevation about 3,000 feet, July 16, 1915.

TWO NEW TEXAN PARAJULI.

BY RALPH V. CHAMBERLIN,
Museum of Comparative Zoölogy.

The type specimens of the new species of *Parajulus* here described were collected by J. D. Mitchell at Victoria, Tex., from where they were taken to the field laboratory of the United States Bureau of Entomology at West Lafayette, Ind., and there kept alive for some time. They were sent to me for determination by Mr. W. R. Walton of the bureau mentioned. Isolated descriptions of these two forms are here published in order that the names may be available for early use.

***Parajulus texanus* sp. nov.**

General color light yellowish brown. A dark median dorsal longitudinal line which is dark brown anteriorly and becomes black posteriorly. The usual series of black dots along each side over the repugnatorial glands on all excepting the first few segments; the dots small, angulate. About each segment a narrow dark annulus or line which fades out on the lower part of each side. A series of light brown spots much lighter and less conspicuous than those of the repugnatorial series occur along each side above the legs excepting on the most anterior and most posterior segments. Vertex of head and the antennæ dusky or blackish; the head below level of eyes pale.

Sulcus across vertex of head coarse; extending forwards to a deep transverse sulcus between inner angles of eyes; the transverse sulcus bent back angularly at middle.

Eye patch black; of moderate size; triangular, but with sides convex and the anterior angle truncate. Ocelli on each side in seven subvertical series in the most caudal of which there are ten

ocelli, and also forming about ten oblique series. Total number of ocelli in each patch near fifty.

First dorsal plate with the lower border straight, not at all angularly produced. Laterally distinctly margined. With two or three longitudinal striae across caudal border below on each side.

The second and succeeding segments deeply longitudinally striate below on each side. A longitudinal sulcus at level of repugnatorial pore.

Repugnatorial pore moderate or small; a little removed from the suture which is considerably excurved at its level.

Anal tergite with caudal tip acute and subspinous; straight, not at all decurved; exceeding the anal valves.

Anal valves with inner border conspicuously raised, and roughened.

Anal scale with caudal and anterior margins widely and evenly convex, not emarginate, meeting at an acute angle on each side.

Mandibular stipes of male slightly excavated. Strongly produced ventrad.

Promentum of gnathochilarium in the male much enlarged as usual; obovate in outline.

First legs in male strongly enlarged; the penult article narrowing distad, rather long, flattened, very weakly curved. Not strongly uncinata. Inner surface with numerous fine tubercles.

Coxae of second legs in male much enlarged and produced mesally in a linguiform process as usual; the process gradually but not strongly narrowing distad; not enlarged at distal end excepting for a slight extension at each angle.

Exposed part of first division of anterior gonopods of male wide proximally and strongly narrowing distad, the apex obtusely rounded; second or posterior division conspicuously exposed in lateral view, curving above base cephalomesoventrad, then bending more strongly a little caudad of mesad and then strongly back more caudad, the end flattened and the distal edge finely dentate and in contact with that of its mate, the two embracing or lying below a large conical process from the eighth segment.

Posterior gonopods sickle-shaped, crossing each other at the middle.

Number of segments in type, 52.

Length of type, 30 mm.

The description above is of a single male.

Parajulus victorianus sp. nov.

As the specimens of this species had been dried out through the evaporation of the alcohol, the coloration cannot be wholly determined. The dark spots along the sides are decidedly larger than in the preceding species and are less angular, being typically sub-circular; they often enclose a light area. In the types no dorsal median longitudinal dark stripe is detectable, though this may be due to the drying and shriveling of the soft parts.

Median sulcus of vertex of head geminate, each half bending sharply ectad at level of eyes and running to the inner angle of eye of the corresponding side and forming part of a transverse sulcus that is angulate at the middle as in the preceding species. Vertex caudally margined, the margining sulcus curving away from the edge on each side as it approaches the middle.

Eye area on each side subpentagonal or subtriangular with the anterior angle broadly obliquely truncate; the caudal side convex as is also the lateral; the mesal side convex or very obtusely angular; the anterior side straight, oblique. Each eye consisting of eight transverse rows of ocelli. Ocelli about 45 in number.

First dorsal plate with lateral border margined, nearly straight; not at all produced below; caudolateral angle subrectangular. Not striate.

Second segment conspicuously longitudinally striate below.

The succeeding segments striate farther dorsad and soon extending entirely across dorsum.

Repugnatorial pore moderate. Not touching the suture which is weakly excurved at its level.

Anal tergite exceeding the valves; caudal angle as a whole sub-acute, the apex, however, narrowly rounded; apex short and not extended as a spinous process, slightly depressed.

Mesal borders of anal valves scarcely elevated, roughened.

Mandibular stipes of male with caudal side straight except at distal or lower end where it is abruptly narrowed, leaving a rounded corner or angular projection.

Promentum of gnathochilarium in the male very large, broadly

oblong with the sides slightly convex and the corners somewhat rounded, also slightly wider distad.

First legs of male enlarged in the usual degree but longer than usual. The penult article exceptionally long, becoming distally much more slender than the preceding article.

Anterior division of the first gonopods conspicuously clavate; the broad distal end bent caudad, the caudal edge setiegerous; posterior division much longer than the anterior, its base broad but above this narrowing rather abruptly to a blade which curves ventromesad nearly to the middle line, with the posterior angle of the tip extended caudad in a short, slender and very acute process.

The posterior gonopods are broad plates each of which curves first cephaloventrad and then ventrocaudad, the distal portion of the blade narrower but still conspicuously broader than usual, the blade with its broad surface subvertical; the distal end characteristically bifid, the two lobes or teeth short.

The types are broken and as a result the number of segments cannot be accurately determined.

Two broken males form the basis of the description.

In the character of the anterior gonopods this species suggests *P. zakiwanus* Chamberlin, known from New Mexico, but the posterior gonopods are conspicuously different.

THE PUPA OF *BOREUS BRUMALIS* FITCH.

BY FRANCIS X. WILLIAMS,

Melrose Highlands, Mass.

In the August number of *PSYCHE* Dohanian describes and figures *Boreus brumalis*¹ and states that the life-history has not been fully worked out in any species of the genus. The order to which this insect belongs, the Panorpatae, comprises a small group of neuropteroid forms, among which are the genera *Panorpa*, commonly known as scorpion-flies, *Bittacus* and *Merope*, and whose mouth-parts are borne at the end of a snout-like extension of the

¹ Notes on the External Anatomy of *Boreus brumalis* Fitch, *PSYCHE*, XXII, pp. 120-123, pl. IX, 1915.

head, or rostrum. In general, their life-history is imperfectly known, but the larvæ are said to be terrestrial and carnivorous.

On October 4, 1915, I had the good fortune to unearth a number of *Boreus* pupæ at Andover, Mass., some fifteen miles north of Boston. Others were found in this locality up to October 22, and in two separate localities at Melrose Highlands, the first pupa being taken October 6 and the last on November 23. All were found in neat and rather elongate earthen cells in or just beneath the fine root-work of green moss which was growing at the base of trees, chiefly oaks. At the base of one tree I soon found over a dozen. The pupal cells were vertical or inclined and extended to within one half of an inch or so of the surface of the soil. No pupæ could be found under moss other than that which grew at the base of trees.

The pupa is of the same general shape and size (3.2–3.75 mm.) as the adult. The appendages are free. The mandibles are rather large and 4-dentate and vary somewhat in my three specimens (1♂ and 2♀). The male has two pairs of long, narrow wingcases and the female a single short pair. The male genitalia are terminal and somewhat reflexed and in well advanced pupæ exhibit a stout up-turned pair of chitinous clasping organs which are strongly toothed on their concave border. In the female the abdomen terminates in a more or less conical point, which encloses the inner portion of the ovipositor, while the outer blades of the ovipositor are ensheathed in a pair of ventrally appressed appendages that arise from the eighth abdominal segment and do not quite extend to the end of the body. The coxæ are long and

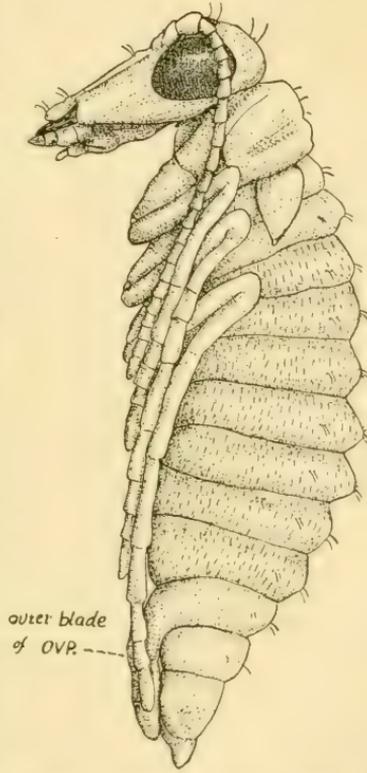


Fig. 1. *Boreus brumalis*, pupa.

stout and probably assist the adult in leaping. There are a few rather long bristles, as shown in the figure, and a short transverse row of little thorns on either side of the mid-dorsal line on abdominal segments 2-5. Under good magnification the surface of the body is finely pointed-granulate. The pupa is at first whitish; but even in the first specimens secured the eyes and mandibles had become quite dark. In well matured examples the body was brownish or greenish yellow and the longer appendages, at first rather closely appressed to the body, showed a tendency to move out of position.

The pupa is easily disturbed and is then decidedly active. The head is moved up and down in a vigorous manner, the mandibles open and shut and the abdomen is twisted around. These movements parallel rather closely those made by the pupa of the Eriocranid moths (*Jugatae*) in working their way to the surface of the soil, and it is possible that the movements of the *Boreus* pupa serve the same purpose. Busck and Böving¹ say the following concerning this Eriocranid pupa, p. 155-6: "While all the other appendages are loose, not glued together as is normal in a Lepidopterous pupa, it is mainly the head and the mandibles and abdominal segments, which are movable and utilized in locomotion, when the pupa digs up through the earth." In *Boreus* the pupal mandibles are about as long as two thirds the distance from their base to the lower portion of the eyes, 4-dentate and several times the size of the small 2-dentate mandibles of the adult insect.

Unfortunately almost all my pupæ were destroyed by a fungus, so that I was unable to rear more than a single *brumalis*. Towards the end of November, the pupæ had become very scarce, though what I took to be deserted open pupal chambers were not uncommon locally. With diligent search, however, I managed to find a single, well advanced pupa on November 22, and this, seven or eight hours later, disclosed a fully or nearly fully pigmented and active male *brumalis*. This insect lived for fifteen days confined in a jelly tumbler half-filled with damp moss. It always kept to the higher places and walked about in leisurely fashion, its metallic blackish head glistening in the light. It contrived to escape once, when it traveled by well-directed six-inch hops.

¹ On *Mnemonica auricyanae* Walshingham, Proc Ent. Soc., Wash., XVI, pp. 151-162, pl. IX-XVI, 1914.

I was unable to find any adults where I had secured the pupæ, though conditions seemed favorable for their presence. The life of the imago must be rather long, however, as it appears to have a somewhat protracted season. So, too, the larval period seems to be rather extended.

It is to be hoped that inasmuch as this curious winter insect is largely confined to the base of trees and is at times not uncommon, the complete life-history may soon be worked out.

A NEMATODE PARASITE OF ROOT APHIDS.¹

BY JOHN J. DAVIS,

United States Bureau of Entomology, West Lafayette, Ind.

Parasites of root-infesting plant lice are so rarely encountered that this record of a nematode attacking a root aphid is especially interesting. We first found apterous viviparous and oviparous individuals of a new species of *Anacia* infested with nematodes at

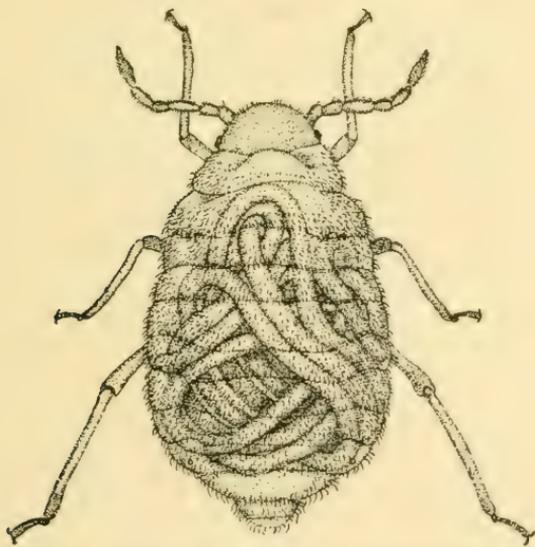


Fig. 1. *Anacia* sp. infested with a Nematode.

Lafayette, Ind., October 16, 1911, and again on October 19, and, although a number of collections were made at frequent dates

¹ Published with the permission of the Chief of the United States Bureau of Entomology.

between September 15 and October 15 from nearby plants, no parasitized aphids were found earlier than the dates mentioned above. The aphids were on the roots of *Muhlenbergia* and rather near the surface; that is about a half inch below the surface of the ground. The coiled and twisted worm was visible within the body of the aphid but after clearing and mounting in balsam it became much more distinct. The accompanying illustration, kindly drawn for us by Dr. Henry Fox, is a very characteristic likeness of the nematode worm within the body of the aphid. The nematode proved indeterminable and it is not unlikely that the aphid is simply an intermediary host.

We know of but one other record of a nematode infesting an aphid. Dr. G. Del Guercio, on page 205 of *Nuove Relazioni* of the Royal Station of Agricultural Entomology of Florence (Vol. I, 1899), records a nematode as one of the natural means which limits the diffusion of *Trama radiceis* Kaltenbach, a root aphid, and on the following page gives a simple outline drawing of the nematode worm.

SOME NEW FORMICID NAMES.

BY WILLIAM MORTON WHEELER,
Bussey Institution, Harvard University.

Forel's discovery, in 1913, that the East Indian ant, long known under the name of *Aphanogaster* (*Ischnomyrmex*) *longipes* F. Smith (1857), is really a *Pheidole*, and the type of the subgenus *Ischnomyrmex*, makes it necessary to change the name of *Pheidole longipes* Pergande (1895) of southern California and Mexico. I would propose for the latter the name *Pheidole grallipes* nom. nov.

Owing to the fact that I was unable to receive any proof, my recent paper on the ants collected by Capt. S. A. White in Central Australia (Trans. Roy. Soc. South Austr. 39, 1915) contains two unfortunate errors. The name *Polyrhachis* (*Camponyrma*) *longipes* (p. 821), applied to one of the new species, is preoccupied by that of *Polyrhachis longipes* described by Frederic Smith in 1858 from the Aru Islands. I would, therefore, change the name of the Australian species to *P. (C.) macropus* nom. nov.

Examination of several fine series of *Camponotus* (*Myrmophyma*)

inflatus Lubbock, the famous honey ant of Central Australia, recently received from the Museum of South Australia, shows that what I described as *Camponotus (Myrmamblys) aurofasciatus* (p. 817) is merely the hitherto undescribed minor worker of Lubbock's species. Forel is probably right in assigning it to the subgenus *Myrmophyma*.

NEW ENCYRTIDÆ FROM NORTH AMERICA.

By A. A. GIRAULT,

Bureau of Entomology, U. S. Department of Agriculture.

Signiphora flavopalliata occidentalis Howard.

Two females from *Chrysomphalus aurantii citrinus*, Avondale, Cal., October 24, 1911. P. H. Timberlake. 14527 D.

Signiphora thoreauini sp. nov.

Female: Length, 0.55 mm. Differs markedly from *aleyrodis* in having the antennal club all black, the cephalic part of the mesoscutum is only slightly darkened, the band on the abdomen is slightly shorter. From *basilica* in lacking the disto-marginal spot on the abdomen, the less colored cephalic thorax, the wholly black club and its greater length. From *lutea* as from *aleyrodis* and in its greater slenderness.

From one female on a slide labelled "From *Aspidiotus hederæ* on Soy, Santa Barbara, Cal., November 14, 1911. P. H. Timberlake. 14594 C." *Type*: Catalogue No. 19209, U. S. N. M., the above specimen.

Neosigniphora elongata sp. nov.

Female: Length, 1.35 mm. Rather long in proportion to its width. Agrees with the description of *Signiphora australica* Girault (the legs, however, dark except the yellow tarsi and the yellow dusky front legs); fore wings clearer near tip and under all of submarginal vein; the marginal cilia at apex are over half the greatest wing width. Hind wings broad. Differs notably from *australica* in the antennal club which is slender, six or more times

longer than wide. Scape long and slender, the pedicel not half its length.

Described from one female on a slide labelled "Webster No. 11824, Elkpoint, S. D., March 28, 1914. Reared from a coccid on *Muehlenbergia*, C. N. Ainslie." The four ring-joints in the genotype are verified. *Type*: Catalogue No. 19210, U. S. N. M., the foregoing female.

Aneristus oculatipennis sp. nov.

Female: Length, 1.65 mm. Black, the tarsi white; apex of scutellum very narrowly around the margin and a broad band across the scutum just back of the cephalic margin, yellowish white; band on scutum occupying somewhat over a third of the surface. Propodeum centrally at apex suffused with yellowish. Body very finely scaly, the head and thorax with numerous, small setigerous punctures, densest on the scutum. Cephalic femora strongly compressed. Fore wings hyaline but with a large, three-fourths-complete circular smoky ring from somewhat less than the distal two thirds of the marginal vein and extending beyond the venation, its open fourth facing the caudal wing margin and partly closed by a fainter dusky stripe opposite the opening and along the caudal margin; the distal margin of the ring is less than its width (not diameter) from the blade's apex; this ring makes a central, large ocula some distance distad of middle, opposite distal marginal vein. Stigmal vein sessile, minute, globular. Middle tibial spur long and *stout* as in normal encyrtids. Axillæ advanced. Parapsidal furrows mere sutures. Caudal femora and tibia compressed, the tibiæ with stiff black bristles dorsad and with two stout, black, subequal spurs. Mandibles broadly subtruncate but bidentate as in *Baoanusia*, the first tooth shorter than the large truncate second one. Scape pale beneath; flagellum subcylindrical, the funicle joints a little flattened, 1 nearly as long as the scape, three-fourths longer than wide at apex, 3 a little longer than wide, much larger than the pedicel; club 1 slightly wider than long. One distinct ring-joint. Maxillary palpus 2-jointed, the second joint ending in a long slender bristle; labials 1-jointed and similarly terminated. Club well-defined.

From five females reared from *Saissetia oleæ*, Catacaos, Peru. The date of the rearing is September 14, 1912. Rust, collector.

Types: Catalogue No. 19211, U. S. N. M., four females on two tags plus a slide bearing appendages.

Nebaocharis gen. nov. (Ectromini)

Female: In Ashmead's table runs to *Anusia* Foerster but differs in having the antennal club solid, the ovipositor exerted for three fourths the length of the abdomen, wings are present in the shape of large scales and the head is not so long, not so narrowed beneath the eyes, the cheeks short. Also the pronotum is less conical, shorter than the scutum or scutellum. Abdomen slender, depressed, its segments very indistinct. Head subquadrate but somewhat narrower toward the mouth (cephalic aspect), the face lenticular but the short, rather shallow scrobes forming a short semi-circle. Axillæ apparently rather widely separated. Hind tibial spur single. *Type:* *N. hemipterus*, sp. nov.

Nebaocharis hemipterus sp. nov.

Length, 1.00 mm. Dark brown, the abdomen, antennæ, extruded valves of the ovipositor and the hind legs, purplish black; scutellum nearly black. Legs, including the caudal tibia just below knee and the caudal tarsus, yellow. Body glabrous or nearly but the head coarsely scaly. Pedicel not flattened, slightly longer than wide, slightly longer than funicle 3 which is slightly the longest, 6 subequal to 2, 1 cupshaped and smallest, all wider than long and compressed; club conical, no wider than the funicle and about half its length. Scape greatly dilated. Flagellum clothed with very short hairs.

Described from one female in the U. S. N. M. collections, labelled "Colorado, 2019. C. F. Baker." *Type:* Catalogue No. 19312, U. S. N. M., the specimen on a tag, the head and a hind leg on a slide.

Xanthoencyrtus Ashmead (= *Scelioencyrtus* Girault.).

The original description of *Xanthoencyrtus* disagrees with my own of *Scelioencyrtus*, which is correct. The club is 2-jointed, and the genus must at present be regarded as an Ectromine. *Xanthoencyrtus nigroclavatus* Ashmead appears to be common in the United States; through the Bureau of Entomology I have seen a series of both sexes labelled "Webster No. 11811, Elkpoint, S. D.

C. N. Ainslie, collector. Parasite reared from *Panicum coccid.*” The male club is solid, the funicle joints distinctly longer than wide, with scraggly hairs. There are three Australian species.

***Epanusia albiclava* sp. nov.**

Female: Length, 1.20 mm. Dark metallic purple, the fore legs (except the coxæ) reddish brown, the middle tibiæ and tarsi and the club yellowish white. Head sculptured as in the genotype. Fore wings embrowned from near base to apex and crossed by a broad, naked hyaline band from all of the marginal and as much of the submarginal veins. Oblique hairless line not differentiated. Head bombyciform (as in the honey bee), a distinct carina between the antennæ, the scrobes running half way up the face but not joining, the face sublenticular. Axillæ slightly separated. Dorsal thorax sculptured and clothed as in the genotype. Marginal vein two and a half times longer than wide, postmarginal vein a little longer than the stigmal, somewhat shorter than the marginal. Fore wings rather narrow for the family but still large. Funicle widest at 2, 1 triangular and longest, widest distad, 6 smallest of the funicle, slightly longer than wide; club cylindrical. Mandibles small, their equal teeth acute. Ovipositor as in *Anagyrodes*.

From a female in the U. S. N. M. collection, taken by sweeping in the fair grounds, D. C., October, 1883. *Type:* Catalogue No. 19313, U. S. N. M., the above specimen and a slide bearing a head, fore wing, antenna and portion of a hind leg.

***Epidinocarsis subalbicornis* sp. nov.**

Female: Length, 1.50 mm. Dull black, including the venation, the wings hyaline, the antennæ distad of funicle 1 pure white; also the apex of the pedicel obliquely ventro-proximad and a stripe across the scape near its apex. Mesopleurum orange yellow, except at caudal margin. Tegulæ white at base. Propleurum whitish. Legs white except hind coxæ. Marginal vein a little over twice longer than wide, subequal to the stigmal, the post-marginal very short; hairless line closed caudad, rather broad, the wing ciliated proximad of it to base. Pedicel over twice longer than wide at apex, somewhat shorter than funicle 1 which is fully $2\frac{1}{2}$ times longer than wide and longest. Funicle 6 a third longer than wide. Thorax very densely, minutely scaly and hispid, the

very short stiff hairs white; a carina between the axillæ. Abdomen and head sculptured like the thorax, the head pubescent like the thorax. The apex of the acutely triangular scutellum reaches base of the abdomen. Scrobes distinct yet the head sublenticular. Frons moderately broad, the lateral ocellus its own diameter from the eyes.

Described from two females labelled "State Insectary, Cal., 675 A, Fresno, Cal., associated with mealy bugs on grape." *Types*: Catalogue No. 19314, U. S. N. M., two females on tags plus a slide with female head and fore wing. One of the females is a paratype.

Formicencyrtus gen. nov. (Encyrtini)

Female: Head ant-like, held nearly horizontally. Runs close to *Anusia* Foerster but the abdomen is somewhat as in *Anastatus*, that is depressed (the ovipositor shortly extruded) but in shape it is broadly oval (dorsal aspect), the second segment occupying about half of the surface, segment 6 two thirds as long as 2, the others short. The wings are like large scales but veinless and inconspicuous. Otherwise agrees with the structural characters of *Anusia flava* Girault except that the scutellum is not triangular but round at apex and there is a minute third mandibular tooth. *Type*: *F. thoreauini*, sp. nov.

Formicencyrtus thoreauini sp. nov.

Female: Length, 1.58 mm. Reddish brown, the propodeum darker, the abdomen dorsad metallic purplish, yellowish at apex, the funicle and club black, the short, extruded part of the ovipositor whitish. Fore wing gradually narrowing distad, somewhat over three times longer than wide at base, hispid, with minute scattered marginal cilia. Mandibles with two equal acute teeth and a third very minute obtuse one. Hind tibiæ with one long, slender spur. Scutellum and axillæ lemon yellow. Body coriaceous to subglabrous, the propodeum glabrous, non-carinate, pubescent latero-dorsad. Axillæ with a very short carina between them, together with the scutellum opaque and more coriaceous than the rest of the body. Dorsal abdomen downy, the hairs white and reclining. Tegulæ large; scutellum, scutum and propodeum of about equal length. Dorsal thorax very sparsely hairy. Caudal margin of

segment 2 of the abdomen slightly concavely incised at the meson. Pedicel normal, slightly longer than wide at apex and than funicle 1, the latter longest but only slightly so, the joints all somewhat wider than long. Club obliquely truncate from the base of joint 2. Scape very greatly foliaceously dilated ventrad. Funicle compressed. Genal suture absent.

From two females on tags in the U. S. N. M. collections labelled "5817⁰². On *coccus confusus*. Mesilla Park, New Mexico. Cockerell. Emerged December 14, 1896." *Type*: Catalogue No. 19315, U. S. N. M., the two females on tags and a slide bearing a hind leg, a wing and a head. One female a paratype.

Zaommoencyrtus submicans Gen. et sp. nov. (Encyrtini)

Female: In my table of the earth's genera runs to *Zaomencyrtus* Girault but differs in having the scape foliaceously dilated, the funicle joints annular; the stigmal vein is subequal to the marginal which is twice longer than wide, twice the length of the postmarginal. Hind tibial spur short, single, distinct. The middle tooth of the mandible is distinctly longest, the first shortest, a minute tooth, distinctly shorter than the others; third tooth half the length of the middle one. Head quadrate (cephalic aspect). Frons very broad. Eyes round-oval, about as long as the cheeks. Vertex rather thin. Face in death circularly depressed, the frons depressed. Axillæ separated distinctly for some little distance, the suture separating from the scutellum delicate. Form slender, rather flattened, not elongate. Head somewhat as in *Spalangia* but shorter.

Female: Length, 1.00 mm. Shining purplish black, the wings lightly dusky from about the bend of the submarginal vein, the duskiess accented under the head of that vein and under the marginal vein; tibiæ, except just below the knees and the tarsi yellow. Venation fuscous, the stigmal vein paler. Body very delicately scaly, shining like the surface of tar. Second joint of club obliquely truncate, longest, the club enlarged and barely shorter than the funicle. Pedicel stout, slightly longer than wide; funicle joints enlarging distad, 6 over thrice the size of 1 or 2 or 3 which are annular and subequal. Pedicel over a third the length of the body of the scape. Hind wings with about fourteen rows of discal cilia. Fore wing with a white streak caudad from the proximal margin of the discal ciliation, parallel with the caudal margin.

Oblique hairless line rather broad with but several lines of cilia proximad of it. Abdomen no longer than the thorax, the ovipositor tipping it.

From six females "Hopk. U. S. 10958 c., July 27, 1914. On *Nyctobates pennsylvanica*, Shiremantown, Penn. Hicoria. W. S. Fisher." *Type*: Catalogue No. 19316 U. S. N. M., a female on a tag; five female paratypes.

Ceraproceroideus Gen. nov. (Encyrtini).

Female: In my table of genera runs to *Ceraprocercus* Westwood but wingless, the head is not oblong but subquadrate (cephalic aspect) and the second segment of the abdomen occupies nearly half of the surface, the sixth next largest, two-thirds the length of the second. Pronotum extremely short. Scutum wider than long but as long or nearly as the normal scutellum whose rounded apex reaches to the base of the abdomen. Axillæ separated for some distance. Vertex flat, the face inflexed, the frons prominent. Vertex of moderate width. Mandibles with the inner two teeth formed by a concaved broad second inner tooth whose lateral or dorsal apex is acute. Fore wings mere scales which are somewhat longer than wide, with a broad costal cell and distinct submarginal and marginal veins, the latter much shorter than the former. Middle tibial spur long and stout, the caudal spur single, slender. Ovipositor slightly extruded, pointing the abdomen. *Type*: *C. cinctipes*, sp. nov.

Ceraproceroideus cinctipes sp. nov.

Female: Length, 1.10 mm. Purplish black, the scutellum except lateral and caudal margins narrowly and the rest of the dorsal thorax, except the tegulæ and much of the surface of the scutum, reddish brown. Head purplish black, the vertex bright lemon yellow, except the lateral margins unnarrowly along the eyes and the cephalic margin broadly. Face with a broadly curved, narrow lemon yellow stripe across it just under the vertex far dorsad of the antennæ, its (lateral) ends terminating under the eye ends. Lateral ocellus in the mesal margin of the lateral black border of the vertex, over its diameter from the eyes. Head finely scaly. Eyes partly on the vertex, the cheeks longer than them. Cephalic legs purple except tips of the tibiæ broadly and the four proximal tarsal joints.

Middle legs purple except the same tarsal joints and the distal two-thirds of the tibiæ, this latter white portion with a black *cinctus* at its middle. Caudal legs all purple, except the three proximal tarsal joints and a broad white *cinctus* a little proximad of the middle of the tibiæ. Abdomen shining, subglabrous. Dorsal thorax scaly, the scutellum more densely so; scutum with sparse pubescence. Antennæ wholly flat. Pedicel triangular, slightly longer than funicle 6. Scape greatly dilated. Funicle joints decreasing in width, increasing in length distad, 6 somewhat wider than long, 1 over twice so, all the joints with their distal margin concave. Club conico-cylindrical, its first joint subquadrate, largest. Fore wings with black, scattered stiff bristles disco-distad and from its cephalic margin, with a fuscous dash across at the thickening of the submarginal vein, a dusky spot against the apex of the venation and an irregular dusky blotch across the apex.

What appears to be the male is very different—winged, the marginal vein somewhat longer than wide, the postmarginal just developed, the stigmal very short, half the length of the marginal. The wings are hyaline and fully developed. Vertex flat but shorter than in the female, the frons less prominent. The antennæ are filiform, the club solid, the scape only compressed-cylindrical, somewhat shorter than the club; pedicel globular; funicle joints cylindrical, 1 longest, nearly twice longer than wide, 6 somewhat longer than wide. Funicle and club with rather long, scraggly hairs. The legs are concolorous except the proximal four tarsal joints of the first two pairs of legs, the proximal joint of caudal tarsi, the cephalic knees and tips of cephalic tibiæ, middle knees and tips of middle tibiæ and a white central *cinctus* on middle tibiæ (therefore, two concolorous *cincti*; the knees include the base of the tibiæ and the apex of the femur). The fore femur, caudal femur and tibia are compressed. The head of the male is wholly concolorous.

Described from two males, one female "From *Aspidiotus helianthi* Parr on *Eugerion canadense*, Wellington, Kans., October 8, 1908. E. G. Kelly." *Types*: Catalogue No. 19317, U. S. N. M., the above specimens on tags with a slide bearing a male head and fore wing and female head, legs, antenna and fore wings. One male a paratype.

Paracopidosomopsis Gen. nov. (Encyrtini).

Female: The same as *Berecynthus* Howard but the mandibular teeth are small and subequal. *Type:* *B. floridanus* Ashm.

This species is closely allied with the so-called *Copidosoma truncatellum* Dalman (at least specimens from Europe in the U. S. National Museum, so labelled) which is congeneric, but the American species differs in having a distinct, rectangular fuscous patch against the stigmal and marginal veins with a more suffused area caudad of it, while in the European species the wings are hyaline. Otherwise the two are certainly much alike. Mr. A. B. Gahan has identified a series of *floridanus* as *truncatellum* but for the present I do not think the two can be regarded as the same. These specimens were labelled "Laf. 11. Lafayette, Ind., J. J. D. Reared from cabbage *Plusia* larva."

Berecynthus Howard.

In my table of genera runs to *Copidosomopsis* Girault but differs in the following essentials: The marginal vein is somewhat longer than wide, the postmarginal distinct, about half the length of the marginal, the abdomen is broader, flat and subcordate, the stigmal vein is slightly longer than the marginal. Axillæ rather broadly joined. Mandible with the third tooth minute, the first long, over twice the length of the second which is over four times the size of the third. Ring joint very minute. Club solid, obliquely truncate. Hind tibial spur single, the middle one enlarged. Genal suture absent. Scrobes not reaching to the middle of the face yet distinct, of tolerable length, forming an inverted "V." Club wider than the funicle and about three fourths its length.

Berecynthus bakeri Howard, var. *gemma*, var. nov.

Female: Length, 1.15 mm. Metallic blue-green, the middle knees and all tarsi except the distal joint, reddish-brown, the venation blackish, the fore wings lightly infuscated from the head of the submarginal vein distad to the apex. Funicle joints increasing gradually in width distad, 1 quadrate not half the length of the pedicel, subequal to 2, 6 somewhat wider than long. Pedicel distinctly longer than wide at apex, nearly half the length of the club which is a little shorter than the body of the scape. Hind wings

with about sixteen lines of uniform discal cilia where broadest. Fore wing with only about two short lines of coarse cilia proximad of hairless line. Whole body scaly reticulate. A very short, delicate carina between the axillæ. Scutellum more finely scaly than the scutum. Ovipositor not prominent.

The male is similar to the female but the scutellum is scaly like the rest of the thorax, the funicle joints all somewhat longer, subquadrate, the club shorter; the third tooth of the mandible is longer, the other shorter. Wings hyaline.

Described from a male and a large number of females labelled "From an *Euxoa* larva, Queensboro, Ontario. A. Gibson;" also "from larva of *Hadena devastatrix*, Ottawa, Canada, July 12, 1914. A. Gibson." *Types*: Catalogue No. 19318, U. S. N. M., 8 females on five tags (seven paratypes).

Differs from the typical form in having the fore wings narrower and the venation black; both forms bear a rectangular fuscous patch along the stigmal vein. Type locality, Ottawa.

***Berecynthus bakeri* Howard var. *arizonensis* var. nov.**

Female: Differs from *bakeri bakeri* in having the fore wings distinctly more dusky, infuscated throughout from the bend of the submarginal vein.

Described from four females from Phoenix, Ariz., March 20, 1915. From *Choraxagrotis* species. H. O. Marsh, Chtn. No. 978. *Types*: Catalogue No. 19319, U. S. N. M., the above specimens on separate tags; three paratypes, one type.

THREE NEW NORTH AMERICAN SPECIES OF THE
GENUS *AGROMYZA* (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

Herewith are presented descriptions of three undescribed species of *Agromyza* from Illinois. The type specimens are deposited in the collection of the Illinois State Laboratory of Natural History.

This paper is published by permission of Dr. Stephen A. Forbes, State Entomologist of Illinois.

Agromyza subangulata sp. nov.

Male: Black. Head black, only the apex of proboscis yellow; frons opaque, brown-black, orbits subshining; lunule whitish pollinose. Thorax shining black, disc of mesonotum distinctly brownish pollinose, central vertical suture and upper margin of pleuræ from wing base nearly to anterior extremity narrowly lemon-yellow; roots of wings lemon-yellow; scutellum concolorous with disc of mesonotum. Abdomen unicolorous glossy black. Legs black; fore knees and bases of tarsi yellowish. Wings clear, bases of thick veins lemon-yellow, remainder brown. Squamæ pale yellow, fringe concolorous. Halteres pale yellow.

Frons more than a third the width of head; orbits distinct, each at widest part about half as wide as is center stripe at same part; five orbital bristles present, which are of moderate length, slightly decreasing anteriorly, the anterior two pairs incurved; orbital hairs sparse; antennæ small, third joint disc-like, slightly pilose; arista bare, tapering, its length about one third more than anterior width of frons; face very slightly receding below; cheek very narrow, at middle about one eighth as high as eye, the latter about one and a third times as high as long; marginal hairs not very numerous, but distinct, vibrissa moderately differentiated. Mesonotum with four pairs of dorso-central bristles; discal setulæ rather long and hairlike, about eight rows between the anterior dorso-centrals; the pair of bristles between the posterior dorso-centrals hardly distinguishable from the discal setulæ. Abdomen ovate; surface with many setulose hairs; hypopygium of normal size. Legs normal; mid tibiæ with the posterior bristles small. Wing with costa to end of fourth vein; veins 3 and 4 distinctly divergent at apices, reaching wing margin at about equal distances before and behind wing tip respectively; inner cross-vein in vertical line with apex of first vein, and distinctly beyond middle of discal cell; outer cross-vein distant its own length from inner; last section of fourth vein four times as long as penultimate section; last section of fifth subequal with the preceding section; auxiliary indistinct but complete; sixth vein reaching three fourths of distance to wing margin. Length, 2.5 mm.

Type locality, St. Joseph, Ill., May 3, 1914 (Hart and Malloch). Food plant unknown.

This species will "run down" to *angulata* Loew in my table of species in this genus,¹ but may be readily separated from it by the characters of the wing venation.

Agromyza albidohalterata sp. nov.

Male: Black, shining. Frons with center stripe reddish yellow, ocellar region, and orbits except their lower portions black; antennæ reddish yellow; arista brown; face and cheeks grayish yellow, the former slightly blackened on center and mouth margin; proboscis yellow; palpi brownish; back of head black. Thorax without any yellow markings, the suture between upper portion of pleuræ and mesonotum brownish, no distinct surface pollinosity. Abdomen more distinctly shining than thorax, the segments unicolorous black. Legs black, knees brownish; all tarsi yellowish except at apices. Wings clear, veins brown. Squamæ whitish, margins and fringes grayish. Halteres yellow, the knobs white. All bristles black.

Frons nearly half the width of head, orbits distinct, each about half as broad at its broadest part as is center stripe at same part; orbital bristles situated close to inner margin of orbits, five pairs present, the upper pair rather weak, the others becoming successively weaker towards anterior margin, the last (anterior) pair very weak, anterior three pairs incurved; no distinguishable orbital hairs; antennæ rather small, third joint rounded, its surface with white pile; arista rather thick, its length about equal to anterior width of frons, pubescence very short; cheek nearly twice as high as third antennal joint and half as high as eye, marginal hairs weak, vibrissa not well differentiated; height of eye one and a third times its length. Mesonotum with two pairs of very weak dorso-central bristles, the disc covered with rather closely placed hairlike setulæ; scutellar bristles weak, the pairs subequal in length. Abdomen slightly longer than thorax, the segmentation very distinct, surface hairs weak but numerous; hypopygium normal. Legs normal in shape; mid tibiæ without discernible posterior bristles. Wings normal in shape; first costal division more than three fourths as long as second; third vein ending midway between apex of fourth vein and apex of second; fourth ending almost exactly at apex of wing, these three veins distinctly divergent on their last section;

¹ See Ann. Ent. Soc. Amer., Vol. 6, 1913, p. 271.

inner cross-vein distinctly before end of first vein and two fifths distant from apex of discal cell; outer cross-vein distant about its own length from inner, and very slightly beyond end of first vein; last section of fourth vein about two and a half times as long as the preceding two sections combined; penultimate section of fifth about two thirds as long as last section. Halteres with exceptionally large knob. Length, 2 mm.

Type locality, St. Joseph, Ill., May 17, 1914 (C. A. Hart). Food plant unknown.

This species will "run down" to *varifrons* Coquillett in the table previously referred to, but may be separated readily by the color of the frons and by the wing venation. In *varifrons* the black of the frons is not confined to the orbits and ocellar region, but extends over the central stripe, on its upper third at least. The last section of fifth vein of wing in the same species is subequal in length with the preceding section, and the second costal division is nearly twice as long as the first.

Agromyza nigrisquama sp. nov.

Female: Black, subopaque. Wings clear, veins black. Squamæ black-brown, fringes concolorous. Halteres yellow, knobs lemon-yellow.

Frons with center stripe opaque, orbits slightly shining, each about one fifth as wide as center stripe, width of frons at vertex slightly over one third the head width, a little narrowed anteriorly, 4 pairs of bristles on orbits, the anterior 2 pairs incurved, the posterior 2 pairs reclinate, orbital hairs sparse; antennæ of moderate size, second joint with distinct dorsal bristle, third joint rounded; arista bare, tapering at base, its entire length equal to from its base to upper orbital bristle; cheek about one sixth the eye height, marginal bristles weak, vibrissæ well differentiated. Mesonotum with 4 pairs of dorso-centrals, the anterior pair in front of suture; no distinct bristles between posterior dorso-centrals; discal setulæ in about 8 irregular rows between anterior dorso-centrals. Abdomen with rather long hairs, especially at apex; ovipositor short, obtuse. Legs slender, the mid tibial setulæ present. Wings broad, costa to end of fourth vein; inner cross vein at distinctly beyond middle of discal cell and slightly before end of first vein; outer cross vein at about its own length from inner; last section of

fourth vein 6 times as long as penultimate section; veins 3 and 4 gradually divergent on their last sections; last section of fifth vein about one third longer than penultimate section. Length, 2 mm.

Type, Monticello, Ill., June 28, 1914 (J. R. Malloch). Taken by sweeping vegetation on bank of Saugamon River. Food plant unknown.

This species will "run down" to section 34 in the table referred to previously, but may be separated from both of the species therein by the comparative lengths of the last 2 sections of fifth vein as well as other characters. Both *isolata* Malloch and *fragariae* Malloch have the last section of the fifth vein shorter than the penultimate section.

A NEW SPECIES OF THRIPOCTENUS (Chalcidoidea).¹

BY L. T. WILLIAMS.

During an afternoon's collecting in a swampy spot near the Arnold Arboretum, Forest Hills, Mass., a few galls on willow twigs were secured and brought into the laboratory at the Bussey Institution. A casual examination on the date of their collection (July 22, 1915) showed that they contained immature insects of some sort, but no further attention was paid them until August 10, when the galls were opened and found to contain several large black thrips, and a single minute Chalcidoid parasite. Any possible doubt as to the relationship between the insects was removed when the parasite was identified by Professor Brues as belonging to the genus *Thripoctenus*, which is known to be an enemy of the Thysanoptera.

The genus *Thripoctenus* was proposed in 1911 by Crawford for a new species from California, belonging to the sub-family Tetrastichinae, and described by him under the specific name of *russelli* in honor of its discoverer, the late Mr. H. M. Russell. A second species has recently been described in Europe by Vuillet. I have not had access to this description but the differences in habitat and in the systematic positions of the hosts would indicate that the present species is perfectly distinct. The characters distinguishing it from the type species are well marked, as will be noted later.

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 112.

The following description contains certain characters of generic, rather than specific value, which are included merely for convenience in identifying specimens.

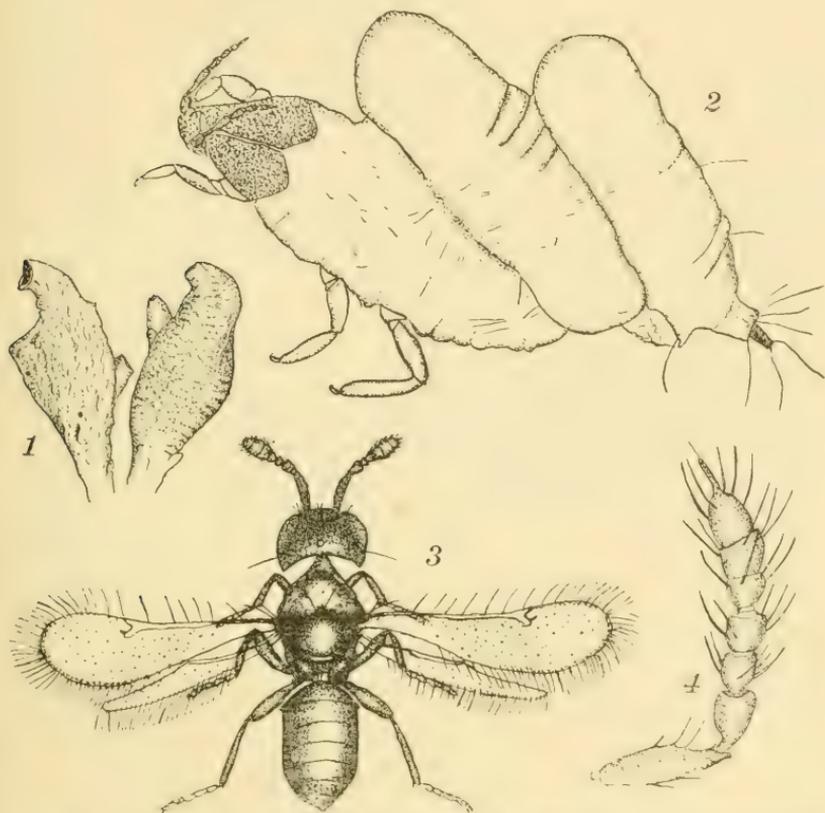


Fig. 1. 1, Willow galls occupied by thrips; 2, Parasitized thrips containing three larvæ of *Thripoctenus nubilipennis*; 3, *Thripoctenus nubilipennis* ♀; 4, Antenna of same, ♂.

Thripoctenus nubilipennis sp. nov.

Female: Length, 0.7–0.9 mm. Antennæ inserted just above the clypeus, 7-jointed, the club of 3 segments and the funicle of 2, the latter shorter than the pedicel. Head as wide or slightly wider than the thorax, seen from in front distinctly wider than long. Clypeus with a distinct keel. Front broad, strongly concave. Inner eye-margin with a row of bristles, the posterior one long and conspicuous. Ocelli in a low triangle. Genæ prominent,

well-developed. Mesonotum convex, somewhat cordate, owing to a posterior cleft or indentation. Parapsidal furrows incomplete, indistinct during life. Scutellum oval, without longitudinal furrows. Tegulae with a pair of bristles. Abdomen elongate-ovate, about as long as the thorax, laterally keeled or compressed. Ovipositor scarcely visible when at rest. Color, black, highly polished, tarsi, except for dusky terminal joints, testaceous. Antennae dark, but translucent, hence appearing yellowish when mounted; clothed with whitish hairs. Eyes very dark russet-red, almost black; ovipositor yellow, transparent. Wings with a distinct median cloud, and a marginal thickening or pigmentation extending from the end of the post-marginal vein to a point on the posterior margin opposite the stigmal vein. Wing-cilia very long, dark-colored.

Male: Smaller (on the average) than the female, abdomen slenderer more abruptly tapering. Antennae 7-jointed, as in female, but differing as follows: scape broader, pedicel shorter than the funicle, club much less marked. Joints of the flagellum with whorls of bristles. Terminal joint with a rod-like, bristle-tipped prolongation, about two-thirds as long as the joint. Color, as in female.

This species is very readily distinguished from *T. russelli* by its uniformly black color and clouded wings. The rod-like appendage of the male is very curious and distinctive, though it may pass for an ordinary bristle if not closely examined under a compound microscope. I presume that it is characteristic of the genus, though I have no means of knowing this, the male of *T. russelli* being as yet undescribed.

Habits of the Hosts.

Specimens of the thrips were sent for determination to Dr. J. D. Hood of the Biological Survey, who kindly identified them as belonging to two species, *Megalothrips spinosus* Hood and *Cryptothrips rectangularis* Hood, both members of the family Phloeothripidae. Unfortunately, the larvae of the two forms were not distinguished during the course of my observations, and it is impossible to ascertain at present whether their relations to the parasite are different, but it seems probable that either is attacked without discrimination.

After the parasite's relation to the Thysanoptera had been established the locality where the galls had been collected was re-visited, and large numbers of additional specimens secured from time to time. These galls were not, of course, the work of the thrips. They were practically all on dead wood, and may have been several seasons old. The commonest type, and that most frequented by the thrips was the one shown in Fig. 1, 1, but the insects were also found in other sorts, among them the well-known "pine-cone" willow gall. The original inhabitant of the gall is therefore of little importance, since the thrips evidently occupy any sort that will accommodate them.

The galls are not a mere temporary shelter, as all stages of the thrips from the egg to the adult were to be found in them, and none were found outside, upon the twigs. There seem to be no definite generations, all stages being obtainable at any time during the period for which they were under observation. What they eat, unless they are able to subsist on the dry wood of the gall, seems a mystery, the dead willows being the only visible source of nourishment. The other insects found in the galls are scarcely sufficient to permit of a regular carnivorous habit, although occasional cannibalism is not unlikely.

Habits of the Parasite.

The life-history of *Thripoctenus russelli* has been studied in detail by Mr. H. M. Russell of the Entomological Bureau. The writer has not been able to treat the present species so exhaustively within the time at his disposal, but the details gathered show many points of similarity between the two species as well as several interesting differences.

Oviposition: On the 16th of August no parasites had issued from the new lot of galls, and to hasten matters a number were cut open, several female parasites rewarding the search. Two or three of these were placed in a vial with an immature thrips. At first they ran around without paying any particular attention to it, but before very long one of them ran up, examined the thrips briefly with its antennæ, and then immediately thrust its abdomen forward between its legs and punctured the larva with its ovipositor. After a moment, however, it relinquished its attempt for no apparent reason. Later the same thrips was approached by a par-

asite (No. 1) which went through the preliminary motions of oviposition, but before it had completed the action another (No. 2) ran up and pierced the thrips with its ovipositor. After remaining in this position some minutes it applied its mouth to the puncture and sucked the wound for about the same length of time. Meanwhile No. 1 repeatedly brought its abdomen forward as if to oviposit, but failed to do so. Both insects immediately afterwards deposited something on the wall of the test tube, which may have been merely excrement, though in the case of No. 1 it was shaped very like the usual parasitic egg.

Subsequently, numbers of adults and pupæ of the *Thripoctenus* were obtained, and the process of oviposition was frequently witnessed. The thrips and parasites (one individual of each, as a rule) were placed on a glass slide within a ring of paraffin, and covered with a cover-slip. Under these unnatural conditions the behavior of the parasites was somewhat capricious. Their first action was almost invariably a systematic examination of their prison, out of which, if there was the smallest space between the wax and the cover they usually succeeded in forcing their way. After these efforts had been brought to a conclusion they might or might not show some interest in the thrips. Often they remained with their antennæ applied to the bodies of the larvæ, without attempting to oviposit. Under such conditions any slight movement on the part of the thrips was likely to stimulate the parasites to action. If they met with the thrips at an unfavorable angle they seldom rectified their position, but let it go. The thrips also showed some variation in their receptions of the attack. They were generally rather quiescent, but sometimes crawled about rapidly in their endeavor to escape. This was usually successful, especially if done just as oviposition commenced, but occasionally a more persistent parasite followed its prey, sidling along to the best of its ability, and still holding on when dragged head-long, or circumvented its victim by mounting on its back. Sometimes the thrips, particularly the pupal forms, protected themselves by violently contorting the tips of their abdomen, and in one case one of them was seen to excrete a drop of brownish fluid on the wings of the *Thripoctenus*.

Oviposition, when successful, usually required ten or fifteen minutes, and a half-hour was not uncommon. After this there was

normally a rather long period of sucking the wound, followed occasionally by a second oviposition. This last, however, was seldom allowed to occur, as I desired to obtain as many parasitized thrips as possible, and usually replaced the infested individuals with fresh ones. There was no particular point selected for attack, though the abdomen was more often pierced than the thorax. In the length of time required for oviposition the species differs markedly from *T. russelli*, which is described as taking less than a minute for the process. The subsequent tasting of the wound appears also to be omitted by the latter species.

The number of larvæ which a parasite would attack was not definitely ascertained. After attacking three or four the female *Thripoctenus* usually died or made its escape. Those that had already oviposited could be counted upon for a repetition of the process more surely than those which had not so far attempted it.

All stages of the thrips except the adult are attacked, the newly-hatched larvæ with an alacrity which appears to be ill-judged, as the larvæ of the parasite can hardly develop in them properly, the pupæ with a reluctance which may be well-founded. At least one pupa transformed after a *Thripoctenus* had oviposited in it.

Development of the Larvæ: The lengths of the egg and larval stages of the parasite were not determined. It seemed impossible to keep the larval thrips alive after removal from the galls, and moreover, individuals oviposited in under laboratory conditions often proved to have been previously infested. The only method of avoiding this source of error was to raise the hosts from the egg, and this could not be managed. Only occasionally were parasite larvæ obtained by dissection. These were extremely delicate in the early stages. One well-grown specimen, dissected from a pupal thrips, resembled the mature forms, being quite smooth, very faintly segmented, and without any pigmentation in the head.

Parasitization was not obvious until it had reached an advanced stage. At this time the host larva grew mottled and waxy in color, the body was much swollen, and the insect was perfectly torpid, if not dead. In a day or two the outlines of the parasites showed beneath its skin. Owing to the large size of the host, successful multiple parasitism is possible, and indeed appears to be the rule. The plate shows a thrips containing three larvæ, and judg-

ing from the groups of pupæ found, even more may complete their development in a single host. This is impossible with the smaller hosts of *T. russelli*. The larvæ are always oriented in the same direction, their heads towards that of the thrips. The skin of the latter soon splits and shrivels to a small pad, to which the larvæ remain attached until they pupate. As in the case of *russelli* the contents of the alimentary canal are retained until after the insect has completed its transformation. This substance, bright crimson at first, loses its color shortly before the pupal stage, and is voided by the adult as a milky fluid.

In a few cases the length of the pupal stage was determined. Five larvæ developed from two thrips (three in one, and two in the other) began to darken on August 31. The first three were completely black by next day, the other two twenty-four hours later. On the 11th of September four of the five pupæ (all of the first lot and one of the other) hatched. Two were males and two females. The last pupa, a female, hatched on the 13th.

Adult: Perhaps the most striking difference between *nubipennis* and the Western species consists in the presence of males in the former. *Thripoctenus russelli* was found to be both parthenogenetic and thelytokous, no males being produced through all the generations that were reared. In *nubipennis* the male is not uncommon, though slightly rarer than the female. Copulation was observed on more than one occasion. It is a process of very brief duration.

The sex of the offspring of unfertilized females could not be determined, owing to the aforementioned difficulty in keeping the thrips alive.

The adults ran about actively but were not observed to fly, and seldom jumped. They did not feed when offered syrup, but the females were fairly well supplied with the juices of the thrips. Those that oviposited frequently survived the others, but four or five days was about the maximum length of life under laboratory conditions.

The presence of a member of this genus in the Eastern States is probably of no economic importance, since the thrips upon which it preys are not injurious. They belong to a different suborder from the hosts of the two species of *Thripoctenus* hitherto described. Whether or not *nubipennis* would attack members of

the Terebrantia could not be determined for lack of material, but the great difference in habit renders it unlikely that it would do so under natural conditions.

Acknowledgments.

My thanks are due Professor Brues for aid in classifying the parasites and for suggestions and references of all kinds during the course of the experiment. To Dr. Hood I am indebted not only for the determination of the hosts as mentioned above, but also for information about their life-history and for references on the parasite. Much use has been made of Mr. Russell's bulletin for purposes of comparison.

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CONTENTS.

New Species of Asilidæ from Southern California. <i>F. R. Cole</i>	63
Plaster-casting Insect Burrows. <i>R. P. Dow</i>	69
Some New England Syrphidæ. <i>C. W. Johnson</i>	75
A New Ant of the Genus <i>Messor</i> from Colorado. <i>Hazel Andrews</i>	81
A Comparative Study of the Maxillæ of the Acridiidæ (Edipodinae and Tet- tiginæ), Phasmidæ and Phylliidæ. <i>G. C. Crampton</i>	83
Table of Males of the North American Species of the Genus <i>Asyndetus</i> with Descriptions of Six New Species. <i>M. C. Van Duzee</i>	88
Cora H. Clarke	94
Exchange Column	96

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PSYCHE

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NEW SPECIES OF ASILIDÆ FROM SOUTHERN CALIFORNIA.¹

BY FRANK R. COLE,

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The species described in this article were all collected in San Bernardino County, California. There are many asilids in this region, and no great amount of collecting has been done since Coquillett worked over this section. Any extensive collecting is certain to bring to light new forms. In traveling only a short distance here, one will encounter a great variety of ecological conditions. There are many flowers at all seasons of the year and the mild climate permits of almost uninterrupted collecting. In the preparation of this paper the writer is indebted to Mr. Frederick Knab for the use of the National Museum collection, which contains much valuable type material in this group.

Cophura highlandica sp. nov. (Plate VIII, fig. 4).

♀. Length, 7 mm. Head yellowish gray pruinose. Body black, mostly hidden by pollen. Front yellowish gray pollinose. Face gently convex. Mystax white and extending nearly to the antennæ. First joint of antenna slightly longer and more slender than second. Third joint four times as long as second, and slender. Style not very slender, rounded at end. Thorax gray and light brown pruinose. Two dark brown vittæ, broad in front and narrowed behind. Thorax very convex. A shining black spot above supra-alar groove and two of the same size just in front of

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scutellum. Bristles of thorax black. Fan-like row of bristles in front of halteres yellowish. Two large bristles on margin of scutellum near center, and two small ones outside of these. Abdomen shining black marked with yellowish gray pollen. Pile of thoracic dorsum very sparse. Pile of legs white, the bristles pale yellow and white. The pollinose bands on abdomen on each side reaching the posterior margin at sides. A black polished spot in center of each lateral patch of pollen. Tarsi black. Bases of tarsi, the tibiæ, and tips of femoræ reddish brown. Wings yellowish hyaline, the extreme apex brownish. Light clouds on veins at bases of discal, submarginal and posterior cells.

Type—U. S. N. M., Cat. No. 20185. One specimen.

Habitat—East Highlands, Cal., Nov. 25, 1914.

Lestomyia redlandæ sp. nov. (Plate VII, fig. 2).

♂. Length, 9 mm. General color blackish. Face and front black. Yellow pollen on face and along oral margin. Antennal triangle black, semi-shining. Mystax white (mostly broken off in this specimen). Scant pile on front near eyes. Two black bristles on underside of second antennal joint. Antennæ black with cylindrical arista which is more than twice as long as wide. The third segment of antennæ begins to widen some distance from base. Occipito-orbital bristles whitish. No markings on dorsum of thorax, which is pollinose. Thoracic bristles black and strong. Scutellum with six strong upcurved bristles on margin. There are three bristles on each side and they converge and cross each other. Halteres yellow. The fan-like row of bristles before the halteres is yellowish. Abdomen dark gray pruinose. There is a shining black spot on each side of second, third, fourth, fifth and sixth segments. Short recumbent white pile on dorsum of abdomen. Hypopygium brownish red, base shining black. Narrow rim on posterior margin of each abdominal segment a dull reddish color. Legs red. Some red color on coxæ. Black ring on all femoræ, broader on the hind ones. Tibiæ black except base. Spines on legs mixed black and white. Wings hyaline.

Type—U. S. N. M., Cat. No. 20186. Single specimen.

Habitat—Redlands, Cal., 1913.

Lasiopogon drabicolium sp. nov. (Plate VIII, fig. 3).

♂, ♀. Length, 8–9 mm. Ground color black. Densely gray pollinose. The pollen of head and thorax with a yellowish tinge. A great deal of white pile on the body. Ocellar bristles black and white mixed and very slender. Occipito orbitals black. One black bristle above on second joint of antenna. The rest of the antennal bristles fine and white in color. Two very faint brown stripes on thoracic dorsum of ♀. Two dark brown widely separated stripes on thorax of ♂, wide at the shoulders and narrowing toward the center of the dorsum where it disappears. Pile of palpi white. In both ♂ and ♀ the pile of front is white and black mixed. Short white pile on thorax. Abdomen covered with short whitish oppressed pile, longer at lateral margins. The mystax black and white and quite heavy. Eighth abdominal segment of ♀ polished black. A circlet of black bristles on genitalia. Scutellum flat, with a semi-circular impressed line as in *arenicola*. Several spines on margin of scutellum, the stronger ones long, black and upcurving. Hypopygium black, slightly pollinose, and covered with white pile and black hair. Legs black, gray pollinose, with white pile and slender black bristles. Tarsi of ♂ dark reddish brown almost black in front. Tarsi of ♀ blackish. Wings grayish hyaline with brownish black veins. Venation normal, the anal cell closed. Anterior crossvein not much before middle of discal cell. In these specimens all the posterior cells wide open.

Type—U. S. N. M., Cat. No. 20183. One male and one female specimen.

Habitat—Redlands, Cal., 1913.

These small robberflies were collected on wild flowers, and one of them was observed capturing a small cecidomyiid.

Metapogon pictum sp. nov. (Plate IX, fig. 5).

♂. Length, 7 mm. General color black. First two segments of antennæ black, gray pruinose. Thorax grayish pollinose, the vittæ brown in color and coalescing. The brown markings vary in different specimens. Some of the spots are golden brown in color. In some specimens the brown markings do not extend to

the scutellum. Border of scutellum gray pruinose, yellowish in center. Abdomen yellowish gray pruinose, hind margins of all except last segment polished black, the last three narrowly. Anterior third of second segment polished black. Second, third, fourth, fifth, and sixth segments with a black spot on each side. The gray pruinose fasciæ on all the segments vary in size and shape, in all but the last segment running almost to the median line. The gray pruinose spots on the seventh segment are confined to the lateral margin. Meso, sterno, and pteropleuræ bare, and gray pruinose with golden brown spots. Scutellum rounded and with a subapical pair of stout bristles. Femora black, the tips of the middle and hind ones being gray pruinose in front. Knees dark reddish brown. Tibiæ and tarsi dark reddish brown. Legs very much darker beneath. White hairs on legs quite thick, the bristles strong and either brown or white. Halteres grayish brown, lighter at tip and base. Supra-alars reddish yellow, the rest of the thoracic bristles black. Antennal style about one third as long as third joint. Mystax mixed yellow and white. In two specimens the front pair of dorso centrals are partly reddish. Wings hyaline. Broad brown spots at base of discal, posterior and submarginal cells. Tip of wing brown. Genitalia polished black.

Type—U. S. N. M., Cat. No. 20184. Several paratypes in author's collection.

Habitat—East Highlands, Cal., February, 1915.

This species is quite close to *punctipennis* Coq., but the markings differ, and the spots of the wing are darker and more distinct. In *punctipennis* the tip of the wing is hyaline, and the base of the marginal cell has no brown color. The thoracic and scutellar bristles of *pictum* are black, those of *punctipennis* are yellowish. The tarsi of *pictum* are darker, and the knees black. In *punctipennis* the knees are red and the gray pruinose fasciæ on the abdomen are broader. A number of specimens of this new species were collected, most of the material being in the author's collection in California and not available for study. These small flies were collected on the dead twigs of sage brush (*Salvia mellifera*) and the wild alfalfa (*Lotus glaber*) so common in Southern California, and are not very quick on the wing.

Lestomyia montis sp. nov. (Plate IX, fig. 6).

♀. Length, 9 mm. Black or blackish in general color. Face black with white pollen on convexity. Mystax white. A black bristle on each side just above oral margin. Tuft of six black ocellar bristles. Yellowish white pile on each side of front. Antennæ black, gray pollinose. Four indistinct blackish stripes on dorsum of thorax. Gray and yellow pollen on thoracic dorsum. Fan-like row of bristles before halteres yellowish. Halteres yellowish. Abdomen black, gray pollinose. Black polished spot on each side of second, third, fourth, and fifth segments. Genitalia and most of sixth and seventh segments shining. Femora black. Tarsi brown. Femora red at tip and with a tinge of dark red color at base. Base and distal end of tibiæ black. Bristles on legs black. White bristles on coxæ. Thoracic bristles black and very long. Wings yellowish hyaline.

Type—U. S. N. M., Cat. No. 20187. One specimen.

Habitat—Bear Valley, Cal., June, 1913. Collected at an altitude of about 8,000 feet.

This species differs from *fraudiger* in the third joint of the antenna being more rounded. The front femora are black at the base.

Nicoces lomæ sp. nov. (Plate VII, fig. 1).

♂. Length, 11 mm. Ground color of thorax dark brown and black, thickly pollinose. Dorsum of thorax black, with a median narrow wedge of silvery pollen running to center of dorsum. Silvery pollen on sides of thorax just above dorso pleural suture and on pleuræ. Brown pollen on pleuræ and in front of scutellum. All abdominal segments shining yellowish red. The posterior margin of second segment of abdomen has a small lateral projection which is silvery pollinose above. Base of second segment shining black, and the narrow lateral margin darkened. Fifth abdominal segment not more than three times broader than long. Yellowish and silvery pollen on coxæ. Fifth and sixth segments bright silvery pollinose. Fourth segment slightly narrower than fifth. Abdomen with recumbent reddish yellow hair. Hypopygium small in type specimen. Face easily one-fourth entire width of head. Inner margin of eyes slightly converging near an-

tennae. Face and front flat and thickly brown and silvery gray pollinose. Two rows of long reddish brown bristles on oral margin, a few long white hairs above, extending to antennae. Ocellar bristles brown. Cilia of posterior orbit brown. Antennae black, gray pruinose. First two joints of antennae with brown bristles. One strong bristle beneath second joint. Third joint flat and slightly longer than first two joints together. Style rather slender acuminate, and less than half as long as third segment. Post-alars and supra-alars quite long and brown in color. White pile on scutellum and just in front of. Legs medium slender, rounded. Tibiae and tarsi very spinose. Femora hairy. Hind metatarsi with many short strong spines beneath. Hind femora slender on basal two-thirds and with a club-like thickening toward the end. Hind tarsi thick and heavy. Metatarsus almost as long as three following joints. Legs reddish yellow, the tarsi dark brown distally. Front femora dark brown. Bristles of legs reddish yellow and pile white. Wings elongate and variegated with blackish brown, basal third being hyaline. Tip of anal cell blackish, posterior cells in part blackish. Fifth posterior cell all black. Hyaline spot in marginal cell. Discal cell all dark.

Type—U. S. N. M., Cat. No. 20200.

Habitat—Redlands, Cal., April, 1914.

There are three paratypes in the U. S. N. M. collection. These are all males. Two are labeled "Los Angeles Co., Cal., Coquillett," and in these the abdomen is more of a reddish color than in the type. The other specimen is labeled "September, Los Angeles Co., Cal." and is smaller and lighter in color than the others, the abdomen being yellow. These specimens are probably faded to some extent but agree very well with the type. As in the described specimen the venter is brown with silvery pollinose areas, and is thickly dotted with small dark brown spots. The wings are marked as in the type but are more of a brownish color. The type was taken on a sandy plot of ground in the foothills south of Redlands, Cal.

This species is quite close to *abdominalis*, but does not have the tinge of red on the thorax. The last segment of the abdomen is narrower, and the bluish black color of the abdomen is confined to the base of the first and second segments. In *loma* the brown of the wings is cut off sharply and does not spread into the basal

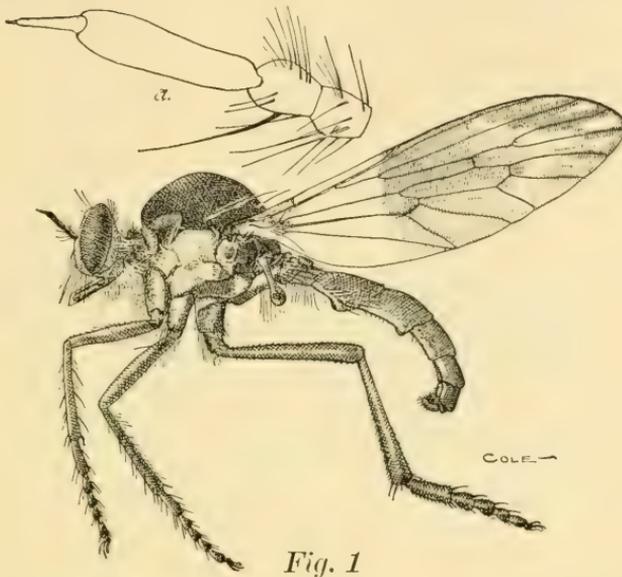


Fig. 1



Fig. 2

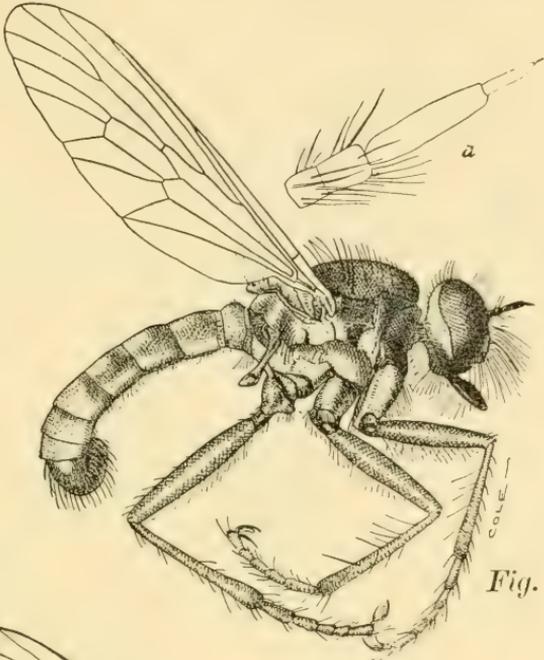


Fig. 3

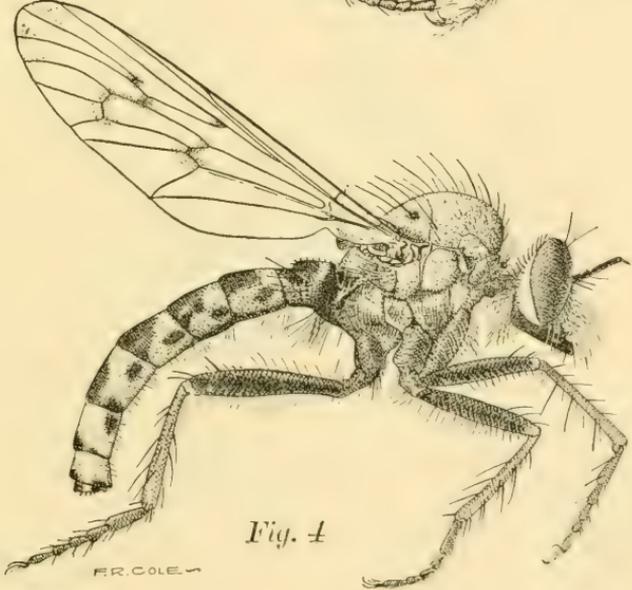
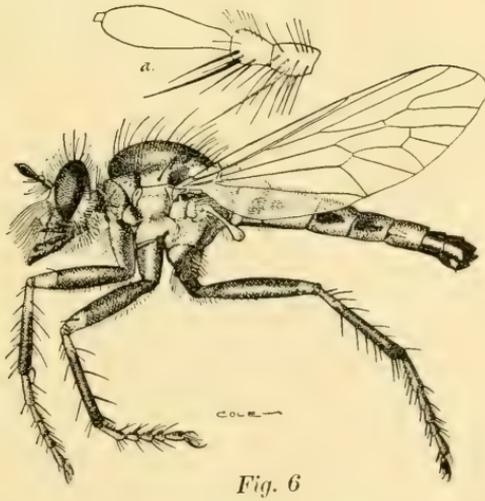
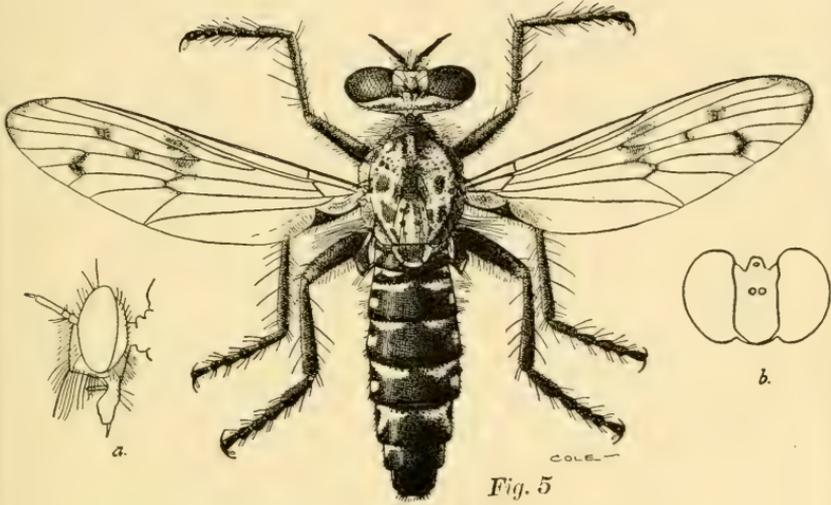


Fig. 4



part of the wing. The arista of the antenna is more slender and sharper at the tip. The thoracic dorsum is dull and pollinose in the new species and shining in *abdominalis*.

EXPLANATION OF PLATES

Plate VII.

- Fig. 1. *Nicocles lomæ* sp. nov.
a. Antenna, greatly enlarged.
Fig. 2. *Lestomyia redlandæ* sp. nov.
a. Antenna, greatly enlarged.

Plate VIII.

- Fig. 3. *Lasiopogon drabicolum* sp. nov.
a. Antenna, greatly enlarged.
Fig. 4. *Cophura highlandica* sp. nov.

Plate IX.

- Fig. 5. *Metapogon pictum* sp. nov.
a. Head from side.
b. Outline of head from front.
Fig. 6. *Lestomyia montis* sp. nov.
a. Antenna, greatly enlarged.

PLASTER-CASTING INSECT BURROWS.

By R. P. Dow,
New York City.

During my visits to J. Turner Brakeley, the hermit naturalist of Lahaway, N. J., we devoted much time to making plaster casts of burrows in the soil. Occasionally we tried the hole made by a snake, rat or even chipmunk, but for the most part our efforts were entomological. Great bare patches of sandy ground were, *par excellence*, insect homes. One hillside patch was the favorite haunt of Myrmeleon larvæ, their traps pitting every square foot of surface. The larvæ of Cicindela avoided such places, perhaps lest overpopulation should spell starvation. They had haunts of their own, some species, notably *C. lepida*, preferring absolutely

bare white sand, others, *modesta consentanea*, *generosa*, liking a surface sparsely covered with pine needles with slight growth of weedy grass. Almost all species are fond of the ruts in the wood-paths seldom rendered dangerous by passing tires or human feet. The "pepo" spiders were omnipresent, although seeking a space perfectly clear for at least a few inches adjacent to the burrow mouth. The various species of wild bees have a habitat of their own, on sloping land where the trees are sparse enough to admit sunlight and where the clay subsoil is confined many feet below the surface. Ant burrows were, of course, abundant and ubiquitous. Here and there, too, were many burrows of whose architects we never learned.

All methods of studying insects underground have their limitations, even their failures. On the whole, as satisfactory as any, has been the plaster cast. This was Mr. Brakeley's own invention and a matter of great pride to him. It has already (a score of years ago) been described in scientific literature, but is seldom practised, for although collectors are numerous, observers of nature are still rare. Besides, it sometimes calls for much labor and always for great delicacy of touch. The *Cicindela* burrow, from six to fourteen inches deep, presents no great task, but that of a *Colletes* bee, extending sometimes seven feet vertically, is a different matter. The late John B. Smith, for twenty-eight years a welcome and frequent visitor at Lahaway, dug out one or two, but for the most part he poured the plaster and sat smoking a cigar allowing the hermit to wield the spade until the pit resembled a small cellar. It was easy for me to do the same. In the first place Mr. Brakeley pronounced me an awkward bumpkin almost certain to smash the cast, and secondly he claimed to be fond of the exercise which kept his muscles limber.

The method in brief: equal volumes of water and plaster of Paris are mixed quickly in a pitcher. If salt water were used the plaster would "set" so quickly that it could not be poured. It has been suggested that by mixing a couple of tablespoonfuls of liquid glue with the water setting is retarded and the cast is stronger. Even at best the mixture must be poured quickly with unshaking hand, since it becomes too hard for use in less than twenty seconds. Three ounces of mixture will fill any *Cicindela* burrow. About four and one-half are needed for a "pepo" spider. A *Colletes* requires seven to nine ounces, the pouring of which

renders the delay of a second dangerous. If one would like to essay a nest of *Formica exsectoides* from which, say, three bushels of earth had been thrown out, it would take about ninety-six pounds of plaster solution. This is only practicable by mixing, say, eight ounces at a time and making nearly 200 separate pourings, trying each surface hole before pouring the second installment into the same hole. Thus the lowest levels would be filled and later superpositions become easier. The smaller species of ants can often be treated with a few ounces of plaster, but great care must be taken as most of the galleries are nearly horizontal and the entrance so small that the thread-like stream of plaster lacks the weight to force its way through the laterals. In such cases, and in *Cicindela* burrows built on a sidehill with horizontal entrance, I have succeeded by taking a wide bottomed paper cone into which a considerable weight of plaster furnished by gravity the force necessary to fill not only laterals on the level but even those which rise several inches.

A great obstacle to success is the resistance of the inhabitant. The body of the "pepo" is almost as large as the neck of its hole (Fig. 11).¹ When she perceives the stream of plaster coming she opposes her body to it, with the result that the plaster falls on all sides of her insufficiently liquid to rejoin, and thus the cast is almost always hollow, the victim either escaping or being buried near the neck. If there are young in the burrow she resists to the death. Everything in the burrow is caught in the surface of the plaster. The *Cicindela* larva opposes its chitinized head to the plaster flow in the same manner and often blocks it completely. In such case the luckless one is hauled up with head imbedded in solidified plaster, to be killed as an act of mercy. If the cast be wholly successful the larva is either forced to the bottom or remains imbedded in it, leaving the cast hollow beneath it.

Often there adheres to the bottom an oval film, not of spun silk nor discarded larval skin. I presume that this is the covering of a pupa of a parasite and that the pupa of the beetle is naked. Mr. Brakeley bred out some parasites, but he sent them, as was his custom, to some scientist and never got back either specimen or name.

Ants do not make the same sort of resistance. Those which do not escape via some other gallery are imbedded in the surface of

¹ All figures are reduced about one third from natural size.

the plaster with the eggs, grubs, inquilines and every other inhabitant of the nest. They do, however, gather to protect their queens. I have had nests in which queens were caught by the legs and their protectors kept the plaster from covering them. One such lay on my table for a month. Three surviving ants watched over the queen. I furnished food, so that it is probable that they died of old age, rather than starvation.

So much for the easy part, the pouring of the plaster. The novice, too eager to see his results, digs out the cast on the same day, and the wet plaster, still soft, breaks into a hundred pieces. The best way is to make a cast one week end and dig it out the next. Then you have a chance of getting your cast home.

The digging out requires first that a pit be dug alongside not closer than a foot from the vertical, otherwise the spade may strike the tube. This must be deeper than the estimated depth of the whole tube. An ordinary table knife is the next useful implement. Beginning near the bottom the earth must be dissected away, never roughly or hastily, until the plaster tube is detected. Then a still more delicate knife, or spatula, comes into play. The cast must be wholly freed from the bottom first. If near the top, it will surely fall and break. It is a veritable triumph, causing feelings of hilarious elation, to detect the bottom of a bee burrow and progress until all the clay cells containing the grubs, etc., are fully exposed for half their circumference, and then to uncover the tube, about as thick as a lead pencil and extending, may be, five feet without a branch.

There are no especial seasons for making casts. Burrows are clean mouthed and inhabited from early spring until frost time. It is well, however, to choose burrows which show fresh earth around them. After every rain the occupant has to clean house, and the result invariably shows. Surface sand burns white. At a depth of six inches it is almost always colored yellow by iron oxides. The yellow upcasts betray the situation. The bees are especially vexatious. The female often digs a score of holes before adopting one permanently. I have watched a species of gray bee flitting and lighting for hours. She kicked away soil with hind legs with marvelous rapidity, until in fewer than twenty seconds she would be entirely out of sight. If she encountered a pebble she abandoned the hole, or backed out with pebble held by her

four hind legs, locomoting with the forward pair. She abandoned hole after hole without visible reason. I once filled sixty such burrows without finding one unabandoned. In this case, as the soil was "made" on the seashore by a sand pump, fresh diggings could not be distinguished.

But, for the present, the matter under consideration relates to *Cicindela*. The illustrations are crudely drawn from actual casts and the identification of species is made *from a similar burrow*. This is accomplished by putting a wire net over a burrow during pupal season and catching a freshly hatched adult. The task is not easy in case of the supposedly two brooded species. Many, perhaps most, of these live in the larval state into the second year. Of *C. lepida* I can be certain, for I have watched them in a territory of my own discovery on Brakeley land. Mr. Brakeley had previously taken a few specimens over his 335 acres, and I found the colony, clustering around a spot where there were the remains of an Indian campfire on the dunes, and where I found also beautiful arrow and spear heads. *C. lepida* and the Delaware Indians camped on the same spot. On July 18, 1915, I saw *C. lepida* scampering by the thousands; their flight is very short, never over six feet, and they run more quickly than *dorsalis*. As I had no net (the mercury was 90° in the shade, and on this hot sand dune 130° or over) I took only a dozen with bare hand, stalking them on knees and the other hand. Their larval burrows could be seen by the thousands. The description given by Mr. Wenzel, quoted from J. B. Smith's list of the Insects of New Jersey, is correct so far as it goes. But the insect is scarce at Jamesburg and only burrows under grass tufts were found. The species does not choose such sites rather than another. The burrows were at least one per yard of dune and the number under grass tufts about in ratio with the area of grass tuft *vs.* clear open sand. The entrance hole has a characteristic shape, which, once seen, can never be mistaken.

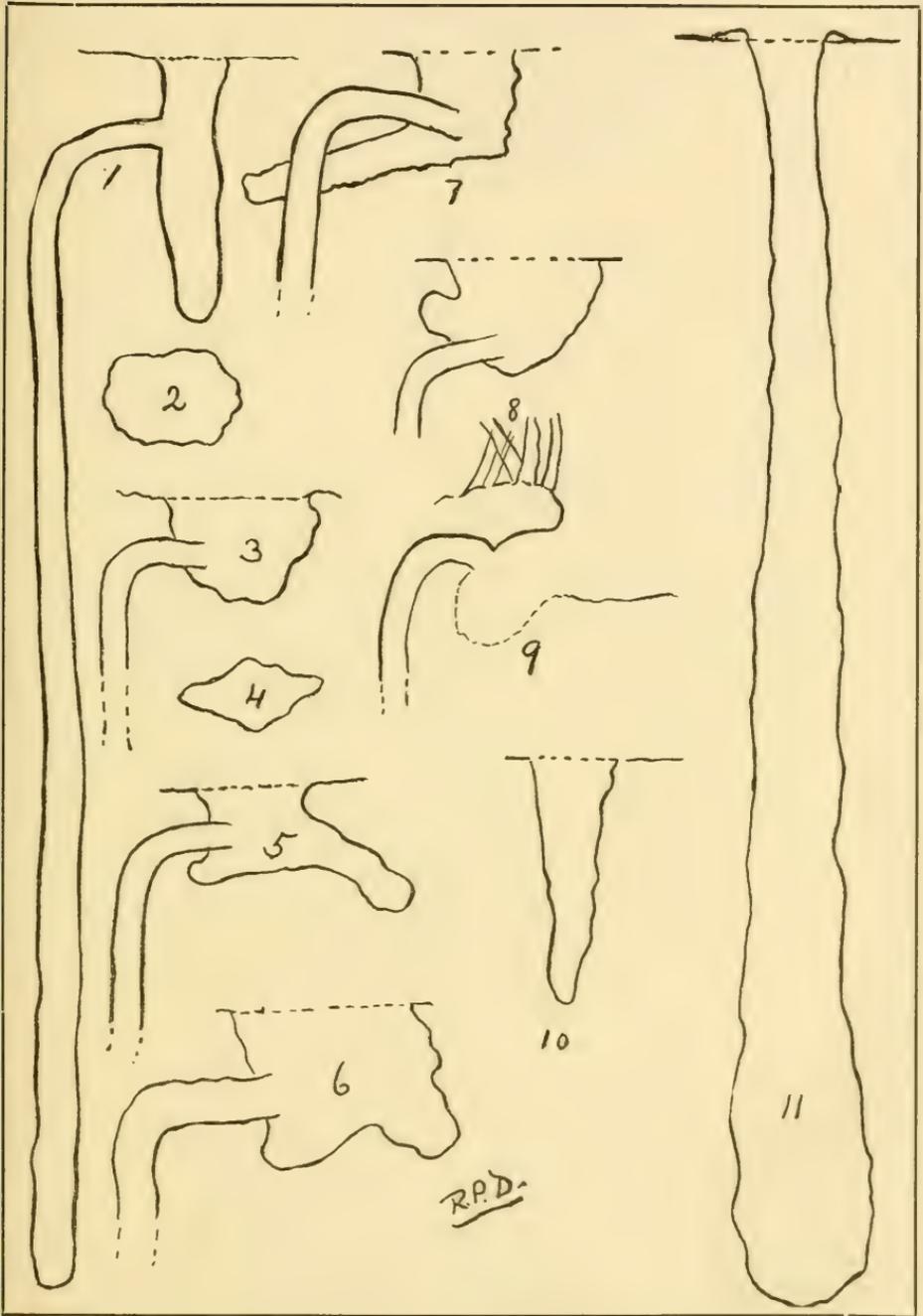
Fig. 2 shows the shape of the surface aspect of most *Cicindela* burrows. Fig. 4 shows *C. lepida*. Fig. 5 is a cast of *C. lepida* burrow.

All *Cicindela* burrows that I have seen agree in general plan. They consist of a pit from which a long, slender tube extends, at first, not far from horizontal for a distance slightly shorter than the

body of the larva. The insect lies habitually with its head at the opening of the tube and presumably with the abdominal hump catching at the corner. Its sensory organs are so keen that it retires into its tube before an observer can look in. After many minutes of quiet watching one may see it no longer alarmed, and back in place. The burrows exhibit three general types, each species never departing from its own. Fig. 1 is that of *C. punctulata*, the simple burrow, depending on its depth for victims. Apparently the larva has to leave its tube to devour its prey. Fig. 2 is the surface aspect, but applies equally to most other species, and is given here merely for contrast to the aspect of *C. lepida*. Fig. 10 is an enigma to me. It looks like a *C. punctulata* burrow without trace of a tube. I have burrows of young larvæ, in which the tube is scarcely 3-32 if an inch in diameter. It may not be argued that the burrow, Fig. 10, indicates that the trap is dug before the tube. On the contrary, the tube is dug and enlarged as the larva grows.

Figs. 3 and 8 are of the no-trap plan. One is typical of what I assume to be *C. modesta*. The other has a trap slanting upward, useless as a prey-catcher. I assume that this was made by the enforced removal of a pebble. Fig. 6 is the double-trap type, which I know to be characteristic of *C. tranquebarica*. Here the victim has the choice of two shallow pits to flounder in while the tiger leans out of its tube devouringly. The fourth type is the single-trap, the pit generally of some length and slanting not far from the horizontal. Fig. 5 is the typical *C. lepida* burrow on open sand. An insect having fallen therein would naturally run for safety into the *cul de sac*. Fig. 9 is a *C. lepida* burrow under a grass tuft. The *cul de sac* meets requirements of environment, but is much broader. Fig. 7 is an aberration or some species not identified. It was larger than and its surface different from that of *C. lepida*. I suspected *C. consentanea* from environment, but lack evidence. The *C. sexguttata* tribe does not generally burrow in open spaces.

Two common species, *C. rugifrons* and *C. dorsalis*, are still to be plaster-casted. I can safely predict that their burrows will be found to have specific distinctive characters. In fact, I may predict that every species of *Cicindela* can be differentiated by its larval burrow.



Dow—Plaster Casts of Insect Burrows.

SOME NEW ENGLAND SYRPHIDÆ.

BY CHARLES W. JOHNSON,
Boston Society of Natural History.

Microdon tristis Loew.

The variations of this species are not clearly defined and it is difficult to separate them with the descriptions available. With a series of thirty-seven specimens before me they seem to be readily separated into two species by the form of the scutellum. In *M. tristis* the scutellum is rather plane or flattened and somewhat rugose, angulate and emarginate, with the spines at the extreme angles, the pile thin so that the outline of the scutellum can be seen distinctly.

The other form has the scutellum noticeably convex, the margin rounded and scarcely angulate, the small spines more approximate and hidden in the long dense pile. The tarsal joints are slightly more dilated and the abdomen of the females are as a rule much broader. For this species the name *M. cothurnatus* Bigot can be used, as I see no character to separate the eastern and western forms. Bigot's type was from Washington and specimens from Seattle agree with his description. It is more northern in its distribution than *M. tristis* although both are found in southern New England, northern New Jersey and Pennsylvania. Specimens before me show the following distribution: Capens, Moosehead Lake, Me., July 15; Bretton Woods, June 24, and Halfway House, Mt. Washington, N. H., July 6 (C. W. Johnson); Kearsarge, N. H., July 2, and West Chop, Mass., July 4 (A. P. Morse); Newton, Mass., bred from pupæ (F. C. Bowditch); Framingham, Mass., pupa, April 19, imago, May 12 (C. A. Frost); Lyme, Conn., pupa, April 30, imago, May 26 (A. B. Champlain); Darien, Conn., (♂, ♀) June 12; Newark, N. J., June 14 (C. W. J.) and Lehigh Gap, June 28 (C. T. Greene).

M. tristis was described from Virginia. I have specimens from Pennsylvania, New Jersey, Connecticut, and as far north as Great Barrington and Auburndale, Mass.

Microdon megalogaster Snow.

One specimen of this species was collected by the writer at Darien, Conn., June 12, and four specimens at Great Barrington, Mass., June 16; the latter were captured on or flying around an ant hill.

Sphærophoria.

The variations in the species of this genus are very difficult to define, while the great difference in the sexes also adds to the confusion. In the eastern United States and Canada there are apparently four species, which may be briefly tabulated as follows:

Table of Species.

- | | |
|--|----------------------------|
| 1. Lateral thoracic stripe ending at the suture | 2 |
| Lateral thoracic stripe continuous | 3 |
| 2. Face entirely yellow, abdominal bands beyond the second segment present in the female, usually obsolete or wanting in the male, length 8 mm. | <i>cylindrica</i> Say. |
| Face with a wide black stripe, abdominal bands similar in both sexes, length 8 mm. | <i>novæangliæ</i> sp. nov. |
| 3. Abdomen in the male with a series of yellow spots, in the female with widely interrupted bands narrowly connected with the lateral margin, length 8 mm. | <i>strigata</i> Staeg. |
| Abdomen with bands on the first four segments, the others irregularly marked with black, length 8-10 mm., | <i>scripta</i> Linn. |

Sphærophoria novæangliæ sp. nov.

S. cylindrica var. (*d*) Williston, Synopsis N. Amer. Syrphidæ, p. 105, 1886.

♂. Face and front pale yellow, a broad stripe extending from the mouth to the base of the antennæ, a small spot above the base of the antennæ and the vertex black, basal two-thirds of the proboscis black, the rest brown, antennæ yellow, upper edge of the third joint and arista brown. Thorax dark greenish black, shiny, the yellow lateral stripe extending only to the suture, pleura black, a small spot above the front and middle coxæ and a large spot in front and behind the base of the wing and the scutellum pale yellow, hairs of the latter black. Abdomen black, the broad yellow band on the second segment slightly wider at the middle becoming gradually narrower towards the lateral margins, band on the third segment double the width in the middle as at the lateral margins,

fourth segment with only a wide dorsal triangle, the lateral extensions being either very narrow, obsolete, or wanting, the fourth and fifth segments shiny, with the margins strongly tinged with reddish brown, all of the segments having a very narrow lateral margin of yellow, genitalia reddish, venter yellow, legs yellow, coxæ livid or slightly marked with brown, front and middle femora with a small spot above near the base and tarsi brown, posterior femora with a subapical and the tibiæ with an apical band of black, with the entire tarsi also black. Halteres yellow. Wings hyaline slightly tinged with brown, stigma yellow. Length, 7.5 mm.

♀. Front yellow, with a wide black stripe about one third its width extending from the black of the vertex to the base of the antennæ, face and thorax as in the male. Abdomen bluish black, shiny, the broad, even bands of the second, third and fourth segments narrowly margined with opaque black, fifth with lateral spots and the narrow posterior margins of both the fourth and fifth segments yellow. Legs including the coxæ pale yellow, the tip of the posterior tibiæ and all of the tarsi blackish. Length, 7 mm.

Fourteen specimens. Holotype, Princeton, Me., July 12, 1909. Allotype, Shackford Head, near Eastport, Me., July 16. Eight paratypes, Princeton, Eastport, Machias (July 19), and Capens, Moosehead Lake, Me., July 17, 1907. Hanover, July 5, 1908; Bretton Woods, June 25, 1913, and Chester, Mass., May 26, in the collection of the Boston Society of Natural History. Two paratypes, Eastport (♂), Bretton Woods (♀), in the Museum of Comparative Zoölogy, and two from Capens, Me., and Bretton Woods, N. H., in the author's collection.

The species is readily distinguished by its black facial stripe. In some specimens the fifth, fourth and part of the third abdominal segments are somewhat reddish.

Sphærophoria strigata Stæger.

This species is common in Labrador and Newfoundland. In New England it has only been collected at Hampton, N. H., May 20, 1907, by Mr. S. A. Shaw.

Melanostoma.

The species of the *mellinum* group of the genus *Melanostoma* are even more difficult to separate than the species of the genus *Sphæro-*

phoria. This is due not only to a still greater diversity in the color markings of the sexes but to the similarity of the females of all the species of this group. That this trouble is not confined to America is apparent when we consult the works of European dip-terists.

M. mellinum L. and *M. scalare* Fabr. have been united and again separated either as varieties or species. Verrall, in his work on the British Syrphidæ, gives a lengthy account of the synonymy and variation of the two forms, and says: "Both species are common and are soon recognized by collectors, but melanoid forms of the female are as common as in *M. mellinum* and become veritable stumbling blocks; the absence of eye-margins separate them from *Chilosia* while the pale antennæ and legs separate them from most all species of *Platychirus* and the absolutely blackish face from all species of *Syrphus*."

In the mélange I have been unable to recognize *M. scalare* in America. *M. mellinum* is found throughout the greater portion of the United States and Canada, a common and easily recognized species in most localities. In the material collected on Mt. Washington, N. H., however, this is not the case. Here there are three marked forms, the males of which are readily separated, but the females are often very difficult to distinguish. One of these has been referred to *M. angustatum* Will. by Coquillett in Mrs. Slosson's list (Ent. News, Nov. 1896, p. 263). The species was described by Dr. Williston from Washington in 1886 (Synop. N. Syrphidæ, p. 50). The Mt. Washington specimens are smaller (7 to 8 mm.) and the antennæ and legs are much darker than specimens from Seattle, Wash. A specimen from Hanover, N. H., and one from Mt. Equinox, Vt., resemble more closely in this respect the western form. The second form is common at an elevation of from 2,000 to 4,000 feet, often associated with *M. angustatum*, and may be characterized as follows:

Melanostoma montivagum sp. nov.

♂. Face shining blue-black, front bronze, antennæ black, base of the third joint slightly reddish. Thorax greenish-black shining. Abdomen black, shining, second segment with two small, obscure, yellowish spots, third and fourth segments with dull yellow subquadrate spots. Legs black, the tips of the anterior

and middle femora and bases of the tibiæ yellowish, the remainder of the tibiæ and the tarsi brownish. Wings infuscated. Length, 7 mm.

♀. A specimen taken at the same time and place as the male described above has the front and middle legs brown with the tips of the femora and bases of the tibiæ yellow, posterior legs black with the bases of the femora and tibiæ yellow, the yellow of the antennæ covering a large portion of the third and part of the second joint, the spots on the second segment of the abdomen very small, those on the second and third dull yellow and the triangular outline poorly defined. Wings equally dark as the male but this does not hold true in all of the specimens referable to this form.

Twenty-two specimens. Holotype and allotype, Halfway House (4,000 feet), Mt. Washington, July 6, 1914. Specimens were also collected near the Glen House, on the carriage road at about 3,000 feet, and in Tuckerman's Ravine. A specimen was also taken by Mrs. Slosson at the summit. The latter specimen was in the U. S. National Museum and was kindly loaned to me by Mr. F. Knab. It was marked "*Melanostoma* n. sp." in Mr. Coquillett's handwriting. Types and ten paratypes in the collection of the Boston Society of Natural History. Other paratypes in the Museum of Comparative Zoölogy, U. S. National Museum, Academy of Natural Sciences, and the author's collection.

Two of the paratypes (♂, ♀) in the Society's collection are melanic or without abdominal spots. The specimens from the Glen House referable to *M. mellinum* are slightly smaller with wings and legs somewhat darker than in the typical form. They seem somewhat intermediate in character, but I have not sufficient material to prove this; whether these mountain forms will prove to be only extreme variations or subspecies of the common *mellinum* remains to be seen. In any event names are necessary to avoid confusion.

A female specimen, a shiny, dark blue form, was also found at the Halfway House, July 6, 1914. With the limited material, I cannot separate it from *Melanostoma concinnum* Snow.

***Merodon equestris* Fabr.**

Specimens of this species from both eastern and western Massachusetts would seem to indicate that the species was established,

and not the result of recent importations of bulbs. A specimen from Blue Hill, June 5, 1910, represents the var. *narcissi* Fabr., a specimen from Mr. J. G. Jack, the var. *transversalis* Meig. and one collected by the writer near Great Barrington, Mass., June 16, 1915, the typical *equestris*.

Xylota nemorum Fabr.

This species has been taken by the writer at Chester, Mass., August 4, 1911, and at the Halfway House, Mt. Washington, N. H., July 6, 1914.

Eumerus strigatus Fallen.

This species has recently been taken by Mr. R. T. Webber, at Melrose Highlands, Mass.

Syrphus xylotoides sp. nov.

♀. Face yellow, covered with a white pollen which extends as a wide margin on each side of the front to the vertex, leaving wide frontal stripe of shining black, vertex facial stripe, and a stripe on the cheek also black, hairs on the front and vertex black, on the face and occiput white, eyes hairy, antennæ black. Thorax bluish, shining, slightly pollinose, with a large white pollinose marking on the sides in front of the suture, pleura whitish pollinose with long white hairs, scutellum shining blue-black, margin yellowish. Abdomen long, narrow, cylindrical, black, two large light yellow quadrate spots occupy most of the second segment leaving only a narrow dorsal line and a wide posterior margin, third segment with two yellow spots near the base, fourth and fifth segments greenish, shining, the former with two small grayish pollinose spots near the base. Legs, the front and middle yellow, base of the femora and a band on the tibiæ and tarsi blackish, the posterior legs except the base of the tibiæ black. Halteres yellow. Wings grayish hyaline. Length, 11 mm.

Three specimens. Holotype and paratype, Great Barrington, Mass., June 16, 1915, in the collection of the Boston Society of Natural History. One paratype, Amherst, Mass., in the collection of the State Agricultural College.

PARASITES OF *ARCHIPS CERASIVORANA* FITCH.

While collecting at Bennington, Vt., from June 18-24, 1915, I found the webs of the Cherry-tree Ugly-nest Tortricid (*Archips cerasivorana*) quite abundant on the wild cherry along the hedge rows. Bringing home six of the nests to ascertain to what extent they were parasitized, the following insects emerged between July 6 and 12. Moths 302. Dipterous parasites: *Dichatoneura leucoptera* Johns. 104 and *Neopales tortricis* Coq. 2. Hymenopterous parasites: *Bassus agilis* Cress. 6, and *Labrorychus prismaticus* Nort. 26. The latter was also bred in considerable numbers from the same species at Winchendon, Mass., by the late Dr. F. W. Russell. *Itopectis (Pimpla) conquistator* Say. was bred from nests taken by the writer at Milford, N. H., July 5, 1914. I am indebted to Mr. H. L. Viereck for the determination of the Hymenopterous parasites.

C. W. JOHNSON.

A NEW ANT OF THE GENUS *MESSOR* FROM COLORADO.

BY HAZEL ANDREWS,

University of Colorado, Boulder, Colo.

A few years ago Prof. T. D. A. Cockerell collected four workers of this ant at Glenwood Springs, Colo., not noticing at the time that they were anything unusual. Recently, while working on the genera *Messor*, *Aphanogaster*, and *Pogonomyrmex*, we found these specimens mixed with the series of *Pogonomyrmex occidentalis* which they superficially resemble. It was evident that they could not belong to *Pogonomyrmex*, on account of the impressed dorsal suture and other characters, and on looking up the literature we failed to find any similar species described. Dr. W. M. Wheeler, who kindly examined a specimen confirms the species as new, and considers that it must be referred to *Messor* rather than *Aphanogaster*. He further notes that it presents some characters suggesting that it may, in a certain sense, be regarded as intermediate between *Messor* and *Pogonomyrmex*.

Messor lobognathus sp. nov.

Worker: Length, about 6 mm. Head quadrate, about as wide as long, excluding mandibles. Posterior corners of head rounded, vertex almost straight, sides almost straight and parallel. Surface of head with sparse hairs, rugose, with rugæ posteriorly divergent; interrugal spaces distinctly reticulate. Clypeus very short with rugose surface, ridges irregular; shallowly emarginate anteriorly. Mandibles stout and convex, peculiarly lobed apically, with two large apical teeth and five to seven rudimentary teeth; surface coarsely striated. Eyes moderate, at sides of head, about half way between clypeus and vertex. Antennæ 12-jointed, hairy; scape compressed and dilated at base, hardly extending beyond corners of head; last four joints of funiculus incrassate, but hardly form-

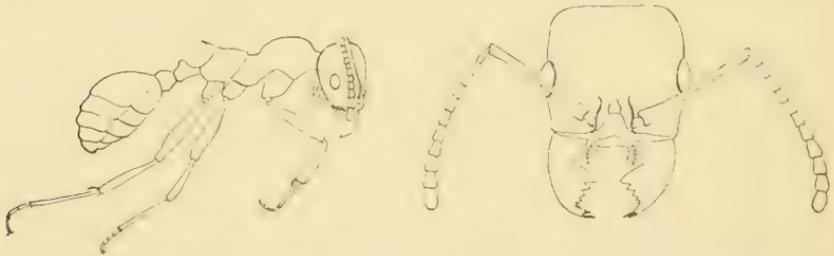


Fig. 1. *Messor lobognathus* sp. nov. Lateral view and anterior view of head.

ing a distinct club. First joint longer than second, but not twice as long. Pronounced beard of recurved hairs, as in *Pogonomyrmex*. Thorax slender, irregularly rugose, sparsely clothed dorsally with long, glistening, light yellow hairs. Pro- and meso-notum convex. Thoracic dorsum deeply impressed at mesoepinotal suture; mesoepinotal suture distinct. Spines of epinotum acute, much longer than broad at base; divergent; striations radiating from the base; infraspinal cavity smooth. Petiole punctate with a few hairs; longer than wide; ventral surface straight in profile; a high posteriorly placed superior node; apex broader than base; posterior slope abrupt; anterior slope long and gentle. Postpetiole narrow at base, a little longer than wide when seen in profile; superiorly convex and sides rounded. Thus the postpetiole is globose. Gaster shining, scarcely larger than head, with delicate microscopic reticulate sculpture on apical part of segments. Sting vestigial. Legs quite long; posterior tibial spurs spinulose.

Bright rufo-fulvous; tip of gaster light brown; clypeus, funiculus, clypeus and borders of mandibles brown.

Glenwood Springs, Colo., altitude 5,750 feet (Cockerell).

Superficially the ant resembles *Pogonomyrmex occidentalis* Cresson, but, as noted by Dr. Wheeler, the impressed thorax, shape of petiole, vestigial sting and non-pectinated posterior tibial spurs put it in the genus *Messor*. From the shape of the mandibles the ant evidently stores seeds. This ant differs from the other species of *Messor* in the fulvous red color and in having the peculiar apical lobe on the mandibles. The antennal scapes are more dilated at the base than in other species.

A COMPARATIVE STUDY OF THE MAXILLÆ OF THE ACRIDIIDÆ (ÆDIPODINÆ AND TETTIGINÆ), PHASMIDÆ AND PHYLLIIDÆ.¹

BY G. C. CRAMPTON.

In attempting to determine the phylogeny and relationships of the Orthoptera-like insects, it has seemed advisable to make a comparative study of the various parts of the head (*i. e.*, the trophi, antennæ, etc.), of the thorax (*i. e.*, the sclerites, appendages, etc.), and of the abdomen (*i. e.*, the cerci, genitalia, etc.); and the present paper dealing with four of the types of maxillæ found in the Orthopteroid forms is offered as one of a series in which the trophi of these insects are discussed, in addition to the various other structures mentioned above. Since no detailed descriptions or figures of the maxillæ of the Phylliidæ, Phasmidæ, and Tettiginæ have been published (so far as I am aware), and since the general scheme of the maxillary structure is practically the same in all Orthopteroid insects, it has seemed preferable to begin the series of articles on the trophi, etc., of the Orthoptera-like forms, with the description of the maxillæ of the above mentioned insects.

The accompanying figures of the maxillæ are necessarily somewhat diagrammatic, since certain structures shown in the figures (*e. g.*, the basal portions of the cardo, etc.) would not be completely visible if sketched from the angle at which the remainder of the figure is drawn. Furthermore, lack of material preserved in al-

¹ Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

cohol has made it necessary to draw the figures from dried specimens—which are always more or less distorted. In the main, however, it will be found that the relations of the parts are represented approximately correctly. Since the specimens were studied from various angles, it was found necessary to examine them submerged in a liquid medium (rather than mounted on slides) and a binocular was found much more satisfactory than the compound microscope, for this purpose.

In all of the figures, the insect's left maxilla has been depicted, and all views represent that surface of the maxilla which is normally directed posteriorly when the maxilla is "*in situ*"—or attached to the insect's head.

In Fig. 1 (Plate XI) is shown the maxilla of a species of the Phasmid *Anisomorpha* (probably *Anisomorpha buprestoides*), while that shown in Fig. 2 is of a species of Phyllium (probably *Phyllium scythe*). Fig. 4 is based upon the condition found in the maxilla of *Tettigidea parvipennis*, and that of a species of *Paratettix*. Fig. 3 represents the maxilla of *Dissosteira carolina*, and in this figure the outline of the distal segment of the galea is somewhat distorted, due to the fact that the specimen was flattened out to a greater extent than in the other insects figured.

As may be seen from the accompanying figures, the *cardo*, or basal portion of the maxilla (*co*, of all figures) is divided into two subdivisions in the Orthoptera-like insects. These two subdivisions are the *veracardo* (*vc*) and the *juxtacardo* (*jc*). The basal portion of the *juxtacardo*, *jc*, is not clearly visible until the maxilla is turned base upward, at a considerable angle. This region of the *juxtacardo* bears a prominent articulatory condyle, *ac*, to which there is usually attached a slender chitinous "muscle tendon." This maxillary condyle tendon is not shown in Figs. 1 and 2, but is colored black in Figs. 3 and 4. The *juxtacardo* of Phyllium and the Phasmids (Figs. 1 and 2, *jc*) is much broader in comparison with the *veracardo* (*vc*) than is the *juxtacardo* of the Acrididæ here figured.

The *stipes* (*st*, of all figures), like the *cardo*, is also divided into two principal subdivisions, the *juxtastipes* (*js*) and *verastipes* (*vs*),¹

¹ The designations *eucardo*, *eustipes*, *paracardo* and *parastipes* would be somewhat briefer and more euphonious than *veracardo*, *verastipes*, *juxtacardo* and *juxtastipes*; but, since *cardo* and *stipes* are Latin terms, it is preferable to combine them with "vera" and "juxta" rather than with the Greek "eu" and "para."

which correspond in a general way to the two subdivisions of the cardo. The juxtastipes of *Phyllium* (Fig. 2, *js*) is much broader than in the other insects here figured, and the verastipes (*rs*) is divided into an upper and lower region in this insect. The lower region (*pf*) corresponds in a general way to the palpifer of the other insects, but is not strictly homologous with the palpifer.

A comparison of the maxillæ of certain immature Plecoptera, Ephemera, and of certain Thysanura, with the first and second maxillæ of such centipedes as *Scutigera* and *Scolopendra*, would indicate that the maxillæ of an insect is compound, and probably represents a combination of the first and second maxillæ of *Scutigera*, etc. I am not yet prepared to say, however, that the line of demarcation between the juxtacardo and veracardo, which is continued upward between the juxtastipes and verastipes, represents the line of union of the basal portions of the two components of an insect's maxilla—although the possibility of such a condition would bear further investigation.

The *palpifer* (*pf*) or palpus-bearing sclerite, is rather indistinctly demarked in the insects under consideration. It is practically always bent backward, or folded around to the other side in such a fashion that the palpus (*pp*) is borne on the surface of the maxilla opposite to the one shown in the drawings.

The *palpus* (*pp*) is composed of five segments, and, in the insects under discussion, the two basal segments are subequal in size, but are much shorter than the three terminal ones. The three terminal segments of the palpus may be subequal in size, or the intermediate one may be shorter than the other two.

The segments of the maxillary palpus of *Phyllium* (Fig. 2, *pp*) are much flattened, or depressed, in conformity with the general flattened condition of the entire body of this insect. The two distalmost segments of the palpus of the Tettiginæ (Fig. 4, *pp*) are also considerably flattened, but this is apparent only after turning the palpus around to a much greater angle than that at which the remainder of the figure was drawn. The end segment of the palpus of *Dissosteira* (Fig. 3) bears a well marked terminal sensory area demarked by a dotted line in the drawing. This area is well provided with sensory setæ whose chief function is doubtless gustatory.

The *galea*, or external lobe of the maxilla, is composed of two segments—the *basigalea* (*bg*) or proximal segment being much shorter, and less distinctly demarked, than the *distigalea* (*dg*) or distal one. The distigalea may overtop the inner maxillary lobe, or lacinia (*la*), as is the case in three of the insects here figured (Figs. 1, 2 and 3), and this condition is characteristic of most of the insects related to the phasmids. The Tettiginæ, however (Fig. 4), seem to be an exception to the rule, and in this respect resemble certain Gryllidæ.

The distal segment of the galea (distigalea) of the Phasmids bears a well developed lobular process, the *galealobulus* (Fig. 1, *gl*) which may be homologous with the basal lobe of the bilobed galea of certain Hymenoptera. The lobule is poorly developed in Phyllium (Fig. 2, *gl*) and is absent in the Acrididæ here figured.

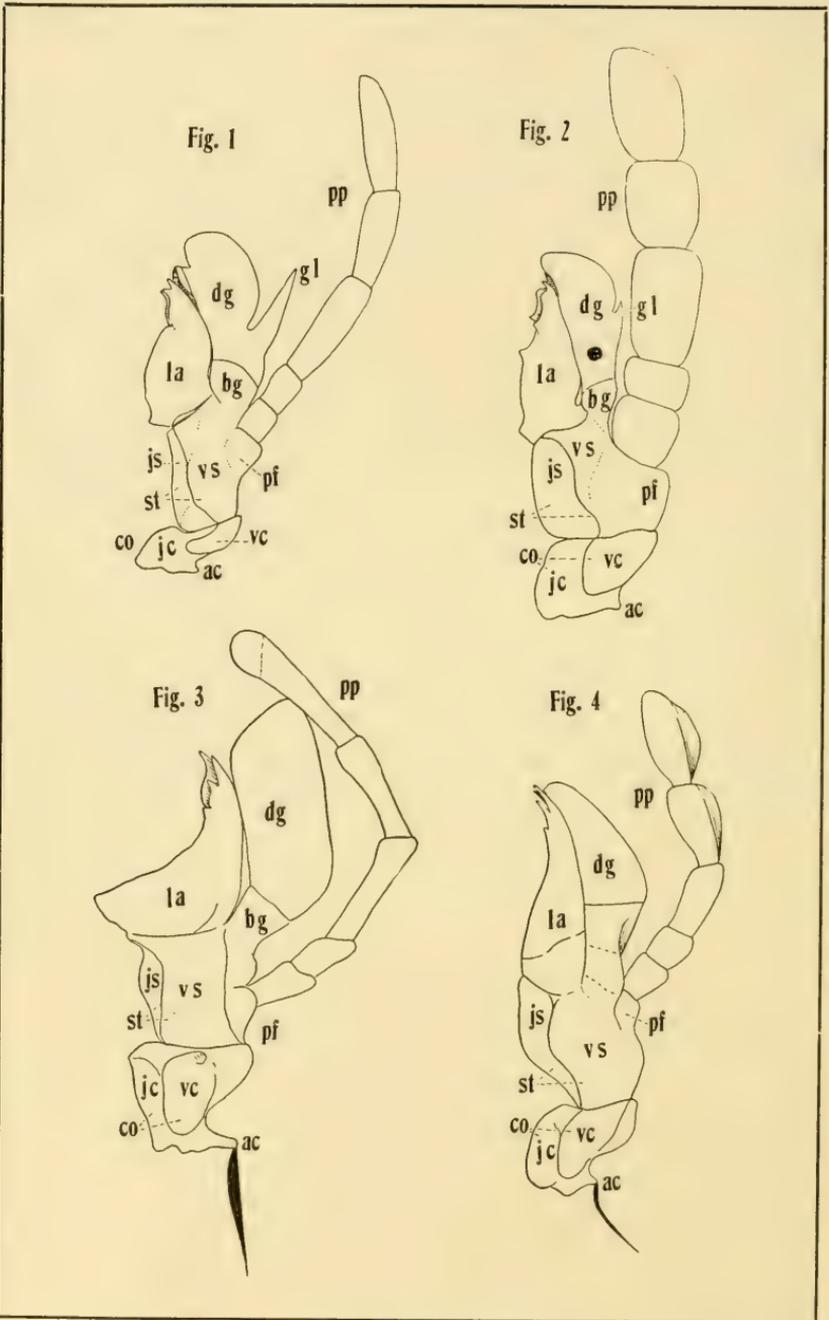
The *lacinia* (*la*) or inner maxillary lobe is more nearly vertical in outline in the Tettiginæ, Phylliidæ, and Phasmidæ (Figs. 4, 2, and 1), while in *Dissosteira* (Fig. 3) the inner margin of the lacinia sweeps downward in a broad curve to the projecting inner basal angle, thereby making the lacinia of this insect much broader at the base than is the case with the other insects under discussion. The inner basal angle of the lacinia of the Phylliidæ and Phasmidæ (Figs. 2 and 1) is much more protuberant than in the maxilla of the Tettiginæ (Fig. 4), although in the latter insects also a projecting basal portion is to be seen if the maxilla is turned much further around than in the view shown in the drawing. In *Dissosteira*, the surface of the inner basal angle of the lacinia is densely beset with rounded microscopic scales.

Along the inner margin of the distal portion of the lacinia, there occur several tooth-like projections, or *laciniadentes*. The function of these "teeth" is apparently that of holding, and possibly of assisting in comminuting the food. In the insects related to the Phasmids, these laciniadentes are arranged in two rows, or are separated by a vertical groove into two sets, although there is usually but one terminal "tooth."

The principal conclusions here reached, concerning the maxillæ of the Acridiidæ, Phylliidæ and Phasmidæ, may be briefly summarized as follows:

The *cardo* is composed of two subdivisions, the *juxtacardo* and *veracardo*.

The *stipes* is composed of two principal subdivisions, the *juxtastipes* and *verastipes*.



CRAMPTON—Maxilla of Orthoptera

The basal two of the five segments of the palpus are subequal, and are much shorter than the three distal ones, which are usually subequal in length.

All of the segments of the palpus are greatly flattened in the Phylliidae, while in the Tettiginæ, the distal two are somewhat flattened.

The galea is composed of two segments, and the distal one overtops the lacinia, save in the Tettiginæ.

The distal segment of the galea of the Phasmidæ bears a well developed lobular process (galealobulus) which may represent the basal lobe of the bilobed galea of certain Hymenoptera. It is but feebly developed in the Phylliidae, and is absent in the Acridiidae.

The tooth-like processes of the lacinia (laciniadentes) occur in two rows, thus differing from those of many other Orthopteroid insects in which they occur in a single row.

The maxilla of the Phylliidae resembles that of the Phasmidæ rather more than it resembles that of the Acridiidae.

The maxilla of an insect is possibly compound, and may represent the combined first and second maxillæ of *Scutigera*, and other centipedes.

EXPLANATION OF PLATE XI.

Fig. 1. Posterior view of the left maxilla of a Phasmid.

Fig. 2. Posterior view of the left maxilla of *Phyllium*.

Fig. 3. Posterior view of the left maxilla of *Dissosteira*.

Fig. 4. Posterior view of the left maxilla of a Tettigid.

ABBREVIATIONS.

ac = articulatory condyle of cardo.

bg = basal segment of galea (basigalea).

co = cardo.

dg = distal segment of galea (distigalea).

gl = lobular process of galea (galealobulus).

jc = proximal subdivision of cardo (juxtacardo).

js = lesser subdivision of stipes (juxtastipes).

la = lacinia.

pf = palpifer.

pp = maxillary palpus.

st = stipes.

vc = distal subdivision of cardo (veracardo).

vs = principal subdivision of stipes (verastipes).

TABLE OF MALES OF THE NORTH AMERICAN SPECIES
OF THE GENUS *ASYNDETUS* WITH DESCRIPTIONS
OF SIX NEW SPECIES.

BY M. C. VAN DUZEE.

Buffalo, New York.

This little genus is distinguished from *Diaphorus* by the latter part of the fourth vein being evanescent, and the costa ending at the tip of the third vein. The males of most of the species have conspicuous bristles at the tip of the abdomen as in *Diaphorus*.

The species described below are mostly from the western states where it is likely many new forms will yet be found.

Table of Males.

- | | |
|---|--------------------------|
| 1. All tibiæ partly or wholly yellow | 2 |
| Hind tibiæ black | 5 |
| 2. Fore tarsi modified, hind tibiæ blackened at base | 3 |
| Fore tarsi normal, hind tibiæ blackened at tip | 4 |
| 3. First joint of fore tarsi incrassated <i>ammophilus</i> Loew. | |
| Second joint of fore tarsi with clavate, halter-like, yellow appendages <i>appendiculatus</i> Loew. | |
| 4. Front and face very wide and covered with silvery pollen, palpi black (Fig. 4) <i>latus</i> sp. nov. | |
| Ground color of front and face showing through the white pollen; palpi rather large, white (Fig. 5) <i>caudatus</i> sp. nov. | |
| 5. Fore and middle tibiæ black or brown | 6 |
| Fore tibiæ yellowish, sometimes the middle ones also | 8 |
| 6. Third antennal joint small, rounded, not longer than wide | 7 |
| Third antennal joint large, twice as long as wide (Fig. 3) | |
| | <i>nigripes</i> sp. nov. |
| 7. Mesonotum with a brown-dusted median vitta between two bluish-gray ones; length 2.5 mm <i>fratellus</i> Ald. | |
| Mesonotum not vittate <i>interruptus</i> Loew. | |
| 8. Third antennal joint somewhat quadrilateral in outline | 10 |
| Third antennal joint rounded below and with a point at tip | 9 |
| 9. Third antennal joint nearly straight above, fore tibiæ with short hair and very small scattering bristles (Fig. 2) <i>texanus</i> sp. nov. | |

Third antennal joint notched on the upper side, the arista inserted just above and before this notch; fore tibiae with a row of rather long slender bristles the whole length (Fig. 6)

johnsoni sp. nov.

10. Fore tibiae with long bristle-like hairs on the whole upper surface; third antennal joint twice as long as wide; second joint extending to near the middle of the third above, at which point the third is attached. 11

Fore tibiae with only short hairs; third antennal joint but little longer than wide (Fig. 1) *cornutus* sp. nov.

11. Second antennal joint ending in sharp point at tip of which the third joint is attached; upper edge of third joint concave

harbeckii VanDuzee

Second joint ending in a rounded projection near the middle of the third joint; third joint nearly straight above

syntormoides Wheeler

Asyndetus cornutus sp. nov.

Male: Length, 2–2.2 mm. Face wide, covered with white pollen which extends a little above the base of the antennae; front wider than the face, green, shining; orbital cilia pale below with a few longer hairs near the oral margin; antennae (Fig. 1) black, third joint somewhat lozenge-shaped with a rounded point at the upper corner, a little longer than wide, arista inserted on the upper edge near the base of the third joint. Thorax green, shining, with only slight traces of pollen; pleurae more black. Abdomen green, becoming more coppery toward the tip, bristles at tip very small; hypopygium concealed. Coxae

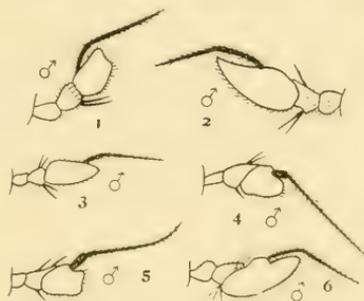


Fig. 1. Antennae of *Asyndetus*. 1, *A. cornutus*, sp. nov.; 2, *A. texanus* sp. nov.; 3, *A. nigripes* sp. nov.; 4, *A. latus* sp. nov.; 5, *A. candatus* sp. nov.; 6, *A. johnsoni* sp. nov.

and femora black; fore and middle tibiae yellowish, but sometimes rather dark, with short hairs and without or with scarcely perceptible bristles; hind tibiae and tarsi and fore and middle tarsi from the tip of the first joint black. Tegulae, their cilia and

the knob of the halteres whitish. Wings grayish hyaline; fourth vein with the thin outer section bent back so as to reach the wing margin a little back of the apex of the wing.

Female: Agrees with the male very closely except that the third antennal joint is small and rounded and the general color is more golden or coppery.

Described from three males and five females taken at Saltair, Great Salt Lake, Utah, June 8; and two males and one female from Carriso Creek, San Diego Co., California. Type in the author's collection.

Easily distinguished from *syntormoides* Wheeler by the third antennal joint being shorter and the hair of the fore tibiæ being very short, while in Wheeler's species it is very long and conspicuous. From *texanus* sp. nov. it is separated by the third antennal joint being more angulated below near the tip, while in *texanus* it is evenly rounded below.

Asyndetus texanus sp. nov.

Male: Length, 2-2.8 mm. Face short, green with thin white pollen; front wider than the face, green, shining, without pollen except just above the antennæ; antennæ black, third joint more brownish, large, twice as long as wide, rounded below, nearly straight above (Fig. 2); arista inserted near the middle above. Thorax green, shining. Abdomen somewhat more coppery, incisures blackish; hypopygium small, imbedded, without visible appendages, the bristles at tip stout but short. Coxæ and femora black, shining, with slight green reflections; fore and middle tibiæ dark yellowish, with short hair; fore tibiæ with a few scattering bristles above; middle tibiæ with two bristles, one at first and one at second third; hind tibiæ black, shining; fore and middle tarsi about as long as their tibiæ, blackened towards their tips; hind tarsi black, shorter than their tibiæ. Tegulæ, their cilia and the halteres yellow. Wings grayish hyaline; third vein nearly straight; fourth vein delicate, gently bent, ending just back of the apex of the wing.

Female: Agrees with the male in color, venation, and bristles of the legs. Third antennal joint small, scarcely as long as wide, rounded at tip.

Described from six males and five females taken at Galveston, Texas, May, by F. H. Snow; and Bill Williams Fork, Arizona, August. Type in the Kansas University collection.

One of the males from Arizona is steel-blue and the bristles of the fore tibiae are scarcely visible.

This species is very much like *snytormoides* Wheeler, but is smaller, the third joint of the antennae are more rounded below and smaller, and the fore feet are less hairy.

Asyndetus nigripes sp. nov.

Male: Length, 3.2 mm. Face and front green; face with thin white pollen and narrower than the front; palpi brown; proboscis black; antennae (Fig. 3) black, third joint more brownish, rather large, about twice as long as wide, pointed, somewhat conical in outline; arista dorsal; lateral and inferior orbital cilia pale ending in a few longer hairs on each side of the oral opening. Thorax dark green, shining, with but little pollen; base of abdomen green, the last three segments more coppery, there are several bristles extending somewhat upward and backward in the described specimen (their position may not be natural). Coxae and legs black; femora with green reflections; pulvilli scarcely enlarged, white; all tarsi about the length of their tibiae. Tegulae, their cilia and the halteres pale yellow. Wings grayish hyaline; veins black; costa stout as far as the tip of the third vein where it ends; third vein nearly parallel with the second vein, ending far before the tip of the wing; the delicate fourth vein with only a slight bend, ending just back of the apex of the wing; cross-vein close to the root of the wing.

Female: Agrees with the male in general characters, but the third antennal joint is small, scarcely as long as wide, rounded at tip.

Described from one male and one female taken at Springdale, Los Angeles Co., Cal., April 29, on a rose bush; and a female from San Diego, Cal., May 1.

Asyndetus latus sp. nov.

Male: Length, 3.5 mm. Face and front thickly covered with silvery pollen so as to conceal the ground color, very wide and with parallel sides; palpi and proboscis black, the former with stiff

black bristles; antennæ (Fig. 4) black, third joint small, taken with the second rounded in outline; arista dorsal, its first joint short, second long and slender, scarcely pubescent; lateral and inferior orbital cilia white. Thorax and abdomen blue green; pleuræ and thorax with white pollen, which is thickest on the former; abdomen with the pollen thinner, when viewed obliquely with a central line and the incisures black; hypopygium small, bronze-green with several stout bristles at tip, its appendages scarcely visible. Coxæ and femora blue-green with white pollen; trochanters and tips of femora yellow; all tibiæ pale yellow; hind tibiæ with their tips black for a distance about equal to the length of their metatarsi, fore tarsi blackened from the second joint and middle tarsi from the tip of the first joint; fore and middle tarsi about one and a fourth times as long as their tibiæ; hind tarsi three fourths as long as their tibiæ and wholly black; fore and middle tibiæ with very short hairs and no bristles except one near the basal third of middle pair; hind tibiæ with slender bristles above; fore pulvilli not enlarged. Tegulæ, their cilia and the halteres pale yellow. Wings grayish hyaline; veins dark brown, yellowish at the root of the wings; costa rather stout from the tip of the first vein to the third where it ends; third vein runs nearly straight and parallel to the second until opposite the tip of that vein where it bends a little backward reaching the costa about half way from that point to the tip of the wing; the slender fourth vein bent forward then backward near its third fourth, ending back of the apex of the wing.

Described from one male taken at Bill Williams Fork, Ariz., in August, by F. H. Snow. Type in the collection of the University of Kansas.

Since writing the above I have found among my material taken at Carriso Creek, San Diego Co., Cal., two females which no doubt belong to the same species as the male described above.

Asyndetus caudatus sp. nov.

Male: Length, 2.2 mm. Face and front green, covered with white pollen which nearly conceals the ground color of the former; face a little narrower than the front but rather wide; palpi rather large, white; proboscis yellowish; antennæ (Fig. 5) black, third joint small rounded; arista dorsal; lateral and inferior orbital cilia white. Thorax and abdomen dark but bright green with but little pollen; hypopygium small, produced forward below into a

short point and with several stout bristles at tip. Coxæ and femora black with green reflections; tips of coxæ, trochanters and base of femora yellow; tibiæ yellow, the tips of the hind pair brown; fore and middle tarsi about one and one fourth times as long as their tibiæ, infuscated from the tip of the first joint; hind tarsi black, shorter than their tibiæ; fore and middle tibiæ without bristles except a very slender one at basal third of middle pair; hind tibiæ with a few very small bristles. Tegulæ, their cilia and the halteres pale yellow. Wings hyaline, slightly tinged with gray; third vein nearly straight, parallel with the second, its tip far before the tip of the wing; the delicate fourth vein broken, its last portion somewhat forward of the basal part, but in a nearly parallel line with it, ending in the apex of the wing.

Described from one male from Bill Williams Fork, Ariz., taken in August, by F. H. Snow. Type in the Kansas University collection.

This can be separated from *latus* n. sp. by its smaller size narrower face and front, white palpi and straight third vein.

Asyndetus johnsoni sp. nov.

Male: Length, 2 mm. Face and front green, the latter only slightly wider than the former; lower orbital cilia white and rather short; antennæ (Fig. 6) black, third joint large, rounded below but irregular in outline above. Thorax and scutellum dark shining green. Abdomen bronze green, towards the apex nearly black; hypopygium black; bristles at apex of abdomen distinct but rather slender. Coxæ black; femora brownish black with a row of slender hairs below; fore and middle tibiæ yellow; fore tibiæ with a row of hair-like bristles extending the whole length above, these bristles about as long as the thickness of the tibiæ; middle tibiæ with three bristles on the upper front edge; hind tibiæ brownish black with a number of small bristles above; fore and middle tarsi about as long as their tibiæ, infuscated from the tip of the first joint; hind tarsi brown, scarcely as long as their tibiæ, with rather conspicuous hair. Tegulæ, their cilia and the halteres yellow. Wings grayish hyaline; fourth vein bent backward but not distinctly broken at about the middle of the last section, ending back of the apex of the wing; cross-vein a little nearer the base of the wing than the tip of the first vein is.

Female: Third antennal joint smaller than in the male with a nearly basal arista. Abdomen green, its insisures black with copper reflections, in certain lights with a longitudinal black line in the center on the dorsum. Femora shining green; I cannot see the row of bristles on the fore tibiae which appear in the male; fore and middle tibiae yellowish, darker at base; hind tibiae brownish black; fore and middle tarsi black from the tip of the second joint; hind tarsi black.

Described from one male and one female taken at Rowayton, Conn., August 4, by C. W. Johnson.

Type in the collection of the Boston Society of Natural History. This is very much like *A. texanus* sp. nov. but has the third antennal joint irregular in outline above, the fore tibiae has a row of hairs or bristles above and the lower orbital cilia is distinctly shorter, especially near the proboscis.

CORA H. CLARKE.

Cora Huidekoper Clarke, the daughter of James Freeman and Anna Huidekoper Clarke, was born February 9, 1851, in Meadville, Pa., the home of her mother's family. From 1854 to 1897 she lived with her parents in Jamaica Plain, a suburb of Boston. After their deaths she moved to Mt. Vernon Street, Boston, where she remained until her own death April 2, 1916. Her summers were passed at a family seashore place in Manchester, Mass. Occasionally this was varied by a visit to Meadville or a trip abroad.

As a child, her health was delicate and for that reason she did not go to school until about thirteen years old, but during her school years, by diligence and conscientious study, she held her place with girls of her own age. When eighteen years old, she went to a horticultural school in Newton. She next studied at the Bussey Institution in Jamaica Plain and there enjoyed the advantage of having Francis Parkman as instructor. The class was small and sometimes she was the only pupil. Mr. Parkman perceived and appreciated her somewhat uncommon mental gifts and said to her father, "Your daughter has qualities of mind that most women do not possess."

She became a teacher in Miss Ticknor's Society for encouraging study at home and then and later her influence became a source of inspiration to many correspondents. Her own delight in these pursuits communicated itself to others. She founded a little club called The Science Club, which has maintained itself for many years, and was the leader of the Botany Group of the New England Women's Club. She was a member of several scientific societies, including the Cambridge Entomological Club and the Boston Society of Natural History, of which she was a member of the Council.

Miss Clarke was especially interested in botany and entomology and was known to entomologists by her interesting papers on the larval cases of the caddis-flies, and by her remarkable success in rearing gall-flies. The gall-midges (Cecidomyiidae) were sent to Dr. E. P. Felt and he has described over thirty species new to science that were reared by Miss Clarke mostly in the vicinity of Boston and Magnolia, Mass. Three of the species were named in her honor, the others usually bearing the name of the plants upon which she found the galls. She reared many Hymenopterous gall-flies (Cynipidae), five new species were discovered and named by H. F. Bassett, two of which were dedicated to her. A number of the little gall making moths were also reared, two of the latter being new species, named by Mr. Augustus Busck.

Miss Clarke was a skillful photographer and made excellent photographs of the galls. Some of these were mounted and arranged in two volumes which she presented to the library of the Boston Society of Natural History. Volume 1, Hymenopterous galls, contains 66 photographs and Volume 2, Dipterous galls, etc., 102 photographs.

The following are some of Miss Clarke's writings:

Description of Two Interesting Houses made by Native Caddis-fly Larvæ. Proc. Boston Soc. Nat. Hist., Vol. 22, pp. 67-71, 1882.

Caddis Worms of Stony Brook, PSYCHE, Vol. 6, pp. 153-158, 1891. Galls Found Near Boston. Read before the Mass. Horticultural Society, Feb. 1, 1890. 11 pages.

New Missionary Work. Jour. N. Y. Botanical Garden, Vol. 3, pp. 62-69, 1902. Awarded the second prize of thirty dollars, competition of 1902, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

A suggestion for Summer Observation. Rhodora, Vol. 14, pp. 177-184, pl. 97-99, 1912.

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New England Orthoptera identified. I wish to examine adult Orthoptera of all families from all parts of New England. Material will be identified for the privilege of retaining desired examples, for which good exchanges will be given, subject to approval of owner.—A. P. Morse, Wellesley College, Wellesley, Mass.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's *Insects of New Jersey*.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; *Insect Life*; Harris's *Insect*; many others.—J. E. Hallinen, Cooperton, Okla.

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Wanted: *Psyche*, Vol. VIII, No. 265 (May, 1898); No. 267 (July, 1898); No. 268 (August, 1898); Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

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CONTENTS.

Notes on Anoplura and Mallophaga, from Mammals, with Descriptions of Four New Species and a New Variety of Anoplura. <i>G. F. Ferris</i>	97
Notes on the Life-History of <i>Methoca Stygia</i> Say. <i>Francis X. Williams</i>	121
A New Species of <i>Lepidopria</i> from North America. <i>Charles T. Brues</i>	126
Book Review	128
Exchange Column	131

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NOTES ON ANOPLURA AND MALLOPHAGA, FROM MAMMALS, WITH DESCRIPTIONS OF FOUR NEW SPECIES AND A NEW VARIETY OF ANOPLURA.

BY G. F. FERRIS,
Stanford University, California.

Under an arrangement made by the Department of Entomology of Stanford University with Dr. Joseph Grinnell, director of the Museum of Vertebrate Zoölogy of the University of California, the author was enabled to accompany a collecting party from the museum, engaged during the summer of 1915 in a Biological Survey of Yosemite National Park, with the privilege of examining for parasites all the birds and mammals taken by the expedition. In addition, through the kindness of Dr. Grinnell, the author was also permitted to examine the skins in the museum, and it is upon the material obtained in these two ways, that this paper is for the most part based. It is in the nature of a supplement to "The Anoplura and Mallophaga of North American Mammals," by V. L. Kellogg and G. F. Ferris (1915), in which there is a discussion of most of the old species listed in this paper, together with a host list of the Anoplura and Mallophaga from North American mammals.

The examination of museum skins has proven to be an excellent method of collecting Mallophaga and Anoplura, nearly as much material being procured in a few days of such work as could be obtained in an entire summer of field collecting. There is some danger that records obtained in this manner may be unreliable due to the packing together of different hosts, but this danger is really astonishingly small, although cases of this nature were, indeed, met with. Certainly all records based entirely upon the examination of museum skins should be checked up by field

collecting wherever any doubt arises. There is the further disadvantage that large skins are usually carefully cleaned when they are tanned and all the parasites are necessarily lost, but undoubtedly assiduous collecting in our museums will add greatly to our knowledge of the Anoplura and Mallophaga.

The mammals which were examined without finding parasites should be recorded as well as those from which parasites were taken. About fifteen fresh specimens of *Ochotona albata* (cony, rock rabbit or pika) and several skins of this and a related species, *Ochotona schisticeps*, were examined with negative results. The finding of Anoplura upon members of this genus would be of much interest since these animals are the nearest relatives of the rabbits and it is to be expected that their parasites should be related to the parasites of the rabbits.

Several specimens of *Aplodontia californica* were examined, also with negative results. It seems probable that the members of this genus harbor no Anoplura or Mallophaga since the author has previously examined a number of specimens with the same result. The examination of a few fresh specimens and many skins of moles of the genus *Scapanus* failed to produce any parasites although an Anopluran species is accredited to the eastern moles of the genus *Scalopus*. Nor was anything found upon any shrews, although numerous individuals of two or three species of *Sorex* and *Neosorex* were examined.

The descriptions of new species and notes on old species follow:

MALLOPHAGA.

Trichodectes retusus Nitzsch.

Numerous specimens from two individuals of *Martes* sp?, the Pine Marten, a single specimen from *Gulo luscus* ssp?, a wolverine (all taken at Lyell Canyon, Mariposa Co., Calif.) and a single immature specimen from a skin of *Mustela vison nesolestes* (Admiralty Is., Alaska).

This species was originally described from an Old World weasel and has been reported from mink and weasel in North America. It is distinguished from the other Mustelid-infesting species of *Trichodectes* by the fact that the antennæ are similar in male and female.

Trichodectes quadraticiceps Chapman.

Several specimens from a skin of *Vulpes cascadiensis* (Mt. Shasta, Calif.).

This species has previously been recorded only from *Urocyon californicus* and there has been no record of any Mallophagan from a North American species of *Vulpes* although a species, *Trichodectes vulpis*, has been recorded from a European *Vulpes*. It is possible that these two species will prove to be the same.

Trichodectes mephitidis Osborn.

Many specimens from *Bassariscus astutus raptor* (Pleasant Valley, Mariposa Co., Calif.) and from skins of the same host from several other localities in California. The occurrence of *T. mephitidis* upon this host seems rather anomalous as this species is typically mustelid-infesting; however, it seems to be normally present upon *Bassariscus* as well. Another species, *T. thoracicus* Osborn, has also been described from the same host.

Trichodectes geomydis Osborn.

From *Thomomys monticola* (Yosemite National Park, Calif.) and skins of *Geomys cumberlandius* (Cumberland Is., Ga.).

ANOPLURA.

Polyplax spinulosa Burm.

From *Microtus (Lagurus) intermedius* (Pine Forest Mts., Nev.).

Polyplax auricularis Kellogg & Ferris.

From *Peromyscus maniculatus gambeli* (Yosemite National Park, Calif.) and skins of *Onychomys torridus pulcher* (Victorville, Calif.) and *Onychomys leucogaster arcticeps* (Colorado Springs, Colo.). Previously recorded from *Peromyscus maniculatus rubidus* (Inverness, Marin Co., Calif.) and *Peromyscus sitchensis prevostensis*, (Forrester Is., Alaska).

Host of the type, *Peromyscus maniculatus rubidus*.

Linognathoides montanus Osborn.

From *Marmota flaviventris sierræ* and *Citellus beldingi* (Yosemite National Park, Calif.) and skins of *Cynomys leucurus* (Routt Co., Colo.), *Citellus oregonus* (Pine Forest Mts., Nev.), *Citellus gram-*

murus (Santa Catalina Mts., Ariz.) and *Citellus plesius ablusus* (Prince William Sound, Alaska). The specimens from *Marmota* are somewhat larger than those from any of the numerous other hosts and there are slight differences in the shape of the sternal plate but there seem to be no good grounds for regarding this form as at all specifically or varietally distinct. Host of the type, *Sciurus cinereus*.

***Linognathoides inornatus* Kellogg & Ferris.**

From *Neotoma cinerea cinerea* and *N. fuscipes streatori* (Yosemite National Park, Calif.). This species was referred to *Linognathoides* because of the entire absence of chitinized tergal and sternal plates but the specimens obtained from *Neotoma fuscipes* have the anterior division of each tergite and sternite distinctly chitinized although in all other respects they agree entirely with the specimens from *N. cinerea*. It may be that this form should be separated as a new species but I have not sufficient material to justify me in doing so. It is evidently rather uncommon in its occurrence for it has been found on but one individual out of dozens examined while the form occurring upon *N. cinerea* is present upon practically every individual of its host species.

***Neohaematopinus pacificus* Kellogg & Ferris.**

From *Eutamias alpinus* and *Eutamias speciosus frater* (Yosemite National Park, Calif.) and *Eutamias merriami pricei* (Stanford University, Calif.).

Host of the type, *Eutamias townsendi ochrogenys* (Cazadero, Sonoma Co., Calif.).

***Neohæmatopinus antennatus* Osborn, var. *semifasciatus* var. nov.**

From *Sciurus douglasi mollipilosus* (Cazadero and Freestone, Sonoma Co., Calif.) and *Sciurus douglasi albolimbatus* (Yosemite National Park, Calif.). In the "Anoplura and Mallophaga of North American Mammals" this form was included with *N. antennatus* Osborn, but it should be separated as at least varietally distinct. It differs constantly from *N. antennatus* in having the anterior division of each abdominal tergite and sternite distinctly chitinized but resembles *N. antennatus* in all other respects. *N. pacificus* K. & F., which also has the anterior division of the

tergites and sternites chitinized is readily distinguishable by the difference in the pleural plates. The new variety is evidently rather close to *N. sciurinus* (Mjöberg) from *Sciurus vulpinus* (Europe) and may prove to be identical with that species but the description of the latter is too incomplete to permit of any certainty. Host of the type, *Sciurus douglasi albolimbatus*.

Neohæmatopinus sciuropteri Osborn.

Numerous specimens from *Glaucomys sabrinus lascivus* (Yosemite National Park, Calif.), better known as *Sciuropterus*. The description of this species was based upon the male and apparently but two specimens of the species have heretofore been known. The

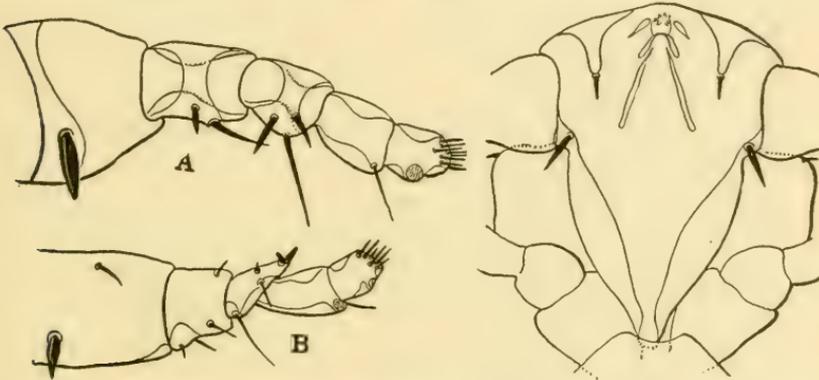


Fig. 1. *Neohæmatopinus sciuropteri* (Orb.); A, antenna of female, B, antenna of male, vertical side. Fig. 2. *Neohæmatopinus sciuropteri* (Orb.); vertical side of head.

figures in "Anoplura and Mallophaga of North American Mammals" were made from a single imperfect male and prove to be wrong in certain respects. There is no spine on the posterior margin of the first antennal segment, as was there figured, this spine really being on the head immediately at the base of the antenna. Furthermore the sternal plate has the posterior lateral angles produced into slight points instead of having the posterior margin straight.

The absence of a spine on the posterior margin of the first antennal segment leaves the emarginate posterior margin of the second tergite in the male as the only positive character separating this species from *Polyplax*. The female can be separated from

the females of the various species of *Polyplax* only by its extremely broad head and the stout spine at the base of each antenna. The female in general resembles the male, but has the antennæ simple, that is without a preaxial process on the third segment, and lacks the emargination of the posterior margin of the second abdominal tergite.

Hæmodipsus ventricosus Denny.

Numerous specimens from skins of *Lepus californicus* (Arcata, Humboldt Co., Calif.) and *Lepus californicus deserticola* (Ehrenberg, Ariz.). The male, which has never been adequately described, is similar to the female except for its much smaller size. The genitalia are very large and conspicuous, the basal plate being long and relatively slender, the parameres about half as long as the basal plate and very broad and heavy. Penis very small and inconspicuous.

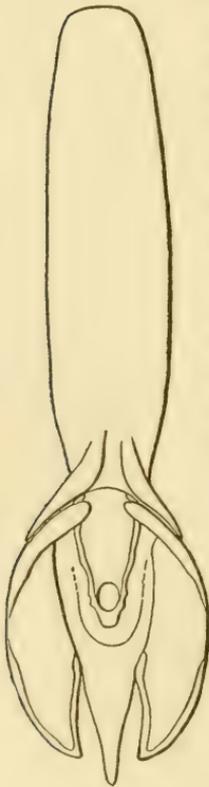


Fig. 3. *Hæmodipsus ventricosus* (Denny); genitalia of male.

It should be noted that the sternal plate is not as regularly hexagonal as it is figured in "Anoplura and Mallophaga of North American Mammals," the posterior margin being longer than the anterior and closer to the lateral angles.

Fahrenholzia pinnata Kellogg & Ferris.

From *Perodipus* sp? (Coulterville, Mariposa Co., Calif.) and skins of *Dipodomys merriami* ssp. (Independence, Inyo Co., Calif.), *Dipodomys deserti* (Mecca, Riverside Co., Calif.), *Microdipodops polionotus* (Benton, Mono Co., Calif.) and *Perognathus parvus olivaceus* (Pine Forest Mts., Nev.).

Host of the type, *Dipodomys californicus*.

Fahrenholzia tribulosa sp. nov.

From *Perognathus californicus* ssp? (Pleasant Valley, Mariposa Co., Calif.), and *Perognathus formosus* (Victorville, Calif.). This is a very distinct form that differs markedly from *F. pinnata* in the character of the male

genitalia. The head is entirely destitute of spines and in the form chosen as the type of the species there are six pairs of pleural plates instead of three as in *F. pinnata*. The specimens from *Perognathus formosus*, however, have but three pairs of pleural plates although they agree with the type in all other particulars. Further collecting may justify the separation of these two forms. The name is from the Latin meaning thorny.

Host of the type, *Perognathus californicus*.

Description of female: Length, 1.65 mm.; length of head, .16 mm.; length of abdomen, 1.15 mm.; width of head, .15 mm.; width of thorax, .16 mm.; width of abdomen, .45 mm.

Head triangular in shape, rather sharply pointed anteriorly and with very shallow antennal sinuses. No hairs on either dorsal or ventral side except for a few very small hairs on the anterior margin and about the rostrum. Antennæ set well back from the anterior margin, five-segmented, rather slender and with all the joints subequal in length.

Thorax about as long as the head and slightly wider, with the lateral margins parallel and nearly straight.

No hairs on either dorsal or ventral sides. Sternal plate regularly oval in shape. First pair of legs small with slender claw, second and third pairs very large and stout with stout, heavy claw, and

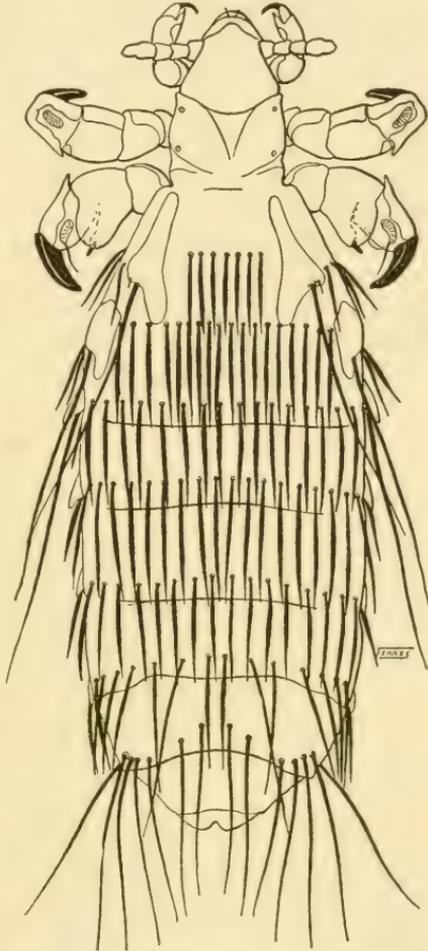


Fig. 4. *Fahrenholzia tribulosa* sp. nov.; female.

with the outer anterior angle of the tarsus produced into a distinct point.

Abdomen elongated with nearly parallel sides, entirely without chitinized tergal and sternal plates, the derm having a reticulated appearance. Each segment, except the first and second, with a single transverse row of stout spines that are somewhat longer than the segment. First and second segments apparently fused, the first without spines. Second segment with six to eight spines. Third to sixth segments with eighteen to twenty-two spines, all spaced very closely. Seventh with about sixteen spines which are for the most part longer and more slender than those on the other segments, the second from the meson on each side being especially long and slender, reaching beyond the end of the abdomen. Eighth segment with about twenty long, slender hairs. On the ventral side the arrangement of the spines is in general similar, except that the eighth segment bears no spines and the ninth has a group of stout spines near each lateral margin.

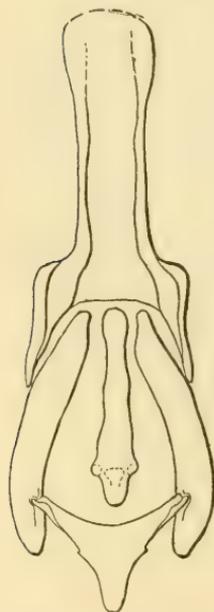


Fig. 5. *Fahrenholzia tribulosa* sp. nov.; genitalia of male.

Six pairs of pleural plates present. The first pair, which may be assigned to the second segment, is divided into two parts, one lying on the dorsal side of the abdomen and the other on the ventral side with three or four spines in the space between. The dorsal piece is long, somewhat broadened posteriorly, with the inner posterior angle extended into a roundly pointed process and bears a single very long hair and an inconspicuous spine on the posterior margin. The ventral piece is shorter, somewhat broadened at the posterior end and bears no spines. Plates of the third segment appressed to the dorsum and partially overlapping the fourth segment; inner posterior angle produced into a rounded tooth and a single long hair on the posterior margin. Plates of the fourth segment similar but smaller, projecting from the body wall and likewise bearing a long stout hair. Plates of the fifth to seventh segments similar to those of the fourth but somewhat smaller and without hairs.

Description of the male: Length, 1.15 mm.; length of head, .16 mm.; length of abdomen, .9 mm.; width of head, .15 mm.; width of thorax, .16 mm.; width of abdomen, .41 mm. Similar to the female except for its smaller size. End of the abdomen rounded. Genitalia of a very different type from those of *F. pinnata*, the basal plate rather short and slender, widening abruptly to the posterior end and with the posterior margin deeply concave. Parameres stout, nearly as long as the basal plate, diverging posteriorly and partially enclosing the penis which is short and stout, with short, widely diverging arms.

Enderleinellus longiceps Kellogg & Ferris.

From skins, in the Stanford University collection, of *Sciurus niger rufiventer* (De Kalb Co., Ind.) and *Sciurus arizonensis huachucha* (Huachucha Mts., Ariz.).

The specimens from *S. niger* agree very well with the type, but those from *S. arizonensis* are referred to this species provisionally, further study and more material may, perhaps, show them to be distinct. The host of the type is recorded only as "Western Gray Squirrel" (Lincoln, Neb.) and may be either *S. niger rufiventer* or *S. carolinensis carolinensis*, both of which occur in that locality.

Enderleinellus kelloggi sp. nov.

Many specimens, both males and females, from *Sciurus griseus griseus*, (Pleasant Valley, Mariposa Co., Calif.) and *Sciurus griseus nigripes*, (Stanford University, Calif.), the type being from the latter.

This species is close to *E. longiceps* K. & F., the only really tangible differences between the two being found in the genitalia of the males. In *E. longiceps* the parts of the male armament are very large and very heavily chitinized, while in the new species they are weakly chitinized, smaller and altogether much less conspicuous. The females of the two species are, on the other hand, practically indistinguishable from each other, although the head of the new species is a trifle the shorter.

Named in honor of Prof. Vernon L. Kellogg, by whom this work has been made possible.

Description of the female: Total length, .76 mm.; length of

head, .14 mm.; length of abdomen, .55 mm.; width of head, .1 mm.; width of thorax, .15 mm.; width of abdomen, .31 mm.

Head rather cylindrical, the anterior margin very flatly rounded, the lateral margins parallel and practically straight, the temporal angles entirely wanting. Antennæ set close to the anterior margin, the second joint the longest, the others subequal. Last three joints slightly wider than the second, giving the antennæ a slightly clavate appearance.

Thorax about one and one half times as wide as the head and slightly more than half as long. Lateral margins angularly convex, posterior margin straight, the thorax as a whole having the appearance of a distorted hexagon. A pair of rather long median hairs on the posterior margin of the mesothorax and a short spine slightly in from each mesothoracic spiracle.

Legs of the type common to the genus, the anterior and middle pairs being small and having slender claws, the posterior pair being very large and stout. Sternal plate spatulate, a narrow handle-like portion projecting between the anterior coxæ.

Abdomen oval, only slightly longer than wide, the greatest width being near the center. Tergites and sternites without chitinized plates and with the exception of the third sternite, undivided and bearing but one transverse row of spines. The spines are in general rather slender, bluntly pointed, and slightly longer than the segment on which they are borne. First to third segments each with a median group of four spines, the third also having a pair of spines near each lateral margin. Fourth and fifth segments each with a median group of eight or ten spines and lateral groups of three or four. Sixth and seventh segments each with a continuous row of eighteen or twenty spines. Eighth with median group of six or eight. Seventh and eighth segments each with two long hairs at the posterior lateral angles. Ninth segment with a narrow, transverse, chitinous band behind which there is a median pair of two small hairs.

Second sternite with a median group of four to six slender spines. Third sternite apparently with two rows of spines, the anterior consisting of four, the posterior of eight, and with the pair of chitinized areas which are practically characteristic of the genus. Fourth sternite with eight spines, fifth and sixth with twelve, seventh with eight, eighth with none. Ninth segment with a group

of small spines and a lobe-like process, which bears a single stout spine, at each posterior angle.

Pleural plates present on the second to fifth segments, rather triangular in shape, with the posterior angles rounded and the posterior margin slightly emarginate. Each with a pair of very small spines on the posterior margin.

Description of the male: Total length, .62 mm.; length of head, .13 mm.; length of abdomen, .41 mm.; width of head, .1 mm.; width of thorax, .15 mm.; width of abdomen, .23 mm.

Head and thorax similar to those of the female. Abdomen, however, with narrow but distinct chitinized areas on the third to eighth tergites. First to third tergites with median group of four to six spines, fourth to eighth with median group of six which occupy the length of the chitinized area. Fourth and fifth with lateral groups of two spines, sixth to eighth with lateral groups of three or four. Seventh sternites without chitinized areas, the arrangement and number of the spines being as on the dorsum, with the exception of the double row on the third sternite. Pleural plates as in female.

Genitalia weakly chitinized, the parts of the mesosome being very small and inconspicuous. Basal plate divided into two slender parallel rods.

Enderleinellus sphærocephalus Nitzsch.

Pediculus sphærocephalus Nitzsch, Germar's Mag. f. Ent., Vol. 3, p. 305 (1818); *Hamatopinus sphærocephalus* Denny, Mon. Anopl. Brit., p. 36 (1842); *Polyplax* (?) *sphærocephalus* Dalla Torre, Genera Insec. Anoplura, p. 14; (1908); *Enderleinellus sphærocephalus* Fahrenholz, Zoöl. Anz., Vol. 39, p. 56 (1912).

From *Sciurus douglasi albolimbatus* (Yosemite National Park, Calif.), *S. hudsonicus vancouverensis* (Kuiu Island, Alaska) and *S. hudsonicus petulans* (Glacier Bay, Alaska).

The occurrence of this species upon some species of American squirrels and not upon others is an interesting point in the problem of the distribution of these ectoparasites. The range of *Sciurus griseus* coincides in part with the range of *S. douglasi*, in fact the two often live in the same trees, yet they harbor very distinct species of *Enderleinellus*. *S. douglasi* and *S. hudsonicus*, with their various subspecies, certainly get no closer than the width of Behring

Straits to *S. vulgaris* and its various subspecies of Europe and Asia, but all have what is apparently the same species of *Enderleinellus*. The student of these parasites is forced to the conclusion that the problem of their distribution is fundamentally the problem of the genetic relationships of their hosts.

Enderleinellus suturalis Osborn.

Many specimens from *Callospermophilus chrysodeirus* and *Citellus beldingi* (Yosemite National Park, Calif.) and from skins of *Xerospermophilus tereticaudus*, (Imperial Co., Calif.), *Ammodermophilus nelsoni* (Bakersfield, Calif.), *Cynomys leucurus* (Routt Co., Calif.), *Cynomys gunnisoni* (Florissant, Colo.), *Citellus mollis* (Virginia Valley, Nev.), *C. townsendii* (Wallula, Wash.), and *C. grammurus* (Santa Catalina Mts., Ariz.).

This is a very puzzling species, a slightly different form appearing on each host genus and even on the different host species of the same genus. Some of these forms, such as *E. osborni* K. & F. appear to be worthy of being distinguished as separate species and perhaps some of the others should be regarded as varietally distinct. The form occurring upon *Callospermophilus* has been given the varietal name of *occidentalis* and this name may be retained for the present, although it is no more worthy of being so distinguished than are some of the others.

The host of the type of the species is *Citellus franklini* (Ames, Iowa).

Enderleinellus uncinatus sp. nov.

From *Glaucomys sabrinus lascivus* (Yosemite National Park, Calif.).

This is probably the smallest known species of Anoplura and it is unique in other respects as well. In fact it is of such peculiar character that it might well be regarded as the type of a new genus. However, its affinities are clearly with *Enderleinellus* and in the present state of our knowledge of the Anoplura it is well to move slowly in the matter of multiplying genera, hence it seems best to regard this as an aberrant *Enderleinellus*.

Its affinities with *Enderleinellus* are shown in the character of the legs, the anterior and middle pairs being small and the posterior pair large and stout. The undivided abdominal tergites

and sternites of the abdomen also relate it to that genus. The characters in which it departs from the *Enderleinellus* type are the absence of a pair of small chitinized areas on the third sternite of the abdomen, the reduction in size if not total absence of pleural plates and the hook-like projections on the ventral side of the antennæ by which its name was suggested.

Description of female: Length, .375 mm.; length of head, .075 mm.; length of abdomen, .25 mm.; width of head, .075 mm.; width of thorax, .11 mm.; width of abdomen, .17 mm.

Head rather elongated and cylindrical, with the antennæ set close to the flatly rounded anterior margin. Temporal angles lacking, the hind head being but little wider than the fore head and having the temporal margins nearly straight and parallel. Occiput slightly pointed. A transverse suture immediately behind the antennæ, a very narrow chitinized band along the anterior margin and a slightly chitinized area along each temporal margin. Chætotaxy of the dorsal surface as follows: Several fine hairs along the anterior margin; a pair of small hairs on each

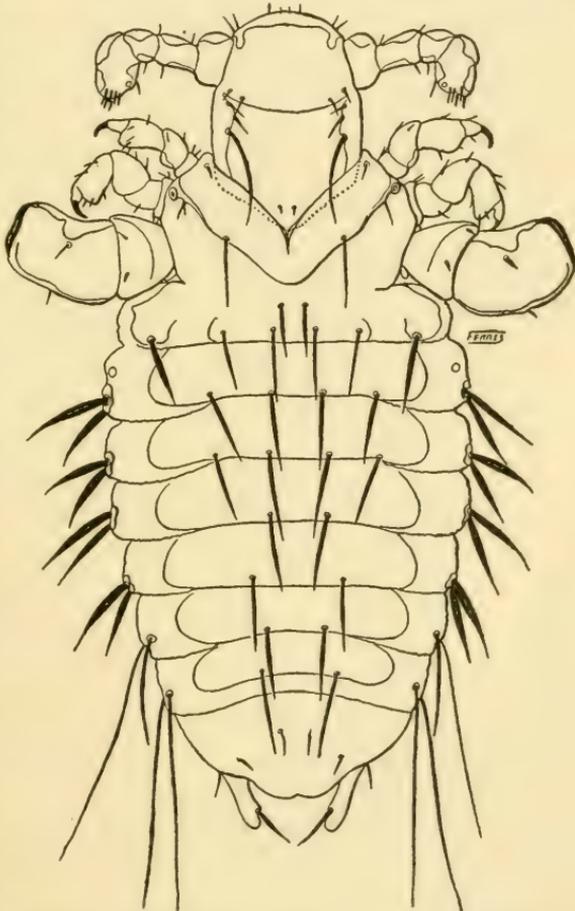


Fig. 6. *Enderleinellus uncinatus* sp. nov.; dorsal side of female.

side just in front of the transverse suture; two short spines followed by a long curved spine on each side at the inner edge of the chitinized area along the temporal margins.

Ventral side of the head with a narrow, irregularly shaped, chitinous area on each side extending from the anterior margin past the posterior margin of the antennæ. Immediately behind this area is a pair of small tooth-like projections followed by another chitinized area with three broad teeth on its posterior margin. No spines on the ventral side of the head.

Antennæ, five-jointed, the first joint quite broad the second longer and more slender. On the ventral side the first joint bears a series of four stout, hook-like projections and the proximal anterior angle of the third and fourth segments is produced into a short tooth.

Thorax about twice as broad as the head and somewhat shorter and with the lateral margins strongly convex. Posterior margin of the mesothorax with a short spine on each side just within the spiracle and a longer spine near the meson. Sternal plate very broad, the coxæ of each pair widely separated. First and second pairs of legs subequal, very small and weak and with small slender claws. Third pair very large and stout and quite short. All coxæ bearing a spine near the posterior margin, the spines on the posterior coxæ being large and conspicuous.

Abdomen elongated, broadest across the second segment, thence tapering gradually to a rounded point. Each tergite with single chitinized plate and a single transverse row of spines. First segment very small and with two small spines near the meson. Second segment with a single large spine near each outer margin and a group of four small spines on the posterior margin. Third and fourth segments each with a similar group of four spines. Fifth to eighth segments each with two spines near meson. Pleural plates either lacking or reduced to extremely small chitinized areas, which on the second to fifth segments bear a pair of extremely long, stout, sharp spines. Lateral margins of seventh segment with two hairs one of which is about twice as long as the other. Eighth segment with a pair of long hairs on lateral margins.

Sternites likewise undivided, the third to sixth with a distinct chitinized plate, the posterior lateral angle of which is produced into a sharp, knife-like process. Second and sixth segments each

with four short spines on the posterior margin, seventh with a single large stout spine at each posterior lateral angle and two spines on the posterior margin; eighth with a median pair close to its anterior margin. Posterior-lateral angles of the ninth segment produced into a rounded lobe which bears a spine near its tip.

Description of male: Length, .35 mm.; length of head, .075 mm.; length of abdomen, .22 mm.; width of head, .075 mm.; width of thorax, .1 mm.; width of abdomen, .14 mm.

In general similar to the female except for slight differences in the arrangement of the spines on the abdomen. Abdomen ending in a broad truncate process which bears several short spines. Genitalia very weakly chitinized and so small as to render it impossible to work out the parts.

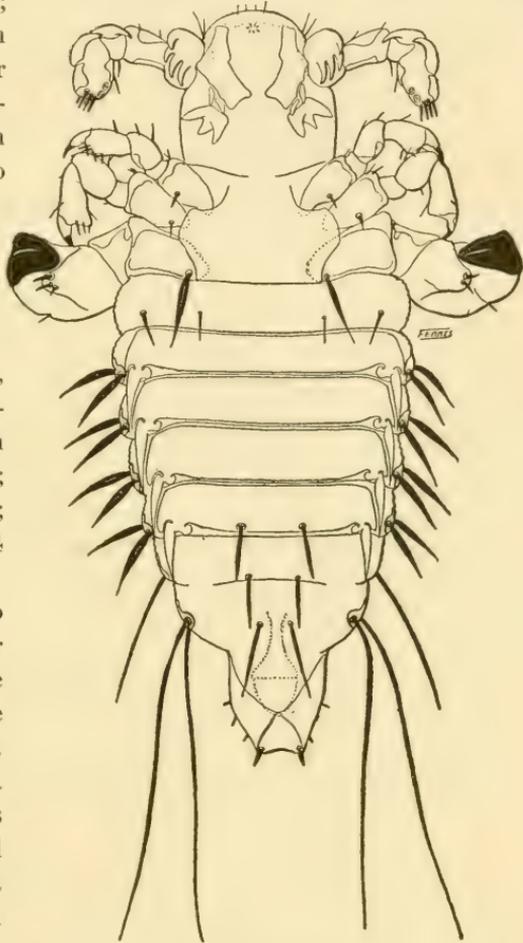


Fig. 7. *Enderleinellus uncinatus* sp. nov.; ventral side of male.

Hoplopleura trispinosa Kellogg & Ferris.

From *Glaucomys* (= *Sciuropterus*) *sabrinus lascivus* (Yosemite National Park, Calif.).

The male, which has not been described, is smaller than the female and none of the abdominal tergites and sternites are di-

vided into more than two plates. The genitalia afford an excellent specific character, differing markedly from the genitalia of *H. arboricola*, the nearest related species. The basal plate is expanded at each end, the parameres are very short and stout and do not enclose the penis as they do in *H. arboricola*, the arms of the penis fitting into slight notches in the ends of the parameres.

Hoplopleura hesperomydis Osborn.

From *Peromyscus maniculatus gambeli* (Yosemite National Park), skins of *Onychomys torridus pulcher* (Victorville, Calif.), and *Onychomys leucogaster arcticeps* (Colorado Springs, Colo.), and a freshly caught *Mus musculus* (Stanford University, Calif.). This species is very similar to *H. longula* (Neum.) from *Mus minutus* of Europe, of which *H. intermedia* Fahrenholz is beyond any doubt a synonym, but there are distinct differences in the pleural plates. The type of the species is from *Peromyscus* (= *Hesperomys leucopus* of the central states.

There are European records of Anoplura from *Mus musculus*, *Hoplopleura acanthopus* and *Polyplax serrata* having been credited to it, but this is the first North American record. It would be a matter of much interest to know if the same species occurs upon this host in Europe. The specimens from *Onychomys* differ somewhat from the others, the sternal plate being less rounded anteriorly and less sharply pointed posteriorly and the hairs on the abdomen being more numerous and much more slender, but the amount of material at hand is not sufficient to justify separating the forms.

Hoplopleura arboricola Kellogg & Ferris.

From *Sciurus douglasi albolimbatus*, *Sciurus griseus*, *Eutamias speciosus frater* and *Eutamias alpinus* (Yosemite National Park, Calif.), and *Eutamias merriami pricei* (Stanford University, Calif.).

The type of the species is from *Sciurus douglasi albolimbatus*.

Hoplopleura hirsuta sp. nov.

Five females and six males from skins of *Sigmodon hispidus* (Raleigh, N. C.), *S. hispidus texianus* (Rockport, Tex.) in the Stanford University collection, and *S. hispidus eremicus* (Sacaton,

Ariz. and Ft. Yuma, Calif.), in the Museum of Vertebrate Zoology of the University of California. Type from *S. hispidus*.

Curiously enough the affinities of this species are not with the species of *Hoplopleura* from other murids, but are with *Hoplopleura arboricola* K. & F., which occurs upon several species of sciurids. The females of these two species are in fact hardly distinguishable, but the genitalia of the males afford good characters for separating them. The sternal plate is much more pointed in the new species than in *H. arboricola* and there are slight but constant differences in the pleural plates.

Description of female: Length, 1.4 mm.; length of head, .25 mm.; length of abdomen, 1.05 mm.; width of head, .16 mm.; width of thorax, .27 mm.; width of abdomen, .5 mm.

(The measurements of both sexes are from specimens that had been relaxed and cleared in caustic potash and are, therefore, probably somewhat greater than measurements from fresh specimens would be.)

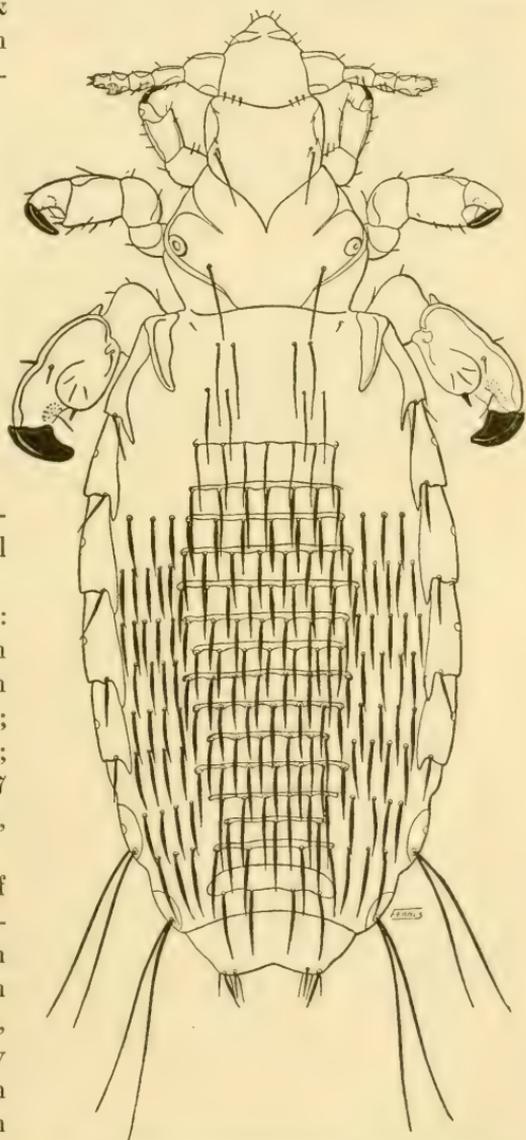


Fig. 8. *Hoplopleura hirsuta* sp. nov.; female

Head rather elongated, widening but little behind the antennæ. Temporal margins very slightly convex and nearly parallel. A long slender hair and a very inconspicuous spine slightly in from the margin near each posterior lateral angle. A few extremely minute spines along the temporal angles, the anterior margin and the transverse suture behind the antennæ. Ventral side of the head with a single hair near the base of each antenna. Antennæ rather slender, of the type common to the genus.

Thorax slightly shorter than the head and about as wide as the head is long. Lateral margins strongly convex. Mesothorax with a single slender hair on each side just in from the spiracle. Sternal plate somewhat elongated, produced posteriorly into a blunt point; longer and more pointed than in *H. arboricola*. Legs of the type common to the genus.

Abdomen, elongated oval. First segment apparently without spines. Second tergite with two narrow transverse plates, each bearing two widely separated pairs of slender spines. Third segment with two plates, each with six or seven slender hairs. Fourth to seventh segments each with three very narrow plates, these plates being about half as long as the segments are wide. The plates of the fourth to sixth segments each bear six to eight awl-shaped spines. First plate of the seventh segment with six spines and the others with four each. Eighth segment with one plate and four spines. On the fourth to sixth segments there are, between the pleural plates and the tergites, two groups of three to five spines. The seventh segment bears one such group.

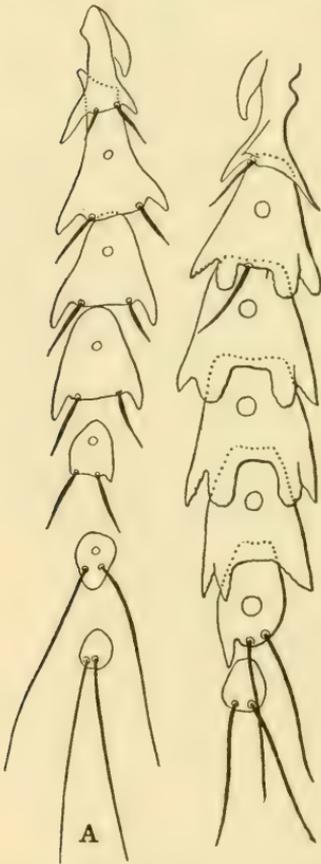


Fig. 9. A, pleural plates of *Hoplopleura hirsuta* sp. nov.; B, pleural plates of *Hoplopleura quadridentata* (Neum.).

Pleurites of the first segment lying on the dorsum, pleural plates of the second to sixth segments with each posterior lateral angle produced into a single short tooth and with two widely separated spines on the posterior margin. Pleurites of the seventh and eighth segments small, each bearing two long hairs.

On the ventral side the second segment bears but one row of eight spines. Third to sixth segments each with three plates and three rows of spines, the arrangement and number of these spines being practically as on the dorsum, except that each lateral pair on the first plate of the third sternite are much enlarged, as is usual in the genus. Seventh segment with a single transverse row of about eight spines, eighth with four spines.

Description of male: Length, 1.05 mm.; length of head,

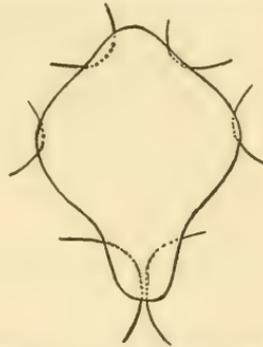


Fig. 10. *Hoplopleura hirta* n. sp.; sternal plate.

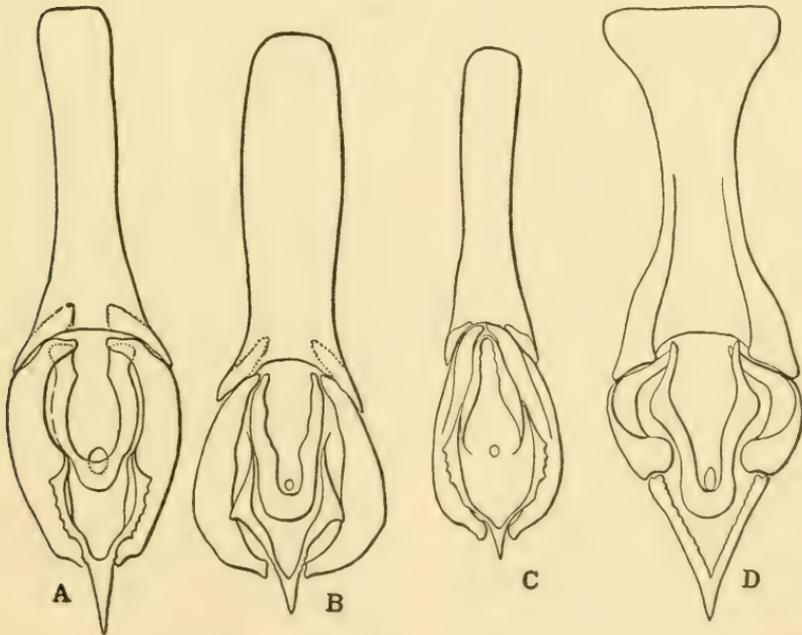


Fig. 11. A, *Hoplopleura arboricola* (K. & F.); genitalia of male. B, *Hoplopleura hirsuta* sp. nov.; genitalia of male. C, *Hoplopleura quadridentata* (Neum.); genitalia of male. D, *Hoplopleura trispinosa* (K. & F.); genitalia of male.

.25 mm.; length of abdomen, .75 mm.; width of head, .16 mm.; width of thorax, .26 mm.; width of abdomen, .4 mm.

The rows of hairs on the abdomen are fewer than in the female. None of the tergites are divided and of the sternites the fourth and fifth are divided into three plates and the third into two. The number of the spines to each plate is practically as in the female.

The genitalia differ from the genitalia of *H. arboricola* in the broader basal plate and the differently shaped parameres and penis.

Hoplopleura quadridentata Neum.

Hæmatopinus (Polyplax) quadridentatus Neumann, Archives de Parasitologie, Vol. 13, pp. 511-513, figs. 13-14 (1909).

Many males and females from several skins of *Nesoryzomys narboroughi* and *N. indefessus* (Family Muridæ) from the Galapagos Islands, in the Stanford University collection. Neumann's specimens were from another murid, *Holochilus squamipes*, and were taken in Peru.

The pleural plates of the specimens at hand differ somewhat from Neumann's figure, but these differences are such that they may easily be due to mistakes in drawing or to mere variation, of which there appears to be a certain amount. The appended figures will serve to supplement Neumann's description.

As showing how slight our knowledge of the Anoplura is, it is worthy of note that this is the fourth record of an Anopluran from the South American region. Two other species

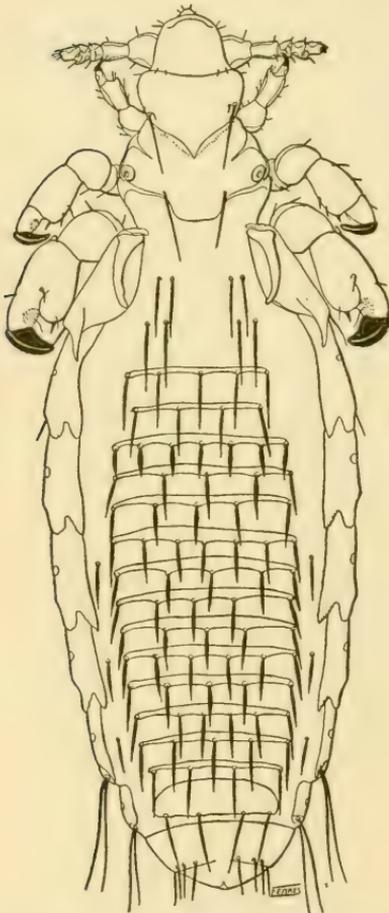


Fig. 12. *Hoplopleura quadridentata* (Neum.); female.

have been recorded, one from a llama and one from the vizcacha, these with the records given above constituting the sum of our knowledge of the Anoplura of South America.

ADDITIONS TO THE MAMMALIAN HOST LIST OF THE ANOPLURA
AND MALLOPHAGA.

Order CARNIVORA.

Family *Canidæ*.

Vulpes cascadenensis (red fox).

¹(M) *Trichodectes quadraticeps* Chapman (Mt. Shasta, Calif.).

Family *Mustelidæ*.

Gulo luscus ssp.? (wolverine).

(M) *Trichodectes retusus* Nitzsch (Yosemite National Park, Calif.).

Martes sp.? (marten).

(M) *Trichodectes retusus* Nitzsch (Yosemite National Park, Calif.).

Order RODENTIA.

Family *Sciuridæ*.

Sciurus hudsonicus vancouverensis.

(A) *Enderleinellus sphaerocephalus* Nitzsch (Kuiu Island, Alaska).

Sciurus hudsonicus petulans.

(A) *Enderleinellus sphaerocephalus* Nitzsch (Glacier Bay, Alaska).

Sciurus douglasi albolimbatus (Douglas squirrel).

(A) *Enderleinellus sphaerocephalus* Nitzsch (Yosemite National Park).

Sciurus griseus (gray squirrel).

(A) *Enderleinellus kelloggi* Ferris (Mariposa Co., Calif.).

Sciurus griseus nigripes.

(A) *Enderleinellus kelloggi* Ferris (Stanford University, Calif.).

Sciurus arizonensis huachucha.

(A) *Enderleinellus longiceps* K. & F. (Huachucha Mts., Ariz.).

¹ (M), indicates a Mallophagan species; (A), an Anopluran species.

Sciurus niger flaviventer.

(A) *Enderleinellus longiceps* K. & F. (De Kalb Co., Ind.).

Eutamias alpinus (mountain chipmunk).

(A) *Neohammatopinus pacificus* K. & F. (Yosemite National Park, Calif.).

(A) *Hoplopleura arboricola* K. & F. (Yosemite National Park, Calif.).

Eutamias speciosus frater.

(A) *Neohammatopinus pacificus* K. & F. (Yosemite National Park, Calif.).

(A) *Hoplopleura arboricola* K. & F. (Yosemite National Park, Calif.).

Eutamias merriami pricei.

(A) *Hoplopleura arboricola* K. & F. (Stanford University, Calif.).

Marmota flaviventris sierræ (marmot or woodchuck).

(A) *Linognathoides montanus* Osborn (Yosemite National Park, Calif.).

Cynomys leucurus (prairie dog).

(A) *Linognathoides montanus* Osborn (Routt Co., Colo.).

(A) *Enderleinellus suturalis* Osborn.

Cynomys gunnisoni.

(A) *Enderleinellus suturalis* Osborn (Florissant, Colo.).

Citellus beldingi

(A) *Enderleinellus suturalis* Osborn (Yosemite National Park, Calif.).

Citellus grammurus.

(A) *Linognathoides montanus* Osborn (Santa Catalina Mts., Ariz.).

Citellus plesius ablusus.

(A) *Linognathoides montanus* Osborn (Prince William Sound, Alaska).

Citellus mollis.

(A) *Enderleinellus suturalis* Osborn (Virginia Valley, Nev.).

Citellus oregonus.

(A) *Enderleinellus suturalis* Osborn (Pine Forest Mts., Nev.).

(A) *Linognathoides montanus* Osborn.

Citellus townsendi.

(A) *Enderleinellus suturalis* Osborn (Wallula, Wash.).

Ammospermophilus nelsoni.(A) *Enderleinellus suturalis* Osborn (Bakersfield, Calif.).*Xerospermophilus tereticaudus*.(A) *Enderleinellus suturalis* Osborn (Imperial Co., Calif.).Family *Petauristidæ*.*Glaucomys sabrinus lascivus* (flying squirrel).(A) *Hoplopleura trispinosa* K. & F. (Yosemite National Park, Calif.).(A) *Enderleinellus uncinatus* Ferris (Yosemite National Park, Calif.).(A) *Neohæmatopinus sciuropteri* Osborn (Yosemite National Park, Calif.).Family *Muridæ**Mus musculus* (house mouse).(A) *Hoplopleura hesperomydis* Osborn (Stanford University, Calif.).*Peromyscus maniculatus gambeli* (white-footed mouse).(A) *Hoplopleura hesperomydis* Osborn (Yosemite National Park, Calif.).(A) *Polyplax auricularis* K. & F. (Yosemite National Park, Calif.).*Onychomys torridus pulcher* (grasshopper mouse).(A) *Hoplopleura hesperomydis* Osborn (Victorville, Calif.).(A) *Polyplax auricularis* K. & F. (Victorville, Calif.).*Onychomys leucogaster arcticeps*.(A) *Hoplopleura hesperomydis* Osborn (Colorado Springs, Colo.).(A) *Polyplax auricularis* K. & F. (Colorado Springs, Colo.).*Neotoma fuscipes streator* (wood rat).(A) *Linognathoides inornatus* K. & F. (Yosemite National Park, Calif.).*Microtus (Lagurus) intermedius*.(A) *Hoplopleura acanthopus* var. *americanus* K. & F. (Pine Forest Mts., Nev.).(A) *Polyplax spinulosa* Burm. (Pine Forest Mts., Nev.).*Nesoryzomys indefessus*.(A) *Hoplopleura quadridentata* Neum. (Galapagos Islands).

Nesoryzomys narboroughi.(A) *Hoplopleura quadridentata* Neum. (Galapagos Islands).*Sigmodon hispidus*.(A) *Hoplopleura hirsuta* Ferris (Raleigh, N. C.).*Sigmodon hispidus texianus*.(A) *Hoplopleura hirsuta* Ferris (Rockport, Tex.).*Sigmodon hispidus eremicus*.(A) *Hoplopleura hirsuta* Ferris (Ft. Yuma, Calif.; Sacaton, Ariz.).Family *Heteromyidæ*.*Dipodomys deserti* (kangaroo rat).(A) *Fahrenholzia pinnata* K. & F. (Mecca, Riverside Co., Calif.).*Dipodomys merriami* ssp.?(A) *Fahrenholzia pinnata* K. & F. (Inyo Co., Calif.).*Perodipus* sp.?(A) *Fahrenholzia pinnata* K. & F. (Coulterville, Mariposa Co., Cal.).*Microdipodops polionotus*.(A) *Fahrenholzia pinnata* K. & F. (Benton, Mono Co., Calif.).*Perognathus parvus olivaceus* (pocket mouse).(A) *Fahrenholzia pinnata* K. & F. (Pine Forest Mts., Nev.).*Perognathus californicus* ssp.?(A) *Fahrenholzia tribulosa* Ferris (Pleasant Valley, Mariposa Co., Calif.).*Perognathus formosus*.(A) *Fahrenholzia tribulosa* Ferris (Victorville, Calif.).Family *Geomyidæ*.*Geomys cumberlandius* (gopher).(M) *Trichodectes geomydis* Osborn (Cumberland Island, Ga.).*Thomomys monticola* (gopher).(M) *Trichodectes geomydis* Osborn (Yosemite National Park, Calif.).

NOTES ON THE LIFE-HISTORY OF METHOCA STYGIA
SAY.

BY FRANCIS X. WILLIAMS,

Melrose Highlands, Mass.

The Thynnidæ, a family of aculeate wasps seems to find its metropolis in Australia. There, many large and striking forms occur—in strong contrast to our own modest species and to those of Northern Europe, represented indeed by the single genus *Methoca*. The diversity between the two sexes of the same species, in our forms at least, is so great—the male comparatively large, with coarse sculpture, compact thorax and well developed wings—the female small, slender and ant-like, that one does not wonder that they were first placed in separate genera, namely *Tengyra* and *Methoca*.

The Thynnidæ have several points in common with their generally hirsute relatives, the Mutillidæ, as for example, the apterous condition and ant-like appearance of the female, her long curved sting, hardness of body, and the habit of the male of carrying his mate about in his mandibles, a procedure possible in the Mutillidæ however only where the male is much larger than the female and capable therefore of flying about with her.

I was prompted by the researches of Adlerz ('03, '05) and of the Champions ('14, '15), on the biology of *Methoca ichneumonides* Latr. of Britain, Belgium, Scandinavia, and other parts of Europe to make observations on our own New England species, *Methoca stygia* Say, and while meeting with indifferent success, I was able to note that the habits of the two species are very similar.

Like its European cogener the female varies greatly in size, the series in my collection has its smallest individual 3.75 and its largest 7 mm. long, while the Champions have found *M. ichneumonides* to vary from 4 to 9 mm. The male of *M. stygia*, Fig. 1, is about 11 mm. long and shining black, with the head and thorax coarsely punctate, and the clypeus with a prominent median tooth. The abdomen is polished and rather coarsely punctate, with the segments, particularly 1 and 2, strongly separated by well-marked constrictions, which are deepest ventrally. The end of the abdomen is armed with an upcurved ventral spine over which is a

hairy tubercle-like process. The insect is rather sparsely pubescent. The female, Figs. 3 and 5, averages about 5 mm. long and is polished and only slightly and delicately punctate. The head is blackish, or at least darker in color than the reddish to brownish black body. The thorax is long and slender and constricted into three subequal portions. The abdomen is petiolate and conic-fusiform. The legs are long and the insect nearly devoid of pubescence. Sharp states that this sex might well be taken for an ant, and this certainly hold true for our own species, which in the field superficially resembles a *Formica*, and to my mind approaches *F. schauffusi* more than any other species in the neighborhood. But *Methoca* possesses curved and not elbowed antennæ, and her conically pointed abdomen has a rapid and distinctive up and down movement. Locomotion is swift and more or less jerky and zigzag.

Prior to 1903 nothing appears to have been published concerning the biology of the genus. In July, 1903, Adlerz observed a female *M. ichneumonides* literally place itself in the open mouth of a *Cicindela* larva, which seizing her, was instantly paralyzed by a sting in the neck from the active wasp. Subsequently Adlerz witnessed this procedure many times by placing *Methocas* with *Cicindelid* larvæ in a large glass vessel containing hard-packed soil in which the larvæ had excavated their trap burrows. The activities of *Methoca* in this connection were somewhat as follows: When the tiger-beetle larva had closed the entrance to its burrow by means of its horizontally placed head and thorax, *Methoca* was seen to run around the insect and at a suitable moment place herself on this animated lid. Instantly *Cicindela* raised its head to seize the wasp in its formidible, sickle-shaped jaws, but the upward movement of the head exposed its soft neck to the immediate and paralyzing sting of *Methoca*. When her venom has taken full effect she slides down into the burrow, indulges in further stinging and malaxation, drags her prey further down, fastens her long white egg behind one of the posterior coxæ and completes her work by filling up the hole and carefully disguising its location. If the *Cicindela* larva is not at the top of the hole *Methoca* plunges boldly in and does not reappear until she fills up the burrow.¹

¹ It may be remarked here that the large spider wasp, *Pepsis formosa* of the west does not always vanquish the hairy tarantula when the latter is on the surface of the ground but kills it as well when in the depth of its burrow. Judging from the manner in which *Pepsis* plunges into hole after hole—as I have observed in western Kansas—it seems not improbable that the tragedy more commonly takes place underground.

Adlerz made a few notes on the early stages and illustrates by rather poor photographs, the *Methoca* larva and cocoon. The latter ranged in length from 8 to 18 mm., being cylindrical, brownish yellow, composed of many layers of silk, and provided above with a sort of collar or neck.

The Champions ('14, '15) have observed the habits of this *Methoca* in England, where it inhabits the heathery and sandy portions of the country. The prey is the larva of *Cicindela campestris* and *sylvatica*. They observed *Methoca* go right down the hole after her prey. The burrow is carefully filled. The wasps worked well in captivity as with Adlerz. The egg stage is about four days and the slender glassy larva matures in twenty days from oviposition. The cocoon is dirt-free.

Bridwell (1912) speaks of *Methoca californica* as being "parasitic in the burrows of tiger-beetles." Aside from this statement, I know of nothing published on the habits of any of our few species.

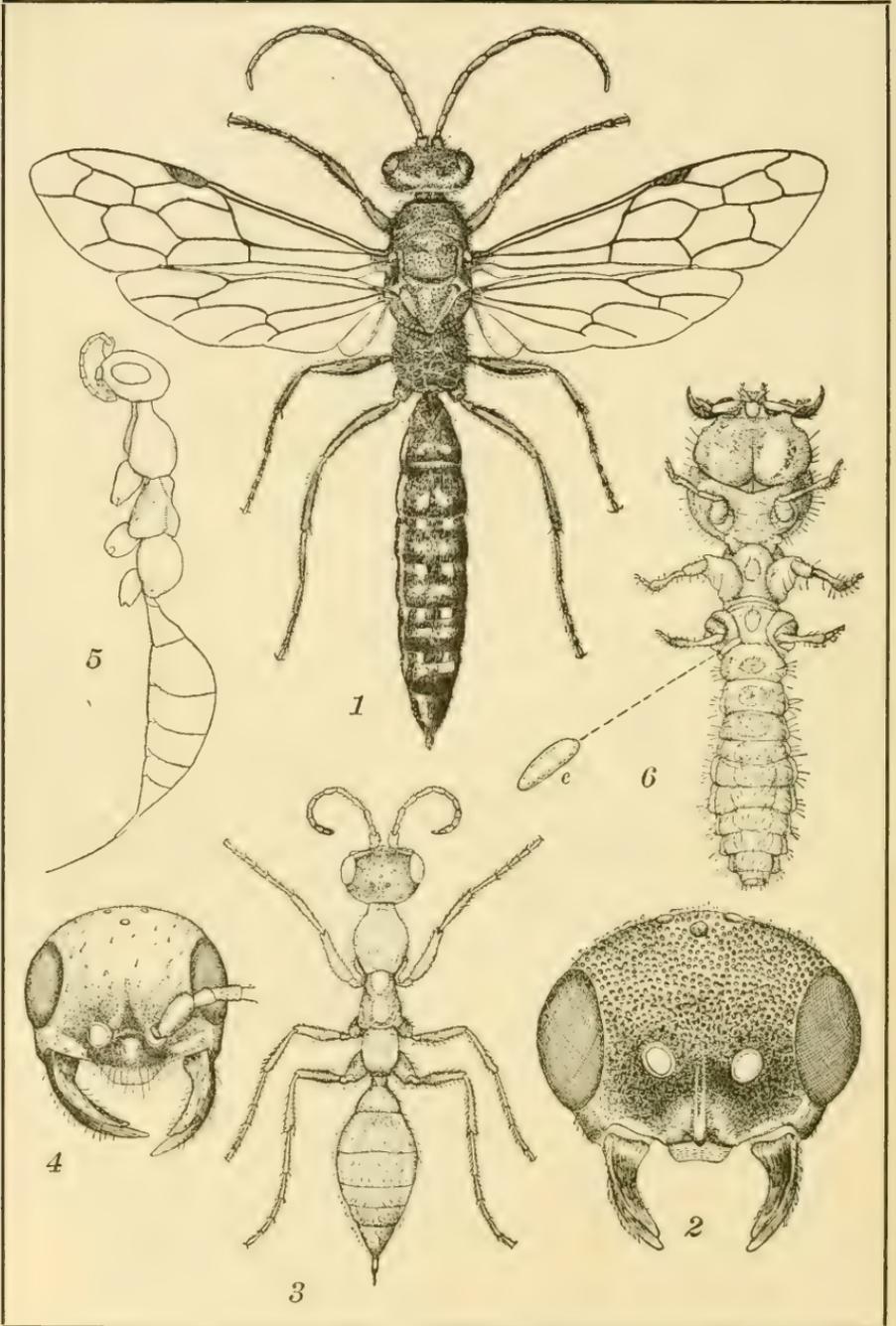
For three consecutive seasons (1913–1915) I have taken a few females of *Methoca stygia* in two adjoining sandy areas in Needham, a suburb of Boston, but not until the third season, when I took upwards of twenty specimens, did I attempt to secure any biological data. The locality was but a few hundred feet in extent, and its sandy and pebble-strewn soil, a favorite haunt for various fossorial wasps, as *Bembex*, *Microbembex*, *Bembidula*, *Tachytes*, *Tachysphex*, *Cerceris*, *Oxybelus*, *Mutilla* and others, was sparsely clothed with small plants, conspicuous among which was a little sedge and an inconspicuous *Hypericum*. A few small colonies of Cicindelid larvæ, probably *C. punctulata* Oliv. for the most part, undoubtedly furnished the food-supply of the *Methoca* progeny. This wasp is emphatically a lover of hot sunshine and was thus taken at rare intervals running in zigzag fashion over the sand. But once did I observe a *Methoca* attempt to enter a *Cicindelid* burrow and this attempt was failure because of the very small size of the aperture. Two *Methocas* confined in the field in glass tumblers inverted over a burrow of a Cicindelid larva yielded no results, but other experiments were in a degree successful.

In the summer of 1915 *Methoca* was comparatively abundant and twenty-six specimens were taken from August 1 to September 5, fifteen of these being captured on August 15. I confined several in a quart preserve jar half filled with sand stocked with half

grown and nearly mature *Cicindela* larvæ. The mouth of the jar was covered with fine gauze and the jar itself sunk in the soil in a sunny spot, to the level of the sand within. The wasps were fed sugar and water placed on flowers, and this appeared to prolong life, one *Methoca* living about ten days. Several of the tiger-beetle larvæ had one to several (five in one case) small, orange-colored maggots attached to the body. These were probably the larvæ of the bombylud fly *Spogostylum*, whose life-history has been partly worked out by Shelford ('13). I was unable to watch *Methoca*, during the greater part of the time, but did notice that while they were often careful to avoid Cicindelid burrows, at other times they would enter these and make them their abode for the night, the original occupant keeping to the bottom. In the afternoon of a very warm day I emptied the jar of its contents to find two semi-paralyzed beetle larvæ each with a *Methoca* clinging to its venter busy malaxating, despite the rude unearthing. But their operations went no farther. On another occasion I observed *Methoca* putting the finishing touches to her work, in depositing grains of soil on the filled-up burrow. I obtained several eggs of the wasp. These, as also observed by the European writers, were transversely arranged in the fold behind one of the hind coxæ of the cicindelid. But one egg is laid on each larva though the latter may vary greatly in size. The cylindrical egg is nearly straight, about five times as wide as long and shining transparent whitish. None hatched though this may well be due to the unnatural conditions to which they were exposed. The victims, in some cases stung so that they soon died and decomposed, in others were nearly as active as normal larvæ. One of the *Methoca* was found decapitated a day or two after being placed in the jar. It may be well to remark that the head is very strongly attached to the thorax and indeed the whole insect is well fitted to pursue its apparently dangerous vocation. Adlerz has called attention to the shape of the metathorax which, approximately at its middle length is furrowed transversely, a place where the jaws of the cicindelid may seize her.

The male of *Methoca* seems to be much rarer than the female and is probably a visitor at flowers.

The Thynnids of Australia are often of striking appearance—a female loaned me from that region is nearly an inch long and iridescent purple and bluish.



WILLIAMS—*Life-history of Methoca stygia*

Great opportunities await the biologist who is interested in these singular insects and who has access to their haunts. More complete field observations and careful methods of confinement will surely furnish a better knowledge of the habits and early stages of our own rare species.

I am indebted to Mr. C. W. Johnson of the Boston Society of Natural History, and to Prof. W. M. Wheeler and Prof. C. T. Brues of Harvard University for the loan of material.

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EXPLANATION OF PLATE.

All figures much enlarged.

Fig. 1. *Methoca stygia* ♂.

Fig. 2. *Methoca stygia* ♂; front view of head.

Fig. 3. *Methoca stygia* ♀.

Fig. 4. *Methoca stygia* ♀; front view of head.

Fig. 5. *Methoca stygia* ♀; lateral view.

Fig. 6. Small larva of *Cicindela* sp., showing egg, e. of *Methoca* secured behind right hind leg. Ventral view.

A NEW SPECIES OF LEPIDOPRIA FROM NORTH AMERICA.

BY CHARLES T. BRUES,
Bussey Institution, Harvard University.

I received recently from Mr. J. J. Davis of the Bureau of Entomology a very interesting Diapriid parasite of the genus *Lepidopria* which was reared by Mr. J. A. Hyslop from a Dipterous puparium found in an adult June-beetle. According to Mr. Davis the puparium was probably *Cryptomeigenia theutis*. The Diapriid is thus a secondary parasite of the June-beetle, but actually lives in the *Cryptomeigenia* which is in accordance with the known habits of the other members of the family which have been reared from various Diptera. This is the first *Lepidopria* to be found in the Western Hemisphere as the only species hitherto described, *L. pedestris* Kieffer, was found in Italy.¹

From the form of the body which is exceeding ant-like, one might be led to suppose that the members of *Lepidopria* like those of the related *Solenopsia* are myrmecophilous, but such is evidently not the case, at least with the present species. Although there are quite considerable differences between the European and North American species I think that both can, at least for the present, be considered congeneric. The most striking disparity appears in the form of the antennæ, but as these organs are very highly modified in the closely related *Solenopsia* one cannot reasonably place very great weight upon them as generic characters.

Following is a description of the new form:

***Lepidoria aberrans* sp. nov.**

♀. Length. Piceous, the thorax and base of the abdomen fuscous; legs and antennæ yellow. Antennæ 12-jointed, stout; scape arcuate, as long as the pedicel and first four joints of the flagellum together; pedicel one-half longer than broad, tip as wide as the apex of the scape; first joint of flagellum two-thirds as long as the pedicel and much narrower; second to seventh joints of flagellum short and broad, strongly transverse; club three-jointed,

¹ André, Hymén. Europe et Algérie, Vol. 10, p. 869. (1911).

a little longer than the preceding joints of the flagellum taken together. Eyes very small, less than half as long as the cheeks; ocelli large, in an equilateral triangle. Palpi very short, scarcely projecting from the mouth opening, the maxillary apparently with three very short joints and the labial with a single joint. Metathorax clothed with woolly hairs, its upper surface slightly raised behind;

the posterior surface excavated to receive the convex base of the nodiform first abdominal segment, the latter elevated into a large erect scale-like node which is curved backward so that its anterior surface is convex and the posterior one concave, its surface woolly. Second

segment comprising over two-thirds of the abdomen, following segments very short. Legs stout, tibiae, especially the anterior ones, strongly swollen apically; tarsal claws stout, simple.

Described from one female, mounted in balsam, reared as mentioned above from a Tachinid pupa, probably *Cryptomeigenia theutis*, found in an adult *Phyllophaga (Lachnosteria) inversa* at Hagerstown, Md., August 15, 1913.

This species differs from *L. pedestris* Kieff. by the three-jointed antennal club.

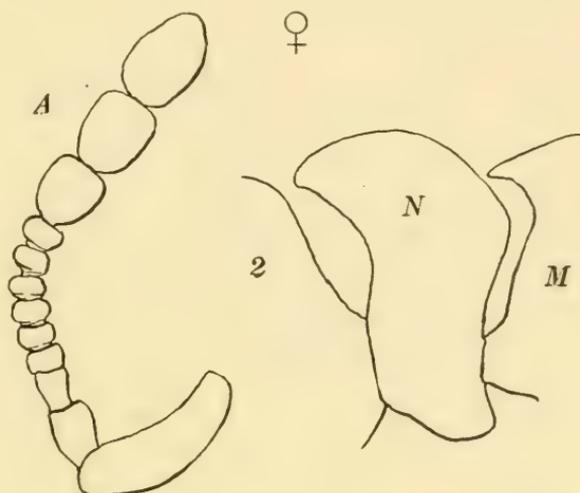


Fig. 1. *Lepidopria aberrans* sp. nov. ♀. A, antenna; N, lateral view of petiole of abdomen shown in position between the metathorax (M) and the second abdominal segment (2).

BOOK REVIEW.

A NEW LIST OF NORTH AMERICAN HEMIPTERA.

The New York Entomological Society has recently published a "Check List of the Hemiptera of America, North of Mexico," by Professor E. P. Van Duzee, the first complete enumeration of the group as found in the Nearctic region and a most valuable contribution, fully upholding the reputation of its author as the foremost American Hemipterist. Though modestly designated a "check list," the paper gives full synonymy, dates, a complete view of the present classification of the group, and the general distribution of the species, in addition to the numbered list of forms. Thus the work is similar in character to Oshanin's excellent "Katalog der Paläarktischen Hemipteren" (1912), making it easy to draw faunistic comparisons. Professor Van Duzee has adhered strictly to his well-known nomenclatorial beliefs, applying the principle of priority not only to generic and specific designations but also to those of higher groups, a procedure which seems logical and results happily in the retention of most of the long-used family names.

In going over the work critically, I have noted a few points to which exception might be taken. Personally I believe that the Corixidæ, Alydidæ, Meziridæ (Dysodiidæ), and Piesmidæ should have family rather than subfamily rank, but further studies, especially in Embryology, will be necessary to answer finally this and many other questions in the taxonomy of the higher groups. Perhaps it will not be out of place to suggest that submission of the parts of the work to specialists on the various families would have improved it in certain details, as may be noted here and there, for instance in the families Lygæidæ, Nepidæ, and Corixidæ. As in most catalogues, a large number of new names are proposed and new synonymies given without explanations or references. It is to be hoped that in his large catalogue, or in a special paper, the author will fully explain synonymies proposed by himself, and give references to those proposed by others. The absence of such information in most catalogues has always seemed to me to be a serious defect.

In the Heteroptera I have noted the following points which call for comment:

- p. ix, 17, Neidiinæ should read Neidinæ.
- p. 4, Graphosominæ should read Graphosomatinae.
Podops is feminine.
- p. 8, No. 181, *hilaris* should read *hilare*.
- p. 8, Acanthosominæ should read Acanthosomatinae, according to the International Code ruling.
- p. 10, No. 236a, *C. distinctus* I consider a distinct species.
- p. 12, No. 288, *vittiger* should read *vittigera*.
- p. 13, Leptocorisiini should read Leptocorisini.
- p. 23, Lethiini should read Lethæini.
- p. xi, p. 25, Tingididæ should read Tingidæ, as indicated by Fabricius' use of the genitive *Tingis* (Syst. Rhyng., p. 124, footnote).
- p. 25, No. 639a, *C. cratægi* I consider a distinct species.
- p. 27, Ploiarioliinæ should read Ploiariolini.
- p. 30, No. 777a, *R. americanus* I consider a distinct species.
- p. 35, *Triphleps* is feminine.
- p. 41, Deræocoriaria should read Deræocoraria.
- p. 42, No. 1105, *amænus* should read *amæna*.
- p. 44, No. 1145, *instabile* should read *instabilis*.
No. 1147, *confluenta* should read *confluens*.
- p. 50, No. 1319, *stellata* should read *stellatus*.
No. 1324, *confluenta* should read *confluens*.
- p. 52, Belostomidæ should read Belostomatidæ as on p. xi.
Belostoma is neuter.

The conscientious preparation of such a work as this involves much painstaking labor, and every page gives evidence of how faithfully the author has done his task. Mistakes are unusually few and many long standing and oft repeated errors, large and small, are at last corrected. In this, his latest contribution, Professor Van Duzee has again laid entomologists under great obligations and has given a new impetus to American Hemipterology, as the lack of a scholarly list has been one of the chief reasons for the neglected condition of this group, which offers such a fertile field for systematic, biological, and economic researches.

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CONTENTS.

Sarcophagidæ of New England, III, <i>Sarcophartia ravinia</i> , New Genus and New Species. <i>R. R. Parker</i>	131
Taxonomic Notes on Agathinæ (Hymenoptera-Braconidæ). <i>J. Chester Bradley</i>	139
Note on Genus <i>Hyoidea</i> Puton (Hemiptera). <i>E. P. Van Duzee</i>	141
Note on the Brazilian Fire-ant, <i>Solenopsis sævissima</i> F. Smith. <i>William Morton Wheeler</i>	142
An Anomalous Blind Worker Ant. <i>William Morton Wheeler</i>	143
A New Brachelytrous Trogositid Beetle from Colorado. <i>H. F. Wickham</i>	146
Notes on the Egg-Parasites of the Apple Tree Tent-Caterpillar (<i>Malacosoma americanum</i>). <i>L. T. Williams</i>	148
<i>Monarthropalpus buxi</i> Lab. in New Jersey (Dip.). <i>Weiss</i>	154
Exchange Column	157

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SARCOPHAGIDÆ OF NEW ENGLAND, III, *SARCOFAHRTIA RAVINIA*, NEW GENUS AND NEW SPECIES.

BY R. R. PARKER.

Sarcofahrtia Gen. nov.

Genotype: *Sarcofahrtia ravinia* sp. nov.

(♂ and ♀.) Rows of frontal bristles not extending below base of vitta and parallel to its sides, except that last one or two pairs may be slightly divergent, uppermost frontal bristle in male not stronger than those immediately beneath and not strongly directed backward, front much broader in females; gena without a row of hairs, hair-like bristles or bristles near lower eye orbit (vestiture sparse and minute in type species); vestiture of back of head black throughout. Epaulets light colored (brownish and light yellowish or only yellowish) vestiture of tibiæ short; three pairs posterior dorsocentrals; two notopleurals; apical bristles absent;¹ lower sternopleura with bristles only. Sides of second and third ventral plates in the male overlapped by ventral edges of corresponding nota (usually the second, third and fourth in females). First genital segment (notum) of male consisting of the fused sixth and seventh abdominal segments (nota) and "hump-backed" in profile (Fig. 3).

¹ In the Sarcophagidæ of New England, I (Proc. Boston Soc. Nat. Hist., V. 35, No. 1, p. 25), the writer defined apical bristles as a "pair of bristles inserted at the apex of the scutellum, sometimes crossing and usually weaker than those next to them laterally." It is his opinion that in this group of flies, it is best to consider the terminal bristles of the scutellum as apical only when they are weaker than the next lateral pair. The designation of apical is sometimes a matter of slight difference in position and its significance seems lost unless the above idea is adhered to. The most posterior pair in this genus (*Sarcofahrtia*) are much the strongest and the designation "apical" as of possible application would be a matter of personal fancy, but by the definition given above there is no possibility of misunderstanding, especially when it is desired to refer to their presence or absence. This fact is mentioned because Villeneuve has described a genus *Blasoziphella* in which he notes that the "apical" bristles are the longest (Annales Musei Nationalis Hungarici, Vol. 10, p. 613, 1912).

This genus is of particular interest because of its apparent relationship to other Sarcophagid genera. This relationship is indicated in the generic and specific names of the type species. The following paragraphs bring out the main points of resemblance.

Sarcofahrtia and *Wohlfahrtia*. Vestiture of back of head black throughout, epaulets brownish and light yellowish or only yellowish, three posterior dorsocentrals; two notopleurals; apical bristles absent; lower sternopleurals with bristles only; abdomen of male almost elliptical; sides of second and third ventral plates (usually second, third and fourth in females) overlapped by ventral edges of corresponding nota; first genital segment of male "humpbacked" as seen in profile and consisting of the sixth and seventh abdominal segments (nota) fused; fourth ventral plate of male without lamellæ; spiracles of abdominal nota on each side in a straight longitudinal line parallel to long axis of abdomen.

The lack of a row of hairs, hair-like bristles or bristles on the gena near the lower eye orbit is also similar to the species of *Wohlfahrtia* studied, though in the latter genus the gena is often entirely naked. The membrane connecting the notum of the first genital segment to the abdomen in the male is very short in both genera; this is radically different from the condition which exists in most species of *Sarcophaga* in which the genital segments can often be pulled well out from the end of the abdomen. The character of the vestigial remnant of the ventral plate of the sixth abdominal segment is the same as that noted for *Wohlfahrtia* (Parker, l. c., p. 18).

Sarcofahrtia and *Ravinia*. Rows of frontal bristles parallel to sides of vitta except that lower one or two pairs may diverge slightly (in *Sarcofahrtia* do not extend below base of vitta and only in a few species of *Ravinia*); epaulets brownish and light yellowish or only yellowish; vestiture of all tibiae short; apical bristles absent; lower sternopleura with bristles only; base of forceps without upward flap-like extensions.

The general appearance of the head, viewed from in front, is strikingly alike in *Sarcofahrtia ravinia*, *Ravinia communis* R. Parker, *R. peniculata* R. Parker and *R. hamatodes* Meigen. This is emphasized in the males by the fact that the sides of the frontal vitta are noticeably "drawn" toward each other at the base, and in both sexes by the sharp delineation of the vitta. The forceps prongs

in *Sarcophartia* are spread as in *Ravinia* and particularly resemble those of *R. latisetosa* R. Parker. The parts of the penis are readily homologized with those of *Ravinia*, especially *R. communis*. The whole structure, however, is not so similar to that of this species of *Ravinia* as are those of *Wohlfahrtia opaca* (Coquillett) and *W. chittendeni* (Coquillett).

The comparison given above is based on the following species: *Sarcophartia ravinia*, *Wohlfahrtia opaca*, *W. chittendeni*, *Ravinia communis*, *R. peniculata*, *R. latisetosa*, *R. quadrisetosa* (Coquillett), *R. hamatodes* Meigen, *R. xanthopyga* (Van der Wulp) (?) and several undescribed species of this genus.

The resemblance of *Sarcophartia* to *Sarcophaga* is merely one of general appearance. Some characters are similar to those of *Agria* and *Sarcophagula*.

The comparison of these genera seems worth while and illustrates the fact previously suggested by the writer concerning generic characters among such patently closely related genera as many of those of this group (Parker, l. c., p. 32). This suggestion may be briefly summed up by saying that the diagnostic value of any particular generic character is not to be found in that character of itself, but is due to the particular set or group of other characters with which it is associated. One might almost say of this group that one character alone is not generic, and that it becomes so only when associated with others that limit its application.

It is doubtful if all possible characters have been included in the generic description. Among those of doubtful rank may be mentioned, palpi dull orange; uppermost pair of frontals in female not noticeably, if at all, farther apart than preceding pairs (they are farther apart in other genera discussed, except *Agria*).

Sarcophartia ravinia sp. nov. (Fig. 1, page 137.)

(♂ and ♀.) Second and third antennal segments pinkish orange (usually, not habitually); palpi dull orange; hairs fringing calypters dark at bend, anterior face of posterior femur with two rows of bristles only, a lower and an upper; posterior surface of middle tibia of male with a single bristle on the middle line distal to the center (two others are present in females, but are more proximal and close to the median dorsal ridge); submesotibial bristle absent in male. Forceps of male with prongs spread from near base (*Ra-*

vinia-like). First genital segment (notum) of female not divided into two lateral lips.

(♂.) Length, 7 to 11 mm.

HEAD: Viewed from side parafrontals and genæ with dark reflections. Breadth of front at its narrowest part about three-sevenths eye width; cheek height about one-fourth that of eye. Front prominent; frontal vitta at its narrowest part usually greater than twice the width of each parafrontal, its sides drawn in at base and converging backward in a slight curve. Second and third antennal segments pinkish orange; third one and one-fourth to one and one-half times length of second; arista shortly plumose to beyond middle, hairs on lower side continuing farthest outward. Palpi, dull orange. *Chortotaxy*. Lateral verticles absent, virbrissæ inserted on line of oral margin.

THORAX: Metanotum clothed with short, reclinate bristles. Hairs covering anterior spiracle usually dark above, light toward base of spiracle, or base of hairs dark and tips light; those of anterior margin of posterior spiracle may be dark below and light above or almost entirely light colored; those of spiracular cover very light and often tinged with brown centrally at base.

WINGS: Bend of fourth vein essentially a right angle; anterior cross-vein slightly more basal than end of first longitudinal; third vein with bristles near its base that may extend more than half way to anterior cross vein; costal spine short; section III of costa at least equal to section V; fifth vein continued beyond junction with posterior cross-vein; alulae fringed with hair; calypters whitish: but posterior one is often more or less smoky, margin with dark hairs at bend at least, otherwise the fringe white.

LEGS: Dark; vestiture short, except under side of coxæ, trochanter with a distinct apical spine: femur more or less spindle shaped; anterior face with two rows of bristles only, an upper and a lower; posterior face with a ventral row of slender bristles that are at least as long as those of lower row of anterior face, well differentiated centrally and extending distally to beyond middle of femur: tibia with a single bristle on anterior face (besides those close to median dorsal ridge) just distal of the middle and nearest the lower side: tarsus slightly shorter than tibia. Anterior and posterior ventral rows of bristles of middle femur developed on proximal half only or thereabouts, distal portion of posterior row

is represented by a short "comb;" submesotibial bristle absent; posterior surface of tibia with a single bristle, this on its middle line on distal half (no bristles on this surface near median dorsal ridge). Ventral surface of anterior coxa with two irregular rows of bristles, one at each side; tibia with a single bristle on posterior surface distal to center and on middle line. *Chatotaxy*. The two posterior pairs of anterior dorsocentrals are scarcely, if at all, weaker than the two anterior pairs of postsuturals, one or two weaker and sometimes inconspicuous pairs anterior to these; acrostichals absent; inner presuturals absent; three pairs posterior dorsocentrals, last somewhat the strongest; prescutellar acrostichals present; usually four sternopleurals, sometimes two, three or five; subnotopleurals slender, but distinct.

ABDOMEN: Outline almost elliptical; nota clothed above with short reclinate bristles, beneath with longer almost erect hair. Vestiture of the three ventral plates practically of same length and not short. Spiracles of nota on each side in a straight line, the rows parallel to longitudinal axis of abdomen and to each other. Fourth segment may or may not be wholly or in part of same color as genital segments. *Chatotaxy*. Second segment with weak, inconspicuous, decumbent marginal bristles; third with two, only occasionally with weaker ones between these and laterals, latter become more slender ventrally but extend well toward ventral plate, fourth with complete row ending ventrally at forward turn of margin.

GENITAL SEGMENTS: Large, protuberant, filling entire opening of fourth segment and notum fits them closely; dull orange, sometimes yellowish pollinose: first, much larger than second; normally with two rows of bristles, first just anterior to line of fusion of sixth and seventh nota, second on posterior margin, either row may be absent, when both are present those of marginal row the weaker; vestiture sparse and only on posterior half of sixth notum, an irregular line of minute bristles anterior to first row of bristles; in profile showing a more or less distinct "hump:" second, in normal position directly beneath first, and appears discoidal (when segments are pulled out is more triangular in profile); vestiture sparse, scarcely longer than that at first. Forceps (rarely exposed); small, base without upward flap-like extensions, prongs attenuated, tips darkened and bent slightly forward but not approaching each other.

GENTHALIA: Fourth ventral plate same color as genital segments, without lamellæ, almost naked. Accessory plates seem to be linear processes from second segment that extend forward from near base of forceps and then turn inward and downward. Anterior claspers stubby, ends bent forward and slightly expanded; posterior claspers slender, hooked forward at tips, often retracted within second segment and not visible. For structure of penis see Fig. 6.

Females differ from males in following important characters.

HEAD: Breadth of front at its narrowest part about equal to eye width, cheek height two sevenths to one third of eye. Just below ocellar triangle frontal vitta fully twice as wide as each parafrenal, much broader than in male, its sides parallel and distinctly delineated to posterior extremity of the triangle. Third antennal segment broader and thicker than in male and prominently marked with sensory organs. *Chatotaxy*. Last pair of frontals (stronger than preceding pairs and directed backward and outward) on same transverse line as greater ocellars.

WINGS: Bend of fourth vein slightly acute; costal spine slightly stronger than in male.

LEGS: Ventral row of bristles of posterior face of hind femur confined to proximal half; tarsus fully as long as tibia. "Comb" absent on middle femur; posterior face of tibia with two additional bristles that are near median dorsal ridge, submesotibial bristle present. *Chatotaxy*. That of mesonotum somewhat more reclinate.

ABDOMEN: Oval in outline, clothed throughout with short reclinate bristles. *Chatotaxy*. Marginals of second segment even less conspicuous than in male; laterals of second and third segments extend to ventral plate but are short and decumbent.

GENTHAL SEGMENTS: Not protuberant. Fifth ventral plate wider than fourth and of same color as genital nota. Fifth notum (first genital segment) not divided into lateral lips, narrow, fringed with bristles; spiracles scarcely visible (concealed by fourth notum), well below center. Notum and sternum of second genital segment prominent.

Described from nine male and two female specimens.

Type: Massachusetts Agricultural College, Amherst, Mass., male and female. *Paratypes:* United States National Museum, Wash-

ington, D. C., one male, one female; Gypsy Moth Laboratory, Melrose Highlands, Mass., four males; collection of H. E. Smith, one male; collection of R. R. Parker, two males.

Range: New England. Massachusetts: Lunenburg (R. T. Webber), North Andover (D. C. Clemons), Melrose Highlands (D. C. Clemons), Wareham (Dr. Franklin). New Hampshire:

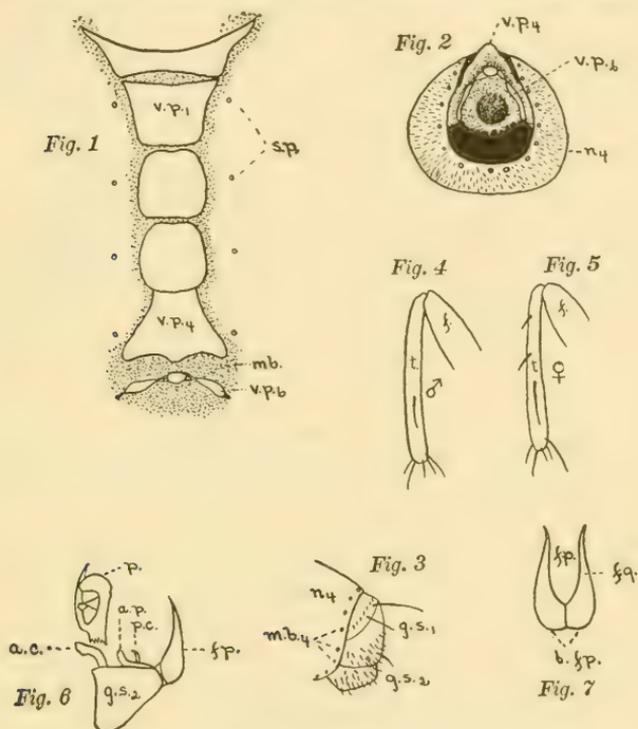


Fig 1. *Sarcophartia ravinia* (For explanation, see p. 138.)

Franconia (Mrs. Slosson). Connecticut: Hamden (B. H. Walden). Inclusive dates of capture, May 20 and August 20.

The most important points for discussion have been considered following the generic description. The following may also be noted. The most distal bristles of the lower row of the anterior face of the third femur in males is not habitually the strongest as in most species of *Sarcophaga*; as a rule there are other stronger bristles in this row. The rows of bristles on the first genital segment are very inconstant; the first row may be lacking, may consist of two stout bristles at the center or there may be an additional

pair lateral to these (four in all); the bristles of the marginal row are more slender and may also be lacking. Both rows were not absent in any specimen examined by the writer. The connection membrane between the genital segments has less play than in most species of *Sarcophaga* and is scarcely discernible. The accessory plates somewhat resemble these of the tsetse flies as regards their apparent position. Due to the fact that the ventral edges of the third and fourth abdominal nota overlap the third and fourth central plates these are not plainly visible as in the genus *Sarcophaga*.

The writer is indebted to the United States National Museum, to Mr. A. F. Burgess of the Gypsy Moth Laboratory at Melrose Highlands, Mass., to Prof. H. T. Fernald of the Massachusetts Agricultural College at Amherst, and to Mr. H. E. Smith of the Bureau of Entomology Laboratory at West Springfield, Mass., for the loan of material.

EXPLANATION OF FIGURE 1. *Sarcophartia ravinia* sp. nov.

- Fig. 1. Showing character of ventral plates, of sixth ventral plate (sternum) and position of spiracles; the sixth ventral plate pulled out of normal position.
- Fig. 2. End of abdomen with hypopygium removed and showing normal position of sixth ventral plate (membrane folded back and sixth plate lies above fourth taxonomic plate).
- Fig. 3. Profile view of end of abdomen with genital segments in their normal position. Note line of fusion of sixth and seventh abdominal nota and the two rows of bristles.
- Fig. 4. Posterior surface of middle tibia of male showing one bristle.
- Fig. 5. Posterior surface of middle tibia of female showing two bristles in addition to the one found in the male.
- Fig. 6. Profile view of second genital segment, forceps, penis and claspers.
- Fig. 7. Posterior view of forceps. Note base without upward flap-like extensions and the spread forceps prongs (*Ravinia* like).

ABBREVIATIONS.

a.c. = anterior claspers.

a.p. = accessory plate.

b.fp. = base of forceps.

f. = femur.

fg. = forceps prong.

fp. = forceps.

g_1 and g_2 = first and second genital segments.

n_4 = fourth notum.

n^6_4 = marginal bristles of fourth notum.

mb. = membrane.

p. = penis.

p.c. = posterior claspers.

sp. = spiracles.

t. = tibia.

v.p.₁, v.p.₄, v.p.₆ = first, fourth and sixth ventral plates.

TAXONOMIC NOTES ON AGATHINÆ (HYMENOPTERA-BRACONIDÆ).

BY J. CHESTER BRADLEY,
Cornell University, Ithaca, New York.

A NEW DEFINITION OF CRASSOMICRODUS ASHMEAD.

A study of the type of *Microdus fulvescens* Cresson, designated by Ashmead as type of his genus *Crassomicrodus* (Proc. U. S. Nat. Mus., vol. 23, p. 128, 1900), reveals the fact that in this species the hind wings have no closed discoidal cell and the longer spurs of the posterior tibiæ are decidedly less than one half of the length of the metatarsi. These are the characters upon which Ashmead based his genus and by which he separated it from *Epimicrodus*. The designated type of the latter genus is *Microdus diversus* Cresson, undoubtedly, as Mr. Viereck has already pointed out, a misprint for *divisus* Cresson, since Mr. Cresson never described a *Microdus* under the name *diversus*. Moreover *divisus* agrees well with most of the characters assigned by Ashmead to the genus *Epimicrodus*.

Microdus fulvescens Cresson agrees generically in all respects with *Microdus divisus* Cresson, of which I have also examined the type. It is, therefore, necessary to unite the two genera. *Crassomicrodus* has page priority and will, therefore, take precedence over *Epimicrodus*.

Spilomicrodus Cameron possesses the characters erroneously assigned to *Crassomicrodus* by Dr. Ashmead in his key (*loc. cit.*) and should, therefore, replace the latter name in that key, while *Crassomicrodus* should there replace *Epimicrodus*.

Crassomicrodus Ashmead.

1900. *Crassomicrodus* Ashmead. Proc. U. S. Nat. Mus. 32:128.
(Type: *Microdus fulvescens* Cresson.)
1900. *Epimicrodus* Ashmead. Proc. U. S. Nat. Mus. 32:129.
(Type: *Microdus diversus* [sic] = *divisus* Cresson.)

Malar space short, or only slightly lengthened, not rostriform as in *Agathis*; maxillary palpi slender, five-segmented, the second segment slender; parapsidal furrows distinct; mesopleural furrow strong, foveolate; propodeum not areolated, its spiracles small and round. First and second discoidal cells separate; second cubital cell petiolate, small and triangular; hind wings without a closed discoidal cell. Longer hind tibial spur less than one half the length of the metatarsus; claws large, simple; ovipositor not exerted.

THE GENERIC POSITION OF TWO CUBAN AGATHINÆ.

Microdus fasciipennis Cresson, of which I have examined the type belongs to *Zelomorphidea* Viereck, a subgenus of *Zelomorphus*. Mr. Viereck has ventured the suggestion that all the South American *Disophrys* probably belong to *Zelomorphidea*, and in the main I suspect that he is correct. Nevertheless *Agathis cubensis* Cresson, of which I have also studied the type, is more closely allied with *Disophrys* than with any other described genus, and should be placed in that genus pending an opportunity for a critical revision of the genera of *Agathinæ*. Its claws are cleft, its areola quadrate, its face elongate, rostriform, and its hind legs stout.

NOTE ON GENUS *HYOIDEA* PUTON (HEMIPTERA).

BY E. P. VAN DUZEE,
Berkeley, California.

Mr. Otto Heidemann has very kindly sent to me for examination a cotype of *Hyoidea horrathi* Montd. and a careful examination of this confirms my assignment of this genus and *Bolteria* Uhler in my synoptical tables of the Miridæ recently published by the University of California and in the Check List of the Hemiptera, in both of which I drop *Hyoidea* as wanting in our fauna and arrange *Bolteria* in the Phylini near *Plagiognathus*. Dr. Reuter did not know *Bolteria amicta*, the type of the genus, but placed *pieta* in *Hyoidea* and described a new species *grisea*. An examination of fresh material of *pieta* shows that it wants the free converging arolia found in *Hyoidea* and must be placed in Subfamily Phylinae. It is probably safe to assume that *amicta* is congeneric with *pieta* although the type is lost and so far as I know the species is now unrecognized.

I am also indebted to Mr. Heidemann for the opportunity of examining typical examples of *Hyoidea grisea* Reuter, and, as Mr. Heidemann suggests in his letter to me, this proves to be a synonym of *Labopidea chloriza* Uhler. I am, however, convinced that both *chloriza* and *grisea* are identical with the earlier described *Tini-cephalus simplex* Uhler and that we must use the generic name *Labopidea* for the species. *Hyoidea* differs from *Labopidea* in having a more polished surface with punctured pronotum, a longer and more parallel form with the pronotum but little wider behind, and a sharp and carinate hind margin to the vertex. The aspect of *Hyoidea* is quite different from *Labopidea* and I believe it should be considered distinct. Both of these genera have free converging arolia and belong to the Orthotylini.

NOTE ON THE BRAZILIAN FIRE-ANT, *SOLENOPSIS*
SÆVISSIMA F. SMITH.

BY WILLIAM MORTON WHEELER.

While discussing the various North American forms of *Solenopsis geminata* Fabr. in a recent paper¹ I stated that the ant described many years ago as *Myrmica sævissima* by Frederick Smith from specimens taken by Bates at Pará, is, in all probability, identical with the one later called *Solenopsis pylades* by Forel. My reasons for making this statement were these: "In the first place, Smith's description is unusually good and applies perfectly to the typical yellow *pylades*. In the second place, his specimens were received from Bates, who gives an interesting account of the habits of this 'fire-ant' in Brazil. Moreover, Mr. W. M. Mann, who collected extensively in the region where Bates collected his specimens and made his observations, tells me that it is there the only common and widely distributed *Solenopsis*, and the numerous specimens collected by Mr. Mann prove to be the typical *pylades* Forel." Forel, however, will not assent to this opinion.² He says that Smith mentions a worker major and a worker minor in his description, whereas it was precisely the feeble polymorphism of the worker that led to the separation of *pylades* from *geminata*. Surely Forel, who has had to spend so many precious hours in the interpretation of Smith's inadequate and faulty specific descriptions, ought not to regard his statements concerning major and minor workers as meaning anything more than a perceptible difference in size. My critic, however, completely ignores the second and third points of my contention, which to me seemed to be the more important.

In order to settle the matter, I sent several specimens of the typical yellow *pylades* Forel, taken by Dr. Mann at Pará, to my friend, Mr. Horace Dornisthorpe, with the request that he compare them with the types of Smith's *sævissima* in the British Museum. He writes me under date of July 3 as follows: "I compared

¹ Some Additions to the North American Ant-Fauna. Bull. Amer. Mus. Nat. Hist., 34, 1915, p. 395.

² Fourmis du Congo et d'autres provenances récoltées par MM. Hermann Kohl, Luja, Mayne, etc. Rev. Suisse Zool., 21, 1916, p. 459.

the ants you sent me with F. Smith's types (two workers on one card, one large, one medium) of *Solenopsis savissima* at the British Museum on Saturday and they agree perfectly in every way. The types were taken by H. W. Bates at Pará." There can be no doubt, therefore, that Forel's *pylades* is merely a synonym of *savissima* Smith.

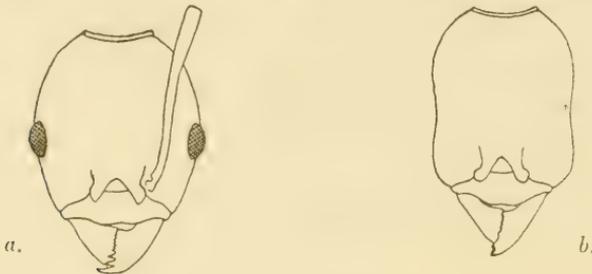
Forel disagrees with me further on the rank of this form, maintaining that it should be regarded as a distinct species and not as a subspecies of *geminata*, because the polymorphism of the worker is very feeble, owing to the complete absence in the colonies of any large-headed forms like those of *geminata*. This is a matter of personal opinion. I called attention to the fact that two of our North American forms, *maniosa* Wheeler and *xyloxi* MacCook are in this respect intermediate between *savissima* and *geminata*, and I may add that the Brazilian form *medusa*, recently described by Mann, is even more polymorphic than *geminata* since its largest workers have the head greatly enlarged and flaring in front, with very strongly curved mandibles. If *savissima* is elevated to specific rank, these forms should also have the same status, but in my opinion they may all be regarded as so many subspecies of a single variable species. I admit that it might be more logical to include *aurea* Wheeler as still another subspecies, with *amblychila* Wheeler as its variety. Owing to the great accumulation of forms in this section of the genus *Solenopsis* within recent years I am not altogether averse to regarding *savissima*, *geminata*, *maniosa*, *xyloxi*, *electra*, *medusa* and *aurea* as so many different, though very closely allied, species.

AN ANOMALOUS BLIND WORKER ANT:

BY WILLIAM MORTON WHEELER.

Several years ago Prof. C. F. Baker sent me from Catalina Island, Calif., a number of ants which I described as *Aphanogaster patruelis* Forel var. *bakeri*. Later he gave me a vial of additional specimens from the same colony. While mounting these I detected among them a single eyeless worker, which seemed to be worth describing and figuring as, to my knowledge, nothing like it has been seen in the genus *Aphanogaster* nor, indeed, in any

other genus of ants possessing well-developed eyes in the normal workers. The workers of *Aphanogaster bakeri*, like those of all the species of the genus, are monomorphic or very feebly polymorphic, and the eyes, though not large, are nevertheless well developed. The exceptional specimen is in all respects normal except in the shape of the head and the absence of visual organs.



a. Head of normal worker of *Aphanogaster patruelis* Forel var. *bakeri* Wheeler. b. Head of eyeless worker of same.

The head, as will be seen from a comparison of the figures, is sub-oblong and the sides, especially at the middle, are very distinctly concave, probably owing to an absence of the optic ganglia. On the left side the integument, where the eye should be, is slightly rugose and presents what appears to be a single minute, pigmented ommatidium; on the right side the integument in the corresponding concavity is smooth and rather pale. That the eyeless individual had been living and working for some time like its normal sisters is shown by its mature coloration and the blunted teeth of its mandibles.

As colonies of *Aphanogaster* contain, as a rule, only a single fertile queen, it is very probable that the anomalous specimen above described and the normal workers are all daughters of the same mother. We may, therefore, assume that the eyeless worker is a mutation, strictly comparable with the eyeless specimens that have appeared in certain cultures of the fly *Drosophila*, and we might infer that the normally eyeless workers and females of such ant genera as *Dorylus* and the corresponding phases of certain species of *Eciton*, in which the eye is reduced to a single ommatidium, arose as similar mutations. We might be tempted, moreover, to extend this inference to other peculiarities of worker ants,

since many such peculiarities are merely suppressions or absences of structures that are well developed in the males and females of the same species. I doubt, however, whether we are justified in drawing such a sweeping conclusion in the face of numerous facts which indicate even more forcibly that the worker characters have arisen from continuous and fluctuating variations. In many genera of ants with polymorphic workers (*Camponotus Pheidole*, etc.) and in many genera containing numerous species, though with monomorphic workers (*Solenopsis*, *Monomorium*, etc.) the eyes show a gradual or serial diminution. Discontinuity may, therefore, be conceived to arise in the development of these structures by a selective survival of certain stages or phases, just as it does in the series of species or of dimorphic workers of the same species. The absence of wings is another character in worker ants which is sometimes supposed to have arisen as a mutation, but, though very rare, anomalous workers with vestigial wings (pterergates) are known to occur. I have recorded and figured such cases in *Myrmica* and *Cryptocerus*, and others have been observed in the former genus by Wasmann and Donisthorpe. Recently I have found an even more instructive case, an Australian *Monomorium*, allied to *M. rothsteini* Forel, the normal females of which have very small wings, too small to be of any service as organs of flight. These females, which will be described and figured in a future paper, are, in fact, truly brachypterous, like certain well-known species of Diptera, parasitic Hymenoptera, Heteroptera and Orthoptera, and suggest that the complete loss of wings in the worker is merely the final stage in a gradual diminution of these organs and has, therefore, originated from continuous variations. As the worker phase of the ants must have been perfected and fixed as a family character not later than the Eocene Tertiary and probably as early as the Cretaceous, it is not surprising that at the present time organs characterizing stages intermediate between the workers and females should be so rarely resuscitated as anomalies.

A NEW BRACHYELYTROUS TROGOSITID BEETLE
FROM COLORADO.

BY H. F. WICKHAM,

Iowa City, Iowa.

Nearly twenty years ago, in July, 1897, I spent a few days in the San Juan range of the Rockies, near Ouray, Colo. A considerable number of wood-frequenting species of Coleoptera were taken at that time, most of which were duly indentified and listed in my published catalogue of the beetles of the state, but a single specimen of remarkable aspect foiled all attempts to locate in North American genera. In brachypterous structure, it reminded one of the Staphylinidæ or of certain Nitidulidæ like *Conotelus* but did not go well into either of these families. Eventually the insect was put aside with a lot of other more or less obscure forms and entirely forgotten, but on looking through some boxes a year ago I came across it again and, after giving it a careful study, decided that the best place for it was in the Trogositidæ (or *Tennochilidæ* as the family is often called) although no brachyelytrous genera of this group were known from the United States. A little later, while looking over the plates of the volume of the *Biologia Centrali-Americana* containing the Trogositidæ (*Insecta. Coleoptera, Vol. II, Part 1*), I recognized my capture as belonging to *Cylidrella* and very close to *C. mollis* Sharp (*t. c.*, p. 389, Tab. XII, fig. 23).

Both Sharp and Lèveillé place *Cylidrella* in the immediate neighborhood of *Nemosoma*, to which genus it bears considerable resemblance except in the shortening of the elytra. It might, perhaps, be taken at first sight for a Clerid of the Hydnocera type, but does not look just right in that company. Up to this time, the genus has been monotypic and specimens seem to be very rare. The specimen described by Dr. Sharp, and upon which the genus was based, was an unique brought from Cerro Zunil, Guatemala, by Mr. G. C. Champion who writes me, in answer to a query, that he does not know of its occurrence outside of that country. Certainly not many specimens can have been taken in the United States, or they would have attracted the attention of some of our systematists and have been described long before this. The distribution is of very particular interest as showing another example

of the extension of genera along this great mountain system and we may now expect that *Cylidrella* will turn up, at considerable altitudes, in forests at intermediate points between Colorado and Guatemala. The Colorado specimen seems to require a new name and I take great pleasure in dedicating it to Mr. G. C. Champion of London, Eng., in recognition of his masterly work, first as a collector and later as a monographer of the Central American beetle fauna. A drawing does not appear to be necessary, since our species so closely resembles the one already known.

***Cylidrella championi* sp. nov.**

Form narrow, elongate, subcylindrical, sides almost parallel. Color castaneous, head nearly black, elytra lighter with a yellowish, ill defined, transversely elliptical common spot, slightly antemedian in position, not reaching the lateral margins and occupying between one fourth and one third of the length, the legs (including the front and middle coxæ but not those of the hind pair), yellowish, posterior femora somewhat infuscate, antennæ yellowish throughout. Head very long, narrowed behind the eyes, the front produced into two large, triangular, toothlike processes which cover the mandibular bases, forehead strongly grooved from the angle of the frontal emargination nearly to the middle of the vertex, where the canal becomes evanescent but reappears shortly as a fine line which again becomes deeper and wider to the base though not attaining the depth or width of the anterior section; surface minutely alutaceous, punctuation fine, arranged in pretty well defined longitudinal rows which are more distinct anteriorly and become confused and coarser at base, the genæ and underside smoother and very sparsely punctured, the latter region polished, shining. Mandibles large, punctured. Palpi yellowish. Eyes round, scarcely prominent. Antennæ with large first joint, second much smaller, funicle apparently of six small joints which are not very well defined and probably permit of little motion, club three-jointed, flattened, the terminal articulation subcircular, the others transverse. Prothorax a little narrower than the head and apparently of about the same length, very gently narrowing posteriorly to the base, side margins finely beaded, especially behind the middle, surface sparsely, finely and irregularly punctured. Elytra at humeri a little broader than the prothorax, gently widening to

behind the middle, apices separately rounding, surface minutely alutaceous, finely punctate in rather obscure rows which fade at tip so that the apical area becomes almost smooth and shining. Abdomen above with four full dorsal segments, as well as the basal lateral portion of another, exposed behind the elytral tips, this uncovered surface being strongly shining and sparsely punctate. The segmental edges have a peculiar laminate appearance, as if folded over. The terminal segment is nearly semicircular in outline and strongly hairy. Underside very shining, sparsely and finely punctured, the prosternal and abdominal apices tinged with yellow. Legs rather slender, the femora and tibiæ flattened, front tibiæ wider, denticulate and strongly hairy, all the tarsi slender, hairy and with large simple claws. Length, if straightened out, nearly 5.00 mm.

Compared with the description of the Guatemalan specimen, this insect is considerably larger, attaining a length of about 5.00 mm., against 3.25 of the southern form. The coloration is also different and there are some diversities in sculpture and structure, which, however, may perhaps be due to unlike interpretation. I think that the funiculus has six joints in *C. championi*, though Dr. Sharp, while admitting difficulty in counting, allows only five in *C. mollis*. He makes no mention of a groove on the posterior half of the head nor of a marginal prothoracic bead.

NOTES ON THE EGG-PARASITES OF THE APPLE TREE TENT-CATERPILLAR (*MALACOSOMA AMERICANUM*)¹

BY L. T. WILLIAMS,
Omaha, Nebraska.

The object of the following observations during the spring and summer of 1915 was to make a detailed study of the life-histories of some of the egg-parasites of the apple-tree tent-caterpillar. For reasons which will presently be stated this purpose was not fulfilled; but as some new species were bred from the eggs, a supposedly erroneous record of Ashmead's verified, and some other

¹Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 117.

points of possible interest noted, a list of the parasites found, together with some comment on their behavior and relative abundance, seemed to be worthy of publication.

The eggs used for one experiment were separated into four lots, according to the dates of collection and the conditions under which they were kept. Box No. 1 contained about 350 egg-masses, collected between February 20 and March 22, in the immediate vicinity of the Bussey Institution, and kept in a greenhouse until the caterpillars and parasites emerged. Box No. 2 contained about 180 egg-clusters, collected in a locality a few miles south of the first (Stony Brook Reservation, near Hyde Park, Mass.) from June 19 to June 29 (mostly on the earlier date). Box No. 3 contained about 50, collected at the same place as those in Box No. 1, but kept out of doors, so that the exact date on which they were gathered is immaterial. Box No. 4 contained about 60, accumulated in the laboratory from time to time, but, for one reason or another, not placed in the other boxes. The results in these last three boxes were almost identical.

In addition to these, about 30 egg-masses were collected in early spring and placed in cold storage for the months of April, May, and June. The box containing these was known as No. 5. Six more masses were isolated in test-tubes for individual records.

Caterpillars hatched from the eggs in the greenhouse about two weeks after collection, and the first parasites emerged March 29, or about five weeks after collection. Under natural conditions the first caterpillars appeared April 19, and the first parasites, June 19. An attempt was made to rear the early hatched caterpillars in order to secure their eggs for experiment, but they contracted the wilt disease, and perished to the last individual. It was, therefore, necessary to rely on pupæ collected in the field, and as these were heavily parasitized the number of adults reared from them was small. The first female emerged and laid her eggs on June 29, probably a day or two earlier than it would have done under natural conditions.

Six species of parasites were bred from the eggs. They will be taken up in the order of emergence.

1. *Ablerus clisiocampæ* Ashm., Family Eulophidæ.

Six individuals, males and females, issued in Box No. 1 March 29. It was the most abundant parasite till April 10, when it gave

place to others. May 31 was the date of the last specimens to appear in this box. In all, twenty-two males, twenty-four females and five or six which escaped before their sex was determined issued from this box.

Under natural conditions this parasite was, oddly enough, the last to make its appearance. In Box No. 2 four males and one female issued between July 26 and July 31, over two weeks after all the other species (except for those in the cold-storage box) had ceased to emerge, and in Box No. 3 six females and four males appeared, at about the same time. The total from all the boxes was thus about 66, and the percentage of parasitism, counting 200 eggs to the cluster, was only 0.06 per cent. This is, of course, economically negligible, supposing it to represent typical conditions.

As its name shows, this insect was described as a caterpillar parasite, but as the Aphelininæ, the subfamily to which it belongs, are otherwise exclusively parasites of the Coccidæ, and as it was afterwards reared by Howard and others from *Aspidiotus* and *Chionaspis*, it was naturally assumed that Ashmead had been mistaken. In the present case, not only were the trees from which the eggs were taken practically, if not absolutely free from scales of any kind, but the egg-masses were in all cases removed from the twigs on which they had been deposited and placed in the boxes by themselves. Under these conditions the corroboration of the original record is certainly ample.

So far as I know, there are few parallels to this case among the Chalcidoidea. The exact relationships of this insect to such widely separated hosts would appear to be a problem of considerable biological interest.

The *Ablerus* is a very attractive little insect, blue-black in color with bright red eyes, which appear, owing to the iridescent cornea, to be surrounded by a band of brilliant metallic blue. The male has not been described, so far as I know. It is smaller and somewhat slenderer than the female. The antennæ are seven-jointed as in the female, but are relatively longer, lack a definite club, and are uniformly straw-colored instead of being banded. The head, testaceous in the female, is dusky in the male, and the wings are completely hyaline whereas those of the female have a distinct median cloud.

2. *Telenomus clisiocampæ* Ashm., Family Scelionidæ.

One male of this Proctotrypoid parasite emerged on March 30, or only one day later than the *Ablerus*. Small numbers of males continued to issue till April 13. After this, females began to appear, and both sexes were found in the tubes till May 31, the males remaining in the majority. Seventy-five males, thirteen females and two or three of undetermined sex issued from this box. In Box No. 2, one male and another, whose sex was not ascertained, issued on June 23. Four were recorded in all. In Box No. 3, one male issued July 1. In Box No. 4 one male and two females issued June 30 to July 3. One male issued in Box No. 5 (cold storage) August 3, or about three weeks after the eggs it contained were removed from the refrigerator and one female August 7. The total number is, therefore, approximately one hundred, or less than 0.1 per cent. of the number of eggs.

This species is very active, especially the male. The female, which is somewhat more sluggish may be superficially distinguished from the male by the clubbed antennæ.

3. *Tetrastichus* sp., Family Eulophidæ.

A single male of this undetermined species issued on March 31. It lived till April 2. This specimen, together with others of unknown or doubtful species, was sent to Mr. A. A. Girault of the United States National Museum, but its condition did not permit him to do more than determine the genus. It seems likely that the species is undescribed.

4. *Oöencyrtus clisiocampæ* Ashm., Family Encyrtidæ.

One female issued in Box No. 1 on April 10. It was followed at intervals by others till April 21, and then did not appear again till May 9. The last one issued June 2. In all ten males, ten females, and three of undetermined sex issued from this box. None came from Box No. 2, and only two (June 30) from Box No. 3. From Box No. 4, one male and three females issued, and from Box No. 5 (cold storage) one female on August 7. This makes thirty in all, less than half as many as the *Ablerus*, to which it comes next in point of numbers.

5. *Tetrastichus* (*sens. lat*) sp., Family Eulophidæ.

A female of this undetermined species issued in Box No. 1 April 13. Others issued in small numbers thereafter till April 29, on which date about a hundred, mostly males, were found in the tube which had been left undisturbed for four days. They continued to issue in considerable numbers till June 2. In Box No. 2, the first individual appeared June 26 and the last July 7, and in Boxes Nos. 3 and 4 the periods of emergence were about the same. In Box No. 5, about eighty issued from the thirty egg-masses between August 2 and August 16.

Quite a large proportion of the parasites failed to find their way into the tubes. In Box No. 4 in particular about five hundred were found in the débris after living insects had ceased to emerge. It may very well be that some fault in the arrangement of the boxes prevented individuals of all the species from emerging, and made the records lower than they would otherwise have been.

No. 5 was the only species to appear in any of the tubes containing the isolated egg-masses. The percentage of parasitism varies from 1 to about 12 per cent., showing that the number taken was too small to justify any definite conclusions, although the average percentage is not far from that of Box No. 4 in which the dead insects were counted. Most of the egg-masses would seem to be attacked, but only a few eggs seem to be parasitized in any one egg-mass.

In spite of the comparative abundance of this species no details of its life-history could be ascertained, except that it passes the winter as a full-grown larva in the host egg, and emerges in June, a few days before the adults of *Malacosoma*. This failure was due to the fact that the insect could not be induced to oviposit in the eggs of its host. On one occasion a moth was secured in the act of laying, and a parasite placed on the egg-mass; but the latter did not oviposit, though it carefully explored the eggs. Finally, the parasites were attracted to the eggs by dipping the latter in syrup, but, as was to be expected, this did not overcome their unwillingness to oviposit. It cannot be stated with absolute certainty that they never did so, as eggs were sometimes left in the tubes while the parasites were not watched. However, observations lasting more than an hour, during which parasites were continually walking about on the eggs, failed to demonstrate any egg-laying

activity on the part of the females. Similar failures were noted in the case of *Ablerus*, *Telenomus*, and *Oöencyrtus*, but the rarity of these insects rendered a fair trial impossible, and the results are accordingly less surprising.

The failure of No. 5 to oviposit normally is the more peculiar in view of the fact that it frequently deposited eggs on the test-tube wall. These eggs, which were rather large, were of the ordinary stalked type. On one occasion some of these eggs apparently developed as far as the first larval stage. These larvæ were much damaged when discovered, and could not be figured or described, but a very distinct segmentation could be made out, and the form appeared to be somewhat flattened.

6. *Aphycoideus io* Girault., Family Encyrtidæ.

Two females issued from Box No. 2 before it had been fitted with a tube. One was found walking about on the laboratory desk, but the other was still in the box, so that there seems to be no reasonable doubt as to their source.

A specimen was sent to Girault, who pronounced it to be a representative of a new genus. Its reddish-yellow color distinguishes it at a glance from any of the other species, all of which are black or very dark.

These observations was undertaken at the suggestion and under the supervision of Professor Brues, whom I wish to thank for his aid during its entire course. Professor Wheeler, Dr. Chapman, and many students of the Department, have also furnished literature, or suggestions. I have already stated that I am indebted to Mr. A. A. Girault for the identification of several of the species.

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MONARTHROPALPUS BUXI LAB. IN NEW JERSEY
(DIP.).

BY HARRY B. WEISS,
New Brunswick, N. J.

This insect, commonly known as the European boxwood leaf miner, has already been recorded by me as occurring in New Jersey (*PSYCHE*, June, 1915), (*Ent. News*, vol. 27, p. 13). Its distribution was at first thought to be rather limited, but it is now known to occur in widely separated parts of the state, namely, Rutherford, Far Hills, Gladstone, Peapack, South Orange and Eatontown and will undoubtedly be found in other places in the future. It was evidently introduced from France or Holland, within the past five years, especially the latter as thousands of boxwood plants are annually imported into New Jersey from that country while, comparatively, only a few come from France. It has also been taken at various times by inspectors examining boxwoods from these countries.

At present, its injuries in New Jersey are confined principally to all varieties of boxwoods growing in nurseries and on private estates. The first sign of injury likely to be noticed by most persons is a small yellowish or light green spot on the upper surface of the leaf. Directly under this on the lower surface is quite a pronounced, irregular, oval blister due to the young maggot enlarging its mine. Later in the season the injury is more apparent and there will be a slight elevation on the upper surface with a yellowish or brownish discoloration. In severe infestations, the entire leaf is taken up by irregular oval swellings which are largest on the under surface. Badly infested plants present during the spring, the superficial appearance of having been winter killed. The leaves are discolored, somewhat brownish and finally drop off. Closer examination however will reveal the larvæ or pupæ within their galls. Inasmuch as boxwood plants have strictly an ornamental value, a plant having unsightly bare branches with new leaves developing at the tips is far from beautiful. Specimen plants which have been trimmed for years in some particular shape are sometimes ruined by the insects infesting an entire side or top.

Infested plants obtained during the middle of April and kept in the laboratory were examined daily and the pupal stage found to last from fourteen to eighteen days. As it was several degrees warmer there than in the open, growth was undoubtedly accelerated. In the open this stage lasted an average of three weeks. In the laboratory, the first adults emerged April 30 and every day following for two weeks, while in the open, the first emergence was on May 20. Inasmuch as the weather varies in different years, it can be safely said that, in New Jersey, the adults appear as a rule during the latter part of May.

According to Professor Chaine who studied the insects at Bordeaux, France, oviposition lasts from two to three weeks, the female depositing the eggs singly in a slit cut by the ovipositor. Young leaves are selected and the eggs deposited at a distance from each other. In the laboratory, oviposition started a couple of days after emergence, the adult females selecting the under surfaces of tender green leaves. Each female would insert the tip of her abdomen in the tissue and sway the body from side to side during the act. The eggs are tiny, oval and translucent, wide at the middle and tapering uniformly toward each rounded end, being about one one-hundred and twentieth of an inch long and twice as long as broad. To the naked eye, they are visible only as white specks. They appear to be laid on their sides in the tissue and the only outward indication of their presence is a slight elevation of the tissue immediately over them, these swellings sometimes being a darker green than the remainder of the leaf. The exact location of each egg can easily be seen by holding the leaf up to the light and examining it with a hand lens. Each light oval spot surrounded by a dark ring means an egg. Several leaves examined in this way were found to contain as many as thirty-three and thirty-five eggs, which were later dissected out. This condition however would prevail only in a cage where many females were forced to oviposit in a few leaves as it was under such conditions that the above numbers were found.

After hatching, which required from two to three weeks in the laboratory, the yellowish white maggots mine the leaves all summer, making small oval pockets which sometimes run together on one side of a midrib if many larvæ are present. The winter is passed in these pockets, the larvæ transforming to pupæ in the

spring. So as to facilitate the emergence of the adult, the pupa issues partly through the thin lower surface of the leaf. An infested leaf may contain from one to twelve and possibly a few more larvæ, although twelve was the largest number taken from a single leaf. The young larvæ are yellowish-white, later becoming yellowish-green when full grown at which time they are about one-eighth of an inch in length. The pupæ also are about one-eighth of an inch long, light orange colored and quite active, while the adults are slender midges with hyaline wings, orange colored bodies and remarkably long legs and antennæ and appear to be fairly strong fliers considering their small size.

Technical descriptions of both sexes and the larva together with suggestions for control can be found in the Thirtieth Report of the State Entomologist of New York by E. P. Felt and need not be gone into here. Considering the damage which this midge is capable of doing and the lack of really efficient remedies together with the fact that even partly injured boxwoods are no longer ornamental, it would appear that the prompt destruction of infested plants before the adults emerge in the spring would be the best plan to pursue.

EXPLANATION OF PLATE XIII.

Fig. 1. Boxwood leaf with lower surface removed to show larval mines.

Fig. 2. Leaves showing galls and empty pupal cases of the midges.

Fig. 3. Leaf showing distribution of the eggs in the tissue, when many females are forced to oviposit in a few leaves.

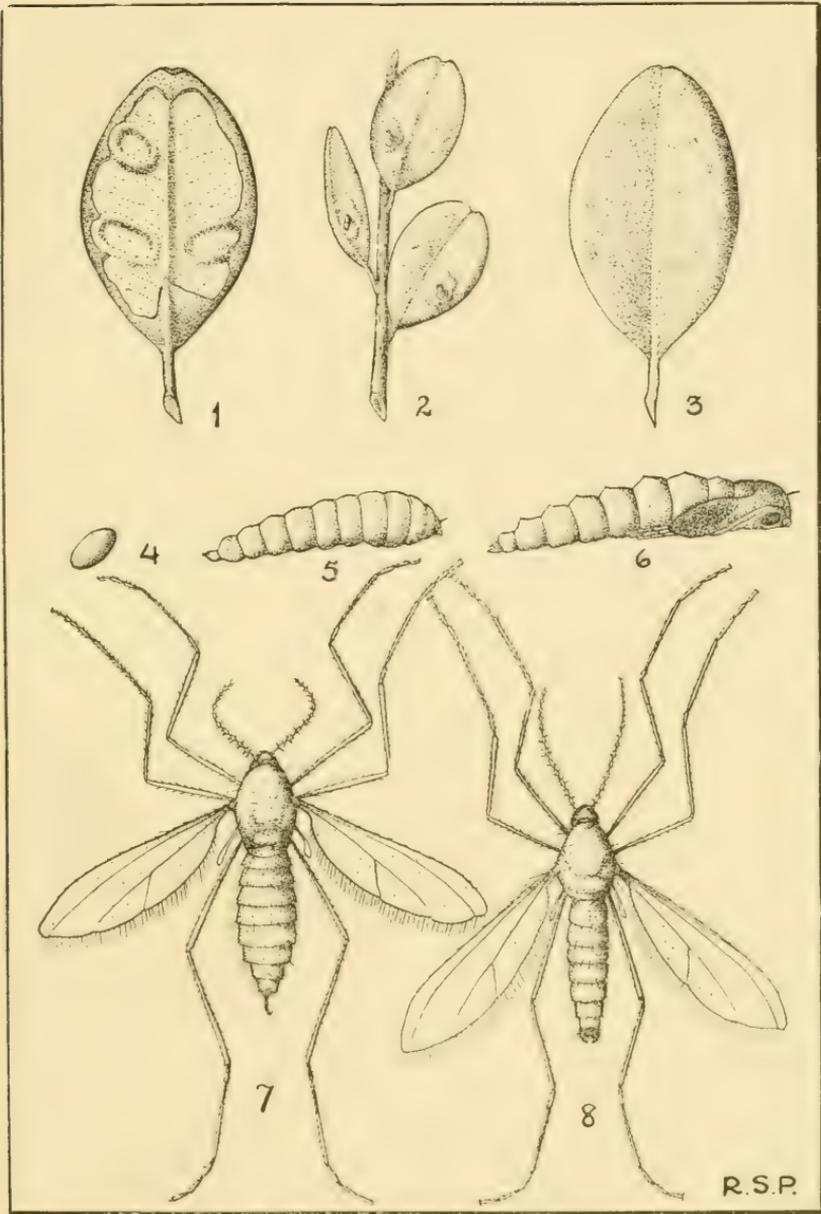
Fig. 4. Egg.

Fig. 5. Larva.

Fig. 6. Pupa.

Fig. 7. Female midge.

Fig. 8. Male midge.



WEISS—*Monarthropalpus buzi*

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CONTENTS.

The <i>Volucella Bombylans</i> Group in America. <i>C. W. Johnson</i>	159
On Some Tingidæ from New England. <i>H. M. Parshley</i>	163
Questions on Nomenclature Connected with the Ant Genus <i>Lasius</i> and its Subgenera. <i>W. M. Wheeler</i>	168
A Phosphorescent Ant. <i>W. M. Wheeler</i>	173
A New Species of Aphiochæta (Diptera; Phoridae) from New England. <i>C. T. Brues</i>	175
The Panurgine Bees of the Genera <i>Hesperapis</i> , <i>Zacesta</i> and <i>Panurgomia</i> . <i>T. D. A. Cockerell</i>	176
A New England Orthopteran Adventive. <i>A. P. Morse</i>	178
Ants Carried in a Floating Log from the Brazilian Mainland to San Sebastian Island. <i>W. M. Wheeler</i>	180
On the Tympanum of Certain Lepidoptera. <i>W. T. M. Forbes</i>	183
Book Reviews: The Rhynchophora or Weevils of Northeastern America, by W. S. Blatchley and C. W. Leng. <i>C. A. Frost</i>	193
Exchange Column	195

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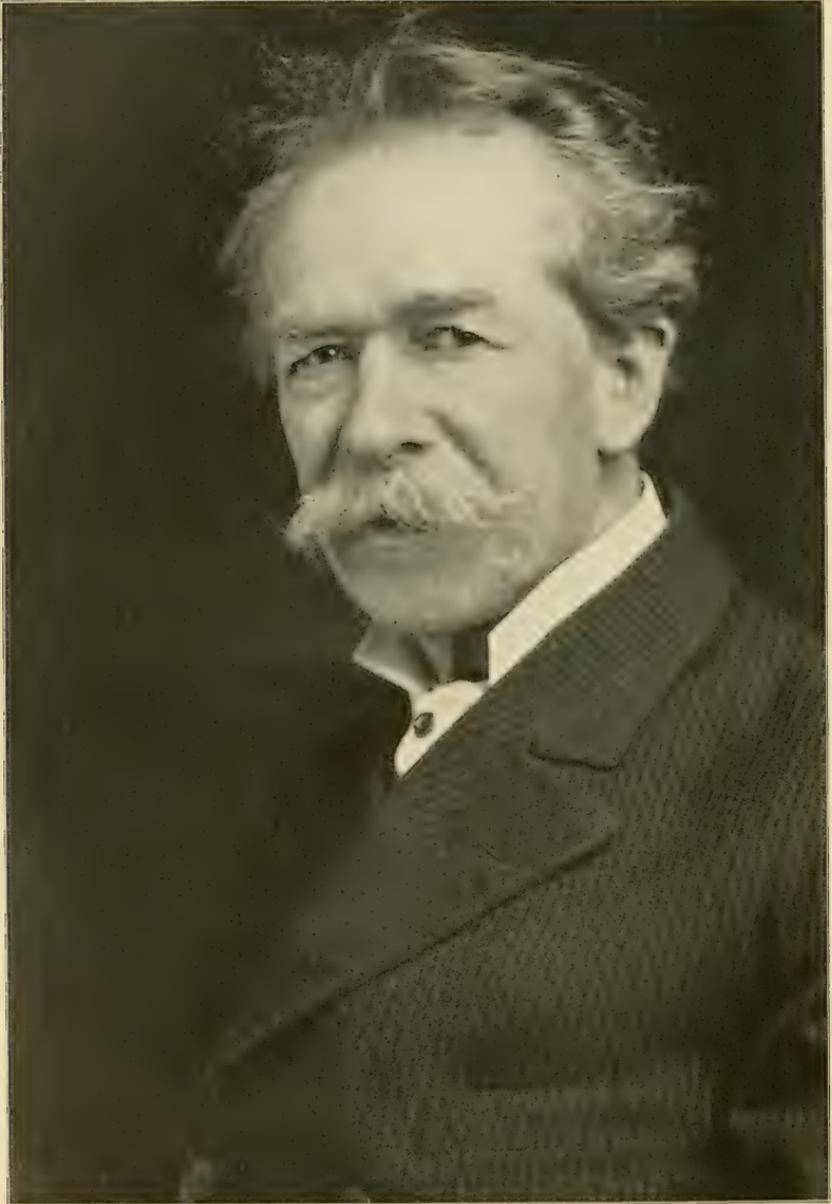
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OTTO HEIDEMANN, 1843-1916

Photograph by J. H. Paine

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THE *VOLUCELLA BOMBYLANA* GROUP IN AMERICA.

BY CHARLES W. JOHNSON,

Boston Society of Natural History, Boston, Massachusetts.

Among some Labrador Diptera received from the Museum of Comparative Zoölogy for study through the kindness of Mr. Samuel Henshaw, was a form of *Volucella* belonging to this interesting group. The work of identifying this form compelled me to make a study of the entire series, and the following notes are brought together in the hope of creating an interest in the study of this group in America, and possibly showing their commensal relations with the various species of genus *Bombus*, as has been done in Europe.

To ignore the various forms however slight without defining their limits, even though intermediates apparently exist, does not simplify matters in this case. To clearly show their differences and their resemblances to their apparent hosts—the various species of *Bombus*—seems to be the first step to be taken in a provisional study.

The group probably represents a protean species, of common origin, circumboreal in distribution, and representing an extremely interesting case of resemblance or “mimicry” of their hosts, the bumble-bees. If what is true of the European species is also true of the American forms, they offer a fascinating field for research.

In referring to their resemblance to various species of *Bombus*, Verrall in *British Flies*, Vol. 8, page 485, 1901, says:

“This species varies infinitely in the color of the pubescence between the two common forms which I have noticed above; these two forms are so remarkably distinct that nobody would imagine at first that they belonged to the same species, but they are now well known to occur and to pair indiscriminately. The

only pair I ever took in *cop.* belonged to the two extreme forms. There can be but little doubt that the form *bombylans* mimics *Bombus lapidarius*, while the form *plumata* mimics *Bombus terrestris*. It is only natural that with such a remarkable dimorphic species pairing indiscriminately, and mimicking a genus such as *Bombus* in which there are numerous other color forms, various other color variations should frequently occur, and a vast number of these have been described as distinct species or have received varietal names.

“If it be once recognized that all the European species which are densely pilose belong to one species, concerning which I hold no possible doubt, then the synonymical list in this book will answer for itself, though I may add that I possess several specimens of the North American *V. fascialis* Will. and I cannot distinguish any structural distinction, so that I expect both *V. fascialis* Will. and *V. evecta* Walker are also synonymous.”

Verrall further states: “A remarkable instance of this mimicry occurs in one very common species, *V. bombylans*, which (I estimate without accurate observation) imitates *Bombus terrestris* (and its allies) for about 60 per cent., but imitates *B. lapidarius* for about 38 per cent., while the other 2 per cent. may be of almost any *Bombus* coloring.”

Another interesting feature in connection with this matter is that the inquiline bee *Psithyrus rupestris* so closely resembles *Bombus lapidarius* as to be scarcely distinguishable while *P. vestialis* is banded similar to *B. terrestris*. In this country our species of *Psithyrus* closely resembles our species of *Bombus* and no species resembling *P. rupestris* is found here.

From the above we might infer that the typical *V. bombylans* is absent in America because there is no bumble-bee here like the *Bombus lapidarius* of Europe. On the other hand our forms resemble more closely the various species of *Bombus* found here than the European species do. Thus we have forms with segments three to five of the abdomen with entirely black pile, resembling *Bombus pennsylvanicus*, etc., and others with a fulvous band on the third segment resembling *Bombus ternarius*.

Regarding their habits Verrall says: “Probably all the European species of this subfamily are scavengers in the nests of large aculeate Hymenoptera, feeding on the diseased pupæ, etc., but not

parasitic on the living larvæ or pupæ, so that the association is friendly and consequently not resented by the more powerful Hymenoptera; beyond this the scavengers have probably gradually mimicked their hosts in order to obtain the protection afforded by their aculeate powers. Dr. Sharp's observations on the larvæ of *V. inanis*, which live in the nests of *Vespa crabro*, tend to show that the larvæ are welcome scavengers who live on the pupæ which have recently died and who thereby prevent those dead pupæ from contaminating the nest, for which friendly action their imitative coloring may possibly indicate them as friends rather than conceal them as enemies."

Twenty-one specific names are placed in the synonymy by Verrall and twenty-four (including the American *V. evecta*, *sanguinea* and *facialis*) are in the synonymy under *V. bombylans* in the Katalog der paläarktischen Dipteren, 1907.

I have before me seventeen specimens of the European and Asiatic forms and forty-one specimens of the American forms. Specimens from Knight Valley, Cal. (H. Edwards), described as *facialis* Will. cannot be separated satisfactorily from the European forms, *plumata* and *hæmorrhoidalis*. The pile on the pleura is black and the face and front yellow. A male from Alai Mountains, Turkestan, shows the same variation as a specimen from California, the lateral stripe of yellow pile being absent in front of the transverse suture; the face, however, is black and the antennæ slightly darker in the Asiatic specimen. The color of the antennæ used by Bigot in his table (Ann. Soc. Ent., France, July, 1883, p. 79) seems to be of little value in separating the forms as there are apparently all gradations from reddish brown to brownish black. As the typical *bombylans* is not known in America it is perhaps best at present to use *facialis* for the American form and treat all the American forms as independent of the European.

There is a form closely resembling *facialis*, with the dorsum of the thorax black pilose and face yellow, but the pile on the pleura is yellow. It seems to be confined to the northeastern United States and Canada. Before me are specimens from Franconia, N. H. (Mrs. A. T. Slosson), Wales, Me., June 20, 1909, and Lake Aziscoos, Me., July 8, 1916 (C. A. Frost), Red Indian Lake, Newfoundland, July 20, 1906 (Owen Bryant), and Lewisport, Newfoundland, July (L. P. Gratacap). To this form I assign

the name *lateralis*. Types in the Boston Society of Natural History, American Museum of Natural History and the author's collection. These two forms resemble *Bombus terrestris moderatus* and *Psithyrus ashtoni*.

Another form has the dorsum of the thorax more or less black pilose with the middle of the third segment of the abdomen reddish, with long reddish pile. As the latter character applies to *sanguinea* Will., I will adopt that name, although there is apparently a slight discrepancy in the color of the pile on the thorax. This form I have only from the Rocky Mountain region, Silver Lake, Utah, July 16; top of Las Vegas Range, 11,000 feet, end of June (T. D. A. Cockerell); top of range between Sapello and Pecos Rivers, about 11,000 feet, August (T. D. A. and W. F. Cockerell); Banff, Alberta, July 17, 1902 (Amer. Mus. Nat. Hist.). The reddish band across the abdomen suggests a resemblance to *Bombus ternarius*, *B. huntii*, *B. melanopygus*, *B. sylvicola*, etc.

Specimens, which have been referred to *V. erecta* Walker, represent two quite distinct forms, the typical *erecta* has the face black, pile on the dorsum of the thorax entirely yellow and the abdomen with a band of yellow pile at the base and another at the tip of the abdomen, pleura yellow pilose. The other form differs in having only a basal band of yellow, the remainder of the abdomen black. To this form I give the name *americana*. Types in the Boston Society of Natural History and the author's collection. It resembles a number of the more characteristic species of American *Bombus*, including *Bombus pennsylvanicus*, *B. affinis*, *B. bimaculatus*, etc., and *Psithyrus laboriosus*.

Typical specimens of *erecta* are in the collection of the Boston Society of Natural History from Franconia, N. H. (Mrs. A. T. Slosson), North Adams, Mass., June 14, and Sharon, Mass., June 13.

The form *americana* is more widely distributed. Monmouth and Orr's Island, Me.; Hanover, N. H.; North Adams, Great Barrington, Mount Tom, and Auburndale, Mass.; Delaware Water Gap and near Newark, N. J., and Folsom, Pa.

The Labrador specimens represent an interesting form and were it not for the great variation and wide distribution of the group, I would describe it as a new species without hesitancy.

As matters are, however, I prefer to consider it a form for which I propose the name *arctica*.

The male is 12 mm. in length, face black with light yellowish pile, pile on vertex dull yellow, antennæ dark brown, arista brown. Thorax black with black pile, except the post-alar callosities which are yellow with yellow pile, pleura black with black pile, scutellum yellow, with yellow pile. Abdomen black, the second and third segments largely yellow with only a dorsal line of black, all the pile of the abdomen yellow. Legs black, tarsi dark brown. Clouding on the wings slight.

The female is similar to the male. The pile on the front is yellowish and on the entire thorax (except the post-alar callosities) a dull yellow more or less mixed with black, when viewed from above the appearance is black. The yellow markings on the third segment are much smaller or obsolete and the pile on the entire abdomen noticeably thicker and a darker yellow. This species resembles the species of the *Bombus borealis* group.

One male and nine females. Rama "N. of three line," 1898 (J. D. Sornborger); Rama, 1898, 1899 (A. Stecker and J. D. Sornborger); Nain (J. D. Sornborger); Nain, August 18, 1908 (Owen Bryant). Holotype, allotype and six paratypes in the Museum of Comparative Zoölogy, and two paratypes in the author's collection.

ON SOME TINGIDÆ FROM NEW ENGLAND.

BY H. M. PARSHLEY,

Bussey Institution, Harvard University.

In working on the New England Tingidæ I have come across three apparently undescribed forms, which are characterized herewith. The first belongs to the genus *Dictyonota*, not hitherto represented in the American fauna, of which twenty species and one variety are recognized in the Palæarctic region. Some of the species live on the broom and furze, and the naturalization of these plants along our eastern coast may possibly account for the presence of the insect in question, although *D. tricornis* Schrank is not itself recorded as dependent on the plants mentioned.

Members of this genus are easily recognized by their thick, rugose, spinous antennæ.

Dictyonota tricornis Schrank, var. *americana* var. nov.

Head, and disc of pronotum black, nervures brown, membrane between the nervures gray. Legs and body beneath very dark brown, antennæ black. Anteocular processes spinose, slightly curved, strongly divergent, frontal spines slender, convergent, as long as the first antennal segment. Antennal segments of equal thickness, rough and setose. Pronotal hood transverse, with two or three rows of areoles dorsally, not projecting over the head. The three longitudinal pronotal carinæ uniseriate, sub-parallel, extending from the hood to the posterior edge of the angulate process of the pronotum. Disc of pronotum punctate, transversely convex, narrowed anteriorly, lateral expansions with three to four rows of areoles, not produced anteriorly beyond the eyes, somewhat reflexed, concave above. Hemielytra without discal elevations, the costal vein depressed, those bounding the discoidal area sharply raised; costal area as wide as the discoidal, with two slightly irregular rows of areoles; subcostal area with two rows anteriorly, one posteriorly; discoidal area extending nearly to apex of abdomen, with three slightly irregular rows of areoles, its inner border curved. Pleuræ and bucculæ reticulate, the latter open anteriorly and evenly rounded posteriorly; sternal ridges but slightly elevated; rostrum extending a little beyond the metasternum. Orifices absent. Ventral abdominal segments each with an anterior finely shagreened area, behind which are a few curved striæ connecting the posterior angles. Males with two strong copulatory hooks at apex of abdomen. Form oval. Length 3 mm.; width 1.2 mm.

Holotype ♂, Eastport, Me., 15 July, 1909 (C. W. Johnson), in my collection; paratypes, 2 ♂♂, Machias, Me., 26 July, 1906 (C. W. Johnson); Roque Bluff, Me., 15 July, 1907 (J. A. Cushman), in the collection of the Boston Society of Natural History.

This form differs from typical *tricornis* (*crassicornis* Fall.) as follows: in shape it is a little more elongate; the lateral expansions of the thorax are a little wider; the anteocular spines are more divergent; the hood is a little more elevated; the costal

area is biseriate at middle; and the bucculæ are evenly rounded posteriorly, in *tricornis* somewhat angulate. As all these characters are somewhat variable, the form may be considered a variety rather than a distinct species. My thanks are due to Mr. O. Heidemann, for his kindness in examining a specimen and pointing out some of the distinctive characters of the form. As the genus is new to the American fauna, I have included generic and specific characters in the description.

Physatocheila plexa Say, not Osb. & Drk.

Long-winged form.—Uniform dull yellowish brown, eyes and fourth segment of antennæ darker. Head with five adpressed spines arranged as follows: two anterior close together and converging, extending forward between the first antennal segments, one median arising behind and extending forward between the anterior spines, and two lateral, arising beneath the margin of the pronotum and extending forward close to the eyes beyond the base of the median spine; anteocular processes stout, incurved; first antennal segment a little longer than the second, both of these but slightly longer than broad, fourth fusiform, nearly as long as the first and second together, third somewhat longer than the front tibiæ, more slender than the others; rostrum moderate and slightly variable in length, extending more or less beyond the middle coxæ, but not beyond the posterior. Disc of pronotum strongly convex, with three low uniseriate carinæ and broad lateral expansions as in the related species; hood a little lower than in *brevirostris* but higher than in *variegata*. Costal area of hemelytra with two almost regular series of areoles; subcostal area with three rows at middle, narrowing to one posteriorly; discoidal area almost straight exteriorly, extending beyond the middle of the hemelytra; hemelytra extending considerably beyond the apex of the abdomen, apical areoles enlarged. Bucculæ large; rostral channel low, widened posteriorly, open behind; tips of wings visible beyond genital segment. Narrow elongate oval. Length ♂ ♀, 3.1–3.2 mm., width 1.1 mm.

Short-winged form.—Disc of pronotum but slightly convex; hemelytra extending but little beyond apex of abdomen, the areas all present but somewhat shortened; wings, if present, not visible beyond genital segment. Broadly oval. Length 3 mm., width 1.1 mm.

Redescribed from specimens taken at Kingston and Providence, R. I., and Truro, N. S.

That this is the form on which Say based his description of *Tingis plexus* (Compl. Writ., Vol. 1, pp. 349-350) is perfectly evident from these quotations: ". . . brownish, more or less tinged with yellow," and ". . . two series [of reticulations] . . . on the lateral margins . . . [of the hemielytra]," statements which apply particularly to this insect, while there is nothing inapplicable in the rest of the description. The characters of *P. variegata* sp. nov. (= *P. plexa* Osborn and Drake, not Say, Ohio Biol. Surv., Vol. 2, 1916, p. 242) are distinctly at variance with Say's description, especially the color, and the reticulation of the costal area. Moreover, if this species had been before him, it is extremely probable that he would have noted the unusual length of the rostrum, as he did in the case of other small Hemiptera.

***Physatocheila variegata* sp. nov.**

(*P. plexa* Osb. & Drk., not Say)

Long-winged form.—Brown, variegated with black and pale cinereous, eyes and fourth antennal segment darker; spines of head pale; disc, reflexed expanded margins, and angulate process of pronotum more or less marked with black, longitudinal carinae more or less pale on the ends, this feature persisting especially at the posterior ends of the lateral carinae, and anterior end of the median; costal area of hemielytra with some of the veinlets black, subcostal and discoidal areas pale cinereous at base and apex, the intervening veinlets more or less blackened; legs brown, femora paler at apex; body beneath cinereous brown. Rostrum unusually long, extending beyond the base of the second abdominal segment. Costal area of hemielytra with areoles irregularly arranged in confused rows, averaging three areoles in width. Other characters about as in the preceding. Form rather broad oval. Length 3.4-4 mm., width 1.3-1.5 mm.

Holotype ♂ and allotype, Gowanda, N. Y., 22 August, 1909 (E. P. Van Duzee); paratypes, Gowanda, N. Y., 21 August, 1898 (E. P. V. D.); Salamanca, N. Y., 20 July, 1911 (E. P. V. D.); Berkeley Springs, W. Va., 26 July, 1888; Wellesley, Mass., 19 May, 1891 (A. P. Morse); Portland, Conn., on white pine, 15 May, 1914 (B. H. Walden). Types in collections of Van Duzee, Parsh-

ley, Ohio State University, and Boston Society of Natural History.

This species varies in distinctness of markings but never approaches the uniform yellowish brown of the true *plexa* Say, from which it is further distinguished by its longer rostrum and irregularly triseriate costal area. In *P. brevirostris* Osb. & Drk., the rostrum does not extend beyond the middle coxæ, the color is uniform dull brown, and the costal area is regularly triseriate.

Some time ago Mr. C. J. Drake kindly sent me a specimen of this species, determined as *P. plexa* Say, and recently Mr. Van Duzee, learning that I had a new *Physatocheila* under consideration, most generously submitted specimens known to him to be of a new species, which have been of great assistance to me in working out the true status of these forms.

Melanorhopala obscura sp. nov.

Long-winged form.—Dark yellowish brown, tinged with gray, eyes, tips of antennæ, rostrum, and tarsi darker. Head with five long acute spines, three arising from the vertex and extending freely forward between the antennæ, two adpressed, arising from the base of the head and extending forward near the eyes. Antennæ proportionally about as long as in *clarata*, but less distinctly club-shaped, the third segment being only slightly more slender than the fourth and but little, though distinctly, enlarged at apex; fourth about as long as the first, regularly fusiform; the second shorter than the first, very slightly enlarged apically. Pronotum convex, with three longitudinal carinæ and uniseriate lateral expansions which are vertically reflexed. Costal area of hemielytra uniseriate, subcostal biseriate, discoidal not quite reaching middle of hemielytra; costal margins parallel, slightly sinuate near middle. Length 4.8 mm.

Short-winged form.—Pronotum narrower, disc perfectly flat, hemielytra narrowed apically, the costal margins evenly curved. Length about 4.5 mm.

Holotype, long-winged ♂, Beach Bluff, Mass., 21 June, 1915 (Parshley), taken in ocean beach drift; paratype, short-winged ♂, Nahant, Mass., 16 July, 1915 (Parshley), with apices of hemielytra somewhat injured; both in my collection.

Sufficiently distinct from the other species of *Melanorhopala* by reason of its small size, narrow form, and antennal structure. In

M. clavata Stal the third antennal segment is more slender, the fourth conical, in the long-winged form the costal margins are distinctly curved, not parallel, and the discoidal area extends slightly beyond the middle of the hemielytra; in *M. lurida* Stal the third and fourth antennal segments are longer, scarcely clavate; and in *M. uniformis* Stal the antennæ are much shorter.

QUESTIONS OF NOMENCLATURE CONNECTED WITH THE ANT GENUS *LASIUS* AND ITS SUBGENERA.

• BY WILLIAM MORTON WHEELER,

Bussey Institution, Harvard University.

There seems to be no end to the nomenclatorial cataclysms precipitated by men who delight in resuscitating and reëditing musty entomological documents that have been unfortunately spared by the tooth of time to plague those among us who wish to see taxonomy rapidly stabilized so that we may be able to give all our attention to more interesting and important matters. Just as we were beginning to flatter ourselves that a few common insect names in universal use for the greater part of a century must at last be immune from the inroads of the resuscitators we are informed by Morice and Durrant¹ that our familiar generic name *Lasius*, which has been borne so long by the common garden ant, probably the most abundant insect of the northern hemisphere, must be consigned to the synonymic limbo and replaced by a new name. The case is so clearly stated by Donisthorpe in his excellent monograph of British ants² that I shall quote his account of it. "Fabricius (Syst. Piez., 415, 1804) published a heterotypical genus *Lasius* for the reception of ten species of ants, but this use of the name is invalid since *Lasius* (Type *Apis quadrimaculata* Panz.) had already been used by Jurine for a genus of bees [Erlangen Litteraturzeitg., 1, 164, No. 33, 1801: Nouv. Méth. Hym., 235-238, No. 33, Pf. 4, 33, 11.33. 1807]. Latreille, Gen. Crust.

¹ The authorship and first publication of the "Jurinean" Genera of Hymenoptera: being a reprint of a long-lost work of Panzer, with a translation into English, and Introduction and Bibliographical and Critical Notes. Trans. Ent. Soc., London, 1914 (1915), pp. 339-436.

² British Ants, Their Life History and Classification. Plymouth, Wm. Brendon and Son, Ltd., 1915, p. 186.

Ins. 4.126 (1809) sunk *Lasius* F. as a synonym of *Formica*, and the Fabrician name ceased to be used till 1861, when Mayr (Europ. Formicid., 49, 1861) revived and recharacterized *Lasius* F., adopting *niger* L. as his type. Bingham Faun. Brit. India. Hym. 2, 338 (1903) and Wheeler Ann. New York Acad. Sc., 21, 165 (1911), also cite *niger* as the type. This species was also adopted as the type by Morice and Durrant Trans. Ent. Soc., London, 1914, 9, 421-423 (1915), who gave the following reasons for the change of the name: "In the Systema Piezatorum Fabricius made use of Jurine's name *Lasius* but applied it to a genus of ants which he separated from *Formica* L. and later authors have ignored Jurine's *Lasius*, no doubt because the publication of the Piezatorum (1804) antedates that of the Nouvelle Méthode (1807). But the real date of *Lasius* Jrn. as we now learn, is May 30, 1801 (Erlangen list), § *Lasius* F. (1804) therefore sinks as a homonym of the earlier *Lasius* Jrn. A new name for *Lasius* F. is necessary; there being apparently no existing synonym, we therefore propose that it be called *Donisthorpea* in recognition of Mr. H. St. J. K. Donisthorpe's careful investigations into the bionomics of this and other Heterogynous genera."

A study of Morice and Durrant shows that the article which they unearthed in the Erlangen Litteraturzeitung of 1801 was published anonymously, but that in a footnote to page 7 of the Kritische Revue of 1806 Panzer admitted that he was its author. It is clear, furthermore, that Panzer cited *Lasius* and several other Hymenopterous genera as Jurine's. My friend Professor Cockerell writes me that he regards the Panzer article as having no taxonomic status both because it was published anonymously and because it did not appear in a scientific journal. I incline to agree with him, though I am compelled to admit that the publication of the genera as Jurine's and not as those of the anonymous author may put a different construction on the matter. This evidently determined Morice and Durrant to accept *Lasius* and certain other genera as being valid and as antedating those of Fabricius. So far as I am able to learn, cases of this kind are not specifically provided for in our various nomenclatorial codes.

Accepting for the moment the correctness of Morice and Durrant contention that *Lasius* Jurine must supplant *Anthophora* among the bees and that the genus *Lasius* Fabr. must be renamed,

we may next inquire whether the introduction of the name *Donisthorpea* was justified. Little study of the history of the ant genus *Lasius* is needed to establish the fact that there are at least three other names, each of which would take precedence of the one suggested by the authors under consideration. In 1840 Shuckard¹ gave the name *Formicina* to a genus, which according to his statement contained what we now call *Formica rufa* and *Lasius flavus*, so that if no resuscitator succeeds in exhuming some other name suggested between 1807 and 1840, *Formicina* should be chosen to replace *Lasius* Fabr., with *L. flavus* as the type. Shuckard evidently selected the large *Formica herculeana* L. as the type of his genus *Formica* (our present *Camponotus*) and placed the smaller species, which we now assign to *Formica* and *Lasius*, in his genus *Formicina*. A second name *Acanthomyops*, was proposed by Mayr in 1862² for the North American *Lasius clariger* Roger. This name has since been retained as that of a subgenus characterized by three-jointed instead of six-jointed maxillary palpi in the worker and female. Ruzsky,³ in 1913, recognized two additional subgenera: *Dendrolasius* and *Chthonolasius*, the type of the former being *L. fuliginosus* Latr.; that of the latter, *L. flavus* L. *Chthonolasius*, therefore, falls as a synonym of *Formicina* Shuckard, but even *Dendrolasius* would take precedence of *Donisthorpea*. If, however, *Formicina* takes the place of *Lasius* as a generic name, the genotype must be shifted to *L. flavus*, a species belonging to what is now a different subgenus, so that *Donisthorpea* could be retained as the name of a subgenus with *L. niger* as the type. The genus would then have the following composition:

Genus *Formicina* Shuckard (= *Lasius* Fabr.).

Genotype: *Formica flava* L.

Subgenus *Formicina* Shuckard (= *Chthonolasius* Ruzsky).

Subgenotype: same as the genotype.

Subgenus *Donisthorpea* Morice and Durrant (= *Lasius auct.*).

Subgenotype: *Formica nigra* L.

Subgenus *Dendrolasius* Ruzsky.

Subgenotype: *Formica fuliginosa* Latreille.

¹ In Swainson and Shuckard's "On the History and Natural Arrangements of Insects," Longman, Orme, etc., London, 1840.

² Verh. zool. bot. Ges. Wien, 12, 1862, p. 699.

³ Myrmekologische Notizen. Arch. f. Naturg., 79, 1913, pp. 58-63, 3 figs.

Subgenus *Acanthomyops* Mayr.

Subgenotype: *Lasius claviger* Roger.

While discussing Morice and Durrant's work in a recent paper¹ Forel contends that *Acanthomyops* Mayr. should replace *Lasius* Fabr. He therefore cites the genus and its subgenera thus:

"Genre *Acanthomyops* Mayr. (1862).

= *Lasius* F. 1804 (non Jurine 1801).

= *Donisthorpea* Morice et Durrant.

Type: *claviger* Roger.

Subgen.: *Chthonolasius* Ruzsky.

Type: *niger* L. (*flavus* ex Ruzsky).

Subgen.: *Dendrolasius* Ruzsky.

Type: *fuliginosus* Latr."

This arrangement seems to me to be inadmissible, first, because Forel has no right to change the type of the subgenus *Chthonolasius* from *L. flavus* to *L. niger*, and second, because these two forms, in my opinion, represent distinct subgenera, *Chthonolasius* (= *Formicina*) being sufficiently characterized by the shape of the maxillary palpi of the female and worker, the vestigial eyes of the worker and the hypogaëic mode of life. In the two latter characters the species of *Chthonolasius* resemble those of *Acanthomyops* and not *niger* and its allies. As an after-thought, however, Forel appends the following postscript: "Mr. Emery m'écrit qu'à son avis il vaudrait mieux prendre pour *Lasius* le nom nouvellement deterré par Wheeler de *Formicina* Shuck., nom en partie basé sur le *Lasius flavus*. Je n'ai rien à y opposer, pourvu qu'on finisse une bonne fois avec ces déménagements perpétuels des anciens noms." I infer, therefore, that he now favors an arrangement like that given above (p. 170) with *Formicina* as the genus, but with *Donisthorpea* eliminated and its species included in the subgenus *Formicina*.

For the present I propose to be conservative and to retain *Lasius* Fabr., because the status of Panzer's Erlangen list seems to me to be very dubious and because I sympathize with those entomologists who decline to abolish generic names in universal use for more

¹ Fourmis du Cogo et d'autres provenances récoltées par M. M. Hermann Kohl, Luja, Mayne, etc. Rev. Suisse Zool. 24, 1916. p. 460.

than half a century. I therefore suggest the following as a satisfactory arrangement of our North American forms of *Lasius*:¹

Genus *Lasius* Fabr.

Subgenus *Lasius* Fabr. (= *Donisthorpea* Morice and Durrant)

niger L. var. *sitkaënsis* Pergande.

Var. *neoniger* Emery.

Subsp. *alienus* Forster var. *americanus* Emery.

Subgenus *Formicina* Shuckard (= *Chthonolasius* Ruzsky).
flavus L., subsp. *nearcticus* Wheeler.

Subsp. *claripennis* Wheeler (in MS.).

brevicornis Emery.

Subsp. *microps* Wheeler (in MS.).

umbratus Nylander subsp. *subumbratus* Viereck.

Subsp. *mixtus* Nyl. var. *aphidicola* Walsh.

Subsp. *vestitus* Wheeler.

Subsp. *speculiventris* Emery.

Subsp. *minutus* Emery.

humilis Wheeler (in MS.)

Subgenus *Acanthomyops* Mayr.

claviger Roger.

Subsp. *subglaber* Emery.

interjectus Mayr.

Subsp. *mexicanus* Wheeler.

Subsp. *coloradensis* Wheeler (in MS.).

Subsp. *arizonicus* Wheeler (in MS.).

Subsp. *californicus* Wheeler (in MS.).

occidentalis Wheeler.

murphyi Forel.

latipes Walsh.

POSTSCRIPT.

Since the preceding article was sent to the Editor of *PSYCHE*, I have received from Professor Emery a paper (Formiche d'Italia nuove o critiche. Rend. R. Accad. Sc. Ist. Bologna 12 Marzo,

¹The subgenus *Dendrolasius*, which should include besides the subgenotype *L. fuliginosus*, the peculiar Japanese *L. spathepus* Wheeler, is confined to Eurasia and is therefore omitted.

1916, pp. 53-66, 7 figs.) in which he discusses the synonymy of *Lasius* and its subgenera. He accepts Jurine's *Lasius* as valid and substitutes *Formicina* Shuckard for *Lasius* Fabricius, presenting the same arrangement of the subgenera and their types as I have given on page 170. I am still unable to take this view of the matter, because I am not convinced that the generic name of another author (in this case Jurine) is valid when cited in an anonymous paper which itself has no taxonomic status. It would seem that if an anonymous author later acknowledges the authorship of his paper, the validity of the latter should date only from the time of this acknowledgment. If this rule were followed, *Lasius* Jurine would date from 1806 and could not replace *Lasius* Fabricius of 1804.

A PHOSPHORESCENT ANT.

BY WILLIAM MORTON WHEELER,
Bussey Institution, Harvard University.

Mr. George P. Engelhardt, curator of the Division of Invertebrates of the Brooklyn Museum, recently sent me the following letter and the ant to which it refers:

"SAN FRANCISCO, CALIF., Aug. 8, 1916.

"*My dear Prof. Wheeler:*

"One of my most interesting days on the Pacific Coast this summer was spent with Fordyce Grinnell on a thirty-mile tramp through the Sierra Madre, July 28. Starting from Pasadena we followed the Arroyo Seco to the Divide, came up around Mount Gabriel (6,150 feet) and reached Mount Lowe (5,650 feet) in time for a glorious sunset. Our descent from Mount Lowe was made over the steep and winding ridge trail after dark. There was no moon, but a star-studded sky, while 5,000 feet below Pasadena and Los Angeles had been transformed into a sea of sparkling lights.

"Down at about the 4,000 feet level we stopped before a bright spark rapidly crossing the trail. Expecting to find one of the Lampyrids, or fireflies, which Grinnell told me were uncommon in the region, we struck a match and to our surprise found an ant. Neither of us had heard of phosphorescent ants before. In a

cyanide tube the phosphorescence of the ant remained undiminished for fully five minutes, after which it decreased gradually and in fifteen minutes disappeared. The light issued ventrally from the last two or perhaps three abdominal segments. It was greenish yellow, and very much like that of our common eastern firefly, only it was constant, not intermittent.

"We kept a sharp look-out all the way down the trail, but no other specimens were found.

"Very sincerely yours,

"GEO. P. ENGELHARDT."

The ant proves to be a worker media of *Camponotus maculatus* Fabr., subsp. *vicinus* Mayr., var. *semitestaceus* Emery, a form peculiar to higher elevations in the Californian Coast Range. It is the palest of several varieties of *vicinus*, which ranges as far east as Colorado and Montana and as far south as Arizona and New Mexico. The yellow color of the var. *semitestaceus* shows that it is nocturnal, but my observations lead me to suspect that the darker forms of *vicinus* have the same habit. As no ants are known to possess photogenetic organs, and as *C. maculatus* is of world-wide distribution and represented by many yellow subspecies and varieties especially in North Africa and Asia Minor, where any tendency to phosphorescence would certainly have been seen and noted, I conclude that the specimen taken by Mr. Engelhardt must either have just fed on some phosphorescent organism or have been infected with phosphorescent bacteria. Although Dr. Rudolph Glaser went to some pains to section and stain the hard abdomen of the specimen for me, I was unable to detect any structures that might account for the luminescence. This failure was in great part due, in all probability, to the imperfect preservation of the ant, which had merely been dropped into strong alcohol. The problem of the source of the greenish yellow light emitted by the posterior abdominal segments and witnessed by Messrs. Engelhardt and Grinnell will, therefore, require fresh material for its solution and must be referred to some entomologist residing in California.

A NEW SPECIES OF *APHIOCHÆTA* (DIPTERA,
PHORIDÆ) FROM NEW ENGLAND.

BY CHARLES T. BRUES,

Bussey Institution, Harvard University.

Aphiochæta johnsoni sp. nov.

Length, 2.0 mm. Fore tarsi thickened; mesopleura bristly above, without any macrochaeta, two scutellar bristles. Thorax brownish yellow; head black; abdomen black or piceous, the first three segments narrowly margined with whitish; hypopygium fuscous, its lamella yellow; legs luteous or dull yellow. Front slightly broader than high; ocellar tubercle large, median frontal groove present, proclinate bristles four, the lower pair much more delicate than the upper pair and almost as far apart; inner bristle of lower reclinate row on the anterior margin of the front midway between the upper proclinate one and the eye-margin, outer bristle close to the eye-margin and well above the margin of the front; middle row of four equidistant bristles forming a row that is bent down medially. Antennæ not enlarged, dark fuscous, arista as long as the head height, strongly pubescent. Palpi distinctly enlarged, but less so than in *A. projecta*, with several short bristles below and a pair at tip almost as long as the vertical thickness of the palpus; cheeks each with two strong bristles; postocular cilia strong. Propleura above the coxa with stout bristles and with weaker ones on its upper half. Mesonotum subshining, hairy, with a number of bristles along the sides and posterior edge; scutellum with two bristles and two hairs; mesopleura above with a patch of small bristles of equal size. Abdomen opaque, with scattered bristly hairs, especially conspicuous near the sides of the basal segments and on the disc of the fourth and following segments. Hypopygium and its median lamella also bristly. Legs stout; anterior tarsi thickened, longer than their tibiæ; middle tibiæ with very weak cilia; those of hind tibiæ a trifle stronger, but not conspicuous; hind tibiæ with four short transverse rows of minute bristles inwardly at tip; hind tibiæ not ciliate below, with only the usual short hairs. Wings large, distinctly tinged with brownish; costal vein extending to distinctly beyond the middle of the wing; costal cilia short and closely placed; first section of

costa slightly more than twice as long as the second; third three-fourths as long as the second; second vein ascending rather sharply to the costa; fourth vein curved at the base, but nearly straight beyond, fifth and sixth sinuous; seventh distinct, long. Halteres pale yellow.

One specimen from Kent, Me., August 19, collected by Mr. C. W. Johnson. Type in the collection of the Boston Society of Natural History.

This species is related to *projecta* Becker which also occurs generally through New England (Boston, Mass.; Brookline, Mass.; Hanover, N. H.), but differs by having the lower pair of proclinate bristles weaker and the palpi less noticeably enlarged in the male as well as by the absence of a fringe of hairs on the posterior femora and the presence of only two scutellar bristles. It is also much like the European *A. hortensis* Wood, but the hypopygium is bristly.

THE PANURGINE BEES OF THE GENERA HESPERAPIS, ZACESTA AND PANURGOMIA.

By T. D. A. COCKERELL,

University of Colorado, Boulder, Colorado.

The genus *Hesperapis* Ckll., 1898, was based on *H. elegantula* Ckll. from New Mexico. At the present time seven species are assigned to it, the range of the genus being from New Mexico to Southern California. The following table separates the known forms:

Thorax above with moss-like ochraceous hair; abdomen dull ferruginous.	<i>elegantula</i> Ckll.
Thorax with ordinary pubescence; abdomen not red	1
1. Area of metathorax dull, or only the apical part shining.	2
Area of metathorax polished and shining.	3
2. Mesothorax strongly and closely punctured, somewhat shining; male about 11.5 mm. long.	<i>eumorpha</i> (Ckll.)
Mesothorax and scutellum shining, polished, finely punctured; male a little over 6 mm. long.	<i>nitidula</i> Ckll.
Mesothorax and scutellum dull, not evidently punctured	<i>semirudis</i> Ckll.

3. Wings perfectly clear *larrea* Ckll.
 Wings brownish 4
4. Wings milky at apex; legs of male wholly black *olivia* Ckll.
 Wings not milky at apex; male tarsi variably reddish
rhodocerata Ckll.

The description of ♀ *rhodocerata*, as originally given (*Panurgus rhodoceratus*, Trans. Am. Ent. Soc., XXIV, p. 148), included the ♀ of *H. olivia*, which is separable with difficulty. The males are more distinct and the ♂ *rhodocerata* may be regarded as the type. Both species visit the flowers of *Pectis* in September.

Zacesta Ashmead, 1899, was described as a member of the Osmiinæ, but Titus (Jn. N. Y. Ent. Soc., XII, p. 26) showed that it was a Panurgid. It comes from Los Angeles County, Cal., and is known only in the male. Examining the type of *Z. rufipes* Ashm. in the U. S. National Museum, I found that it closely resembled *Hesperapis* as typified by *H. elegantula*. The following characters are noteworthy:

- (1) The moss-like ochraceous hair on thorax above, as in typical *Hesperapis*.
- (2) The narrow face and essentially parallel orbits, as in *H. elegantula*.
- (3) The orange flagellum, as in *H. elegantula*, but the scape shorter and stouter (sexual character?).
- (4) Clypeus has a broad yellow apical band, not seen in *Hesperapis* (but male of *H. elegantula* is unknown).
- (5) Compared with *H. elegantula* has larger, shining, area at base of metathorax.
- (6) Venation is as in *H. elegantula*, except that second submarginal cell is longer, and the lower section of basal nervure descends much less abruptly.
- (7) The pygidial plate is long and narrow.
- (8) Titus has described the palpi of *Zacesta*; the first three joints of labial palpi are nearly equal whereas in *H. elegantula* the first is nearly as long as 3 plus 4, the second somewhat shorter than the first.

Hesperapis, as interpreted above consists of at least two very distinct groups, one typified by *H. elegantula* (type of genus), and the other containing the remaining species. *Zacesta* is per-

haps closer to *H. elegantula* than it is to the other species assigned to *Hesperapis*, and its rank as a genus appears doubtful. I think we must call it *Hesperapis (Zacesta) rufipes* (Ashm.).

Panurgomia Viereck, 1909, was based on *P. fuchsi* Viereck, from Arizona. The unique specimen, a female, was unfortunately in bad condition. Mr. J. C. Crawford recently wrote me (February, 1916) that he considered the genus identical with *Hesperapis*, and the type species at least extremely close to *H. eumorpha* Ckll. This led me to reëxamine the type, and I found that it possessed the essential characters, so far as could be seen, of the group of *Hesperapis* which includes the majority of the species. The entirely dull area of metathorax agrees with the minor group of *H. eumorpha*, etc. The stigma is too large for typical *Hesperapis*. The clypeus is large, strongly convex, polished and shining. Hence it appears that *Panurgomia* is a valid subgenus (or genus?) for the group of *Hesperapis* which excludes the typical species.

A NEW ENGLAND ORTHOPTERAN ADVENTIVE.

BY ALBERT P. MORSE,

Wellesley College, Wellesley, Massachusetts.

Hapithus vagus sp. nov.

A large and rather stout member of the genus. Rostrum of the vertex as broad as the basal joint of the antennæ. Antennæ, except the basal joint, long and extremely slender, two or three times as long as the body, pale brown, annulate with dusky on alternate joints, every third annulus darker; this pattern is very noticeable near the base and becomes indistinct apically. Maxillary palpi with last joint slender at base, a little securiform, twice as long as the width of the broadened tip.

Pronotum transverse, narrowed anteriorly, the front margin straight or slightly concave, the hind margin a little convex medially; lateral lobes twice as long as deep, smoothly convex below, the anterior and posterior angles rounded. Tegmina nearly or quite covering the abdomen, those of male flat above; of female a little convex, with densely and irregularly reticulate venation, the lateral field crossed by about seven parallel oblique branches of

the mediastinal vein. Wings as long as tegmina. Hind femora plump, stout, a little less than three times as long as broad. Hind tibiae armed with four spines on outer side, usually five (sometimes six) on inner side, with numerous short rigid teeth between them. Ovipositor slightly shorter than the hind femora, straight or gently curved upward at base, the tip armed at base with a prominent, dull tooth which is succeeded by a diminishing series of four or five smaller ones toward the apex. Cerci short, less than one-third as long as ovipositor, tapering acuminate from a stout base to a delicate point and clothed with long, soft pubescence.

The ground color is a pale yellowish brown thickly and irregularly spotted and in places washed with darker brown and fuscous, particularly in an hour-glass or X-shaped mark on the middle of the pronotum above, the entire area of the lateral lobes, the dorsal part of the lateral field of the tegmina, and the outer face of the hind femora. The dorsal field of the tegmina of the female often shows a series of three or four oblique dusky lines running backward and inward from the canthus along irregular raised venules; in the male a variable number of irregular fuscous spots is distributed chiefly along the canthus and about the speculum, with a larger stigmatal blotch.

MEASUREMENTS.

Body.	Hind fem.		Tegmina.	Antenna.	Cercus.	Ovipositor.
	Length.	Width.				
♂ 13-15 mm.	10	3.5-4	9.5-10	40-45	2.5	
♀ 14-15 mm.	10-12	3.5-4.5	9.5-10	40-45	2.5	8.5-9 mm.

Described from the type (♀), allotype (♂), and several paratypes of both sexes; the material also contains several nymphs in various stages. Collection of A. P. Morse.

This species was first recorded by Scudder (PSYCHE, September, 1900, 105) under the name *Apithes agitator*, from the greenhouse of the Botanic Garden at Cambridge, Mass. The specimens on which the description is based were collected there in alcohol in September and October, 1902. Recently, on pinning them up, it was seen to be quite distinct from *agitator*. Mr. Morgan Hebard

has kindly examined a pair and compared descriptions and regards it as new.

I am informed by Mr. Cameron of the Botanic Garden that these insects were troublesome in the greenhouse for five or six years, eating the tender green leaves of many kinds of plants and seeming to be particularly fond of ferns; also, that they were believed to have come originally from Jamaica. Their extermination is believed to have been effected at least in part through the introduction into the greenhouse of a number of small frogs.

ANTS CARRIED IN A FLOATING LOG FROM THE BRAZILIAN MAINLAND TO SAN SEBASTIAN ISLAND.

BY WILLIAM MORTON WHEELER,
Bussey Institution, Harvard University.

Dr. Hermann von Ihering, the well-known writer on zoögeography and till recently the director of the Museu Paulista of San Paulo, Brazil, has sent me for identification some ants which were taken under the peculiar circumstances described in the following paragraph quoted from his letter:

"I find that the 'raft-theory' of dispersal has generalized some exact observations in an extraordinary manner. Here in South America we have wonderful opportunities to observe the 'swimming islands' in the great rivers, although the upper and lower courses of these streams have to a considerable extent their own peculiar faunas. My experiments with wood, bamboo, etc., containing ant-colonies, have demonstrated that the latter are decidedly resistant to submersion provided their nest-entrances are closed. Till the current year, one of our naturalists, Mr. Gaste, was, however, unsuccessful in his various excursions in finding living insects in wood that had drifted from our coast. One morning, while he was on the island of San Sebastian, he found a tree trunk that had floated to the shore during the night and was filled with a living ant-colony belonging to a species of *Pheidole* unknown to me. San Sebastian is situated some kilometers off the coast of the main land. Of course, we cannot say how long this

log had been floating in the water before it reached the island. Please examine the ants," etc.

The portion of the ant-colony received from Dr. von Ihering consists of a single soldier, five workers and three young, winged females, representing a new species of *Pheidole* of which I subjoin a description.

Pheidole peregrina sp. nov.

Soldier: Length, 3.2 mm. Allied to *Ph. pubiventris* Mayr, *rufipilis* Forel, and *angusta* Forel, especially to the last. Head small, subrectangular, a little longer than broad, as broad in front as behind, with rather straight sides and feebly excised posterior margin. Eyes moderately large and convex, in front of the middle of the sides of the head. Mandibles rather large, indistinctly denticulate in the middle, with two large apical and two small basal teeth. Clypeus with a short carina behind, concave in front, with rather deeply notched anterior border. Frontal area distinct, triangular, not deeply impressed, with median carinula. Frontal carinae short. Antennal scapes rather stout but not flattened, curved at their bases, their tips reaching a little more than half the distance between the eyes and the posterior corners of the head. Joints 2-7 of the funiculus scarcely longer than broad, club a little longer than the remainder of the funiculus, its two basal joints subequal, together as long as the terminal joint. Thorax shaped much as in *pubiventris*, but the pronotum without prominent humeral tubercles and the epinotal spines reduced to small, erect teeth which are not longer than broad at their bases. Petiolar node compressed anteroposteriorly, with indistinctly emarginate, transverse superior border. Postpetiole less than twice as broad as the petiole, with rounded sides and dorsal surface. Gaster elongate elliptical, with distinctly truncated anterior border. Legs moderately long.

Smooth and shining: mandibles coarsely and sparsely punctate; cheeks and front rather loosely longitudinally rugose; remainder of head with sparse, fine, piligerous punctures. Mesonotum, epinotum and sides of petiole opaque, very finely and obscurely punctate-rugulose.

Hairs short, abundant, pale yellow, reclinate, covering the whole body and the appendages, longest on the gaster, which, however, has no appressed hairs. Pubescence absent.

Brownish yellow, legs a little paler, clypeus and posterior portion of gaster somewhat darker; antennal clubs blackish.

Worker: Length, 2 mm. Head distinctly longer than broad, narrower behind than in front, without posterior corners but with distinct, reflected occipital margin. Eyes in front of the middle of the sides. Mandibles finely denticulate, with two larger apical teeth. Anterior clypeal border straight, transverse and entire in the middle. Antennal scapes extending about one-fourth their length beyond the occipital border of the head. Thorax, petiole, postpetiole and gaster much as in the soldier, but epinotal teeth more slender and pointed and a little longer than broad at their bases.

Sculpture and pilosity as in the soldier but the hairs are somewhat more erect.

Brownish yellow, mandibles paler, head, clypeus and terminal antennal joint castaneous. In some specimens the middle portions of the femora and tibiae are very feebly infuscated.

Female: Length, 5-5.5 mm. Head distinctly broader than long, a little broader behind than in front, with straight sides and feebly excavated posterior border. Mandibles finely denticulate, with two large apical teeth. Clypeus as in the soldier. Antennal scapes reaching to the posterior corners of the head. Thorax of the usual shape, with strongly flattened mesonotum; epinotum with acute teeth as long as broad at their bases. Petiolar node rather low, its upper border sharp and entire.

Sculpture, pilosity and color much as in the soldier, but the head indistinctly rugulose and coarsely punctate over its whole dorsal surface, the mesonotum more densely punctate and behind on the middle finely and densely striolate, the postpetiole opaque and finely punctate and the gaster brown, except at the base. Ocellar region black. Wings yellowish hyaline, with pale yellow veins and pterostigma.

This species differs from *pubiventris*, *rufipilis* and *angusta* in its smaller size, in pilosity and in the head of the soldier being even smaller than in *angusta*. The hairs of *peregrina* are more reclinate, more abundant and shorter than in any of these species, the epinotal spines are less developed, the pronotum is smooth and rounded, without tubercular humeri in the soldier and the head

of the worker is longer and has a reflected occipital margin which is lacking in *pubiventris* and *angusta*.

The observations of Mr. Gaste and Dr. von Ihering throw light on one of the methods of ant dispersal. Of course, the establishment of a species of ant on an island does not require the conveyance of a whole colony as in this instance, since a single fecundated female enclosed in a vegetable cavity might, if transported in a similar manner, suffice for the establishment of a species.

ON THE TYMPANUM OF CERTAIN LEPIDOPTERA.

BY WILLIAM T. M. FORBES,
Ithaca, N. Y.

At the base of the abdomen in many Lepidoptera there is a curious and complex organ, which has been referred to but rarely in the literature, and which is known, in the Geometridæ, at least, as the tympanum. So far as I have discovered, its function is unknown, but its location and general structure justify the guess that it is the resonator for an auditory organ, corresponding to the well-known one in the Hemiptera. It should prove an interesting problem for the histologist and physiologist. The present article will not consider its function, but will outline its structure in the principal families of Macrolepidoptera, and offer a couple of suggestions as to their relationship.

A brief examination shows that there are several analogous, but not homologous organs of this type in the various families, indicating parallel lines of descent from a form that presumably had neither, but may have possessed a wholly internal sense-organ,—which served as a stimulus to their forma-

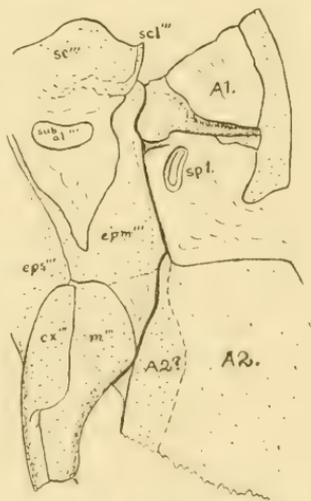


Fig. 1. Side view of metathorax and base of abdomen of *Apalodes torrefacta* (Eupterotidæ), showing primitive macrolepidopterous arrangement of sclerites.

tion,—in connection with the first spiracle. The first type of tympanum is that more or less familiar in the Geometridæ, which is used by Prout (*Genera Insectorum*, fasc. 103) as the most fundamental distinguishing character of that family. This appears superficially as a simple hollow balloon located immediately below the spiracle, opening to the exterior in the fold that normally exists in the sclerite of the abdomen facing the hind coxa. It is usually more or less ellipsoidal, and opens conspicuously on the side, forward and outward. In many cases the two tympana are so large as to be separated from each other only by membrane, and look like a pinhole clear through the moth,—as is very conspicuous in *Eudule* and many *Acidaliinæ* (*Sterrhidæ*). In the *Ennominaæ* the organ is smaller and less conspicuous externally, but entirely of the same character, and it exists even in the lower *Ænochrominæ* (*Monocteniidæ*). In this type the spiracle lies on the upper edge of the organ, and the dorsal part of the segment is normal.

Internally (Fig. 6) the structure is seen to be somewhat more complex. The tympanum itself may be compared roughly to a kettle-drum with edges curving inward strongly to meet the edge of the membranous area that represents the head, and faces forward. (It has been turned back in the figure to show the structures between it and the thorax.) Running almost across this head there is a tapering chitinous tongue, lying in the membrane, to the tip of which are attached a couple of muscles, the soft fleshy connection with the nerve (B), which histological study, is likely to prove the end-organ itself, and a variety of air-sacs and fine tracheæ. In fact the whole organ is enveloped in a system of air-sacs, which have mostly been removed in the specimen figured. The external opening of the apparatus is on the side that lies against the body-wall,—as if a large hole had been cut in the side of the kettle. The nerve-supply appears to be from the anterior segmental nerve of the first segment of the abdomen, which runs back from the ganglion, which is fused with the metathoracic one. This nerve runs past the tympanum anteriorly, and then over the spiracle and up to supply the dorsal musculature, etc. The part of it between the tympanum and spiracle is surrounded by large air-sacs, which connect directly with the spiracle.

The European genus *Cimelia* is generally placed in the Geomet-

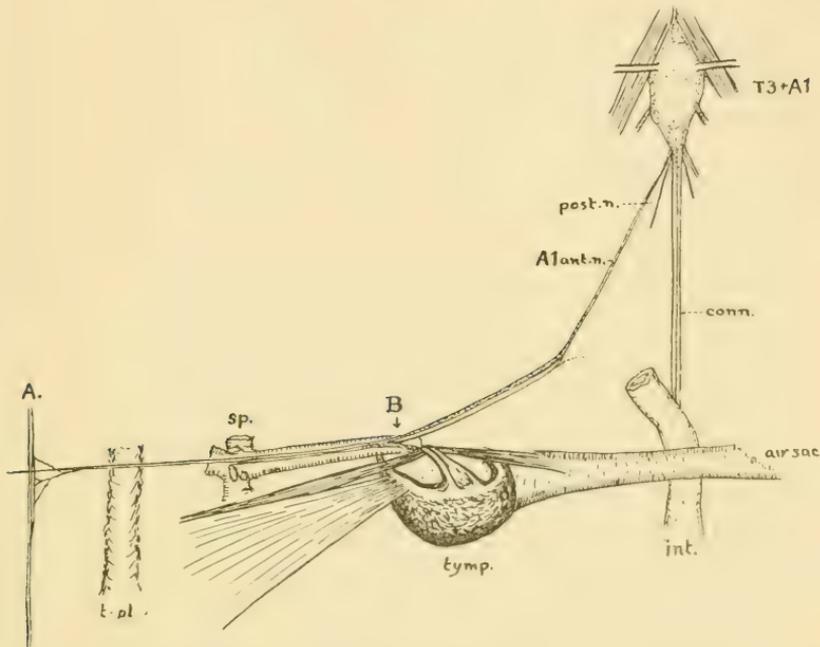


Fig. 6. Tympanum with its principal muscles and nerve connections, of the Geometridæ (drawn from *Biston ursaria* and *Phigalia titea*). Only two of the numerous air-sacs are indicated, the one lying ventrad of the nerve, and along which the nerve runs from the tympanum to the spiracle, and the large double one connecting the tympana. The latter appears ventral in the dissection, which was opened out on the middorsal line, but in fact lies above the digestive system. When the dissection is first opened it is normally filled with air and may be the most conspicuous object in the field.

ridæ, but appears to be omitted in Prout's consideration of the Enochrominæ (Genera Insectorum, fasc. 104). A superficial study of the single dry specimen available shows that there is no true tympanum, either of Geometrid or any other type, but there is a slight thickened bar that may represent the bar across the drum-head of the tympanum, lying in the membrane of the ventral surface. There is no definite suggestion of Notodontid structure; and I believe that the genus represents a new family type, leading up to the Geometridæ from something intermediate between the Dioptriidæ and Notodontidæ,—probably direct from the unknown Geometrid-Bombycid ancestral form. There seems to be nothing in venation or mouth-parts to contradict this reference.

For the normal, and primitive condition in the Lepidoptera (except the very lowest Tineoids and Jugatae), we may take *Apateledes*, a somewhat isolated genus of the Bombycid stem (Fig. 1). Here the metathorax is moderately developed, and there are no specializations which do not occur all the way from the Cossidae to the Saturniidae. The scutum and scutellum are normal, the cord connecting the scutellum with the inner margin of the wing is somewhat wavy, but forms no distinct lobe, the epimeron is V-shaped as in the mesothorax, and though too lightly chitinized to be quite sure of its boundaries shows no sculpturing except a slight articular surface where it meets the tergopleural line of the abdomen. The postscutellum is not sharply set off from it, and the entire structure is essentially as in the mesothorax. The first segment of the abdomen is, as usual in Lepidoptera and related insects, largely membranous; the tergum is a rectangle of membrane, enclosed in an anterior band which articulates subdorsally with the thorax, a posterior band, extended well down on the sides, but not reaching the ventral region, and a pair of heavily chitinized lateral grooves;—the latter seem to represent the tergopleural suture, so that the narrow edge of chitin below them should be considered the pleurite. The front end of this groove runs to a shallow pocket between thorax and abdomen. The lateral region is wholly membrane, containing a normal spiracle. Ventrally the first two segments are not distinguished, and are heavily chitinized only in front where they lie against, and are

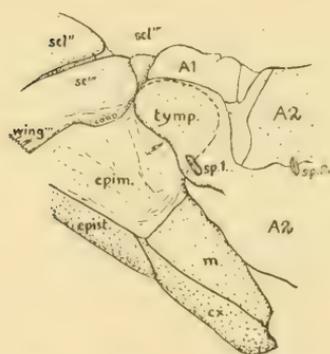


Fig. 2. Same view of *Hemerocampa leucostigma* (Liparidae), showing second type of tympanum.

slightly grooved by, the posterior coxæ. The external modification to form the first or Geometrid tympanum is merely the enlargement of the coxal groove into an ample cavity, and the distortion of other structures to make room for it.

The second type of tympanum occurs in the Arctiidae, Lymantriidae, Syntomidae, Pericopidae, etc. (Fig. 2.) In this the thorax is undisturbed, though in the forms I have studied there is the usual lack of definiteness of the epimeron; the abdomen dor-

sally and ventrally is as before, but in the pleural region above the spiracle there has developed a bulla exactly like that of the Geometridæ externally, but instantly distinguished from it by the fact the spiracle lies on its lower edge. A cursory examination suggests that it has developed out of the remaining rudiments of pleurites. The thorax shows more or less trace of the curious modification described for the Noctuidæ, but the venter of the abdomen is typical.

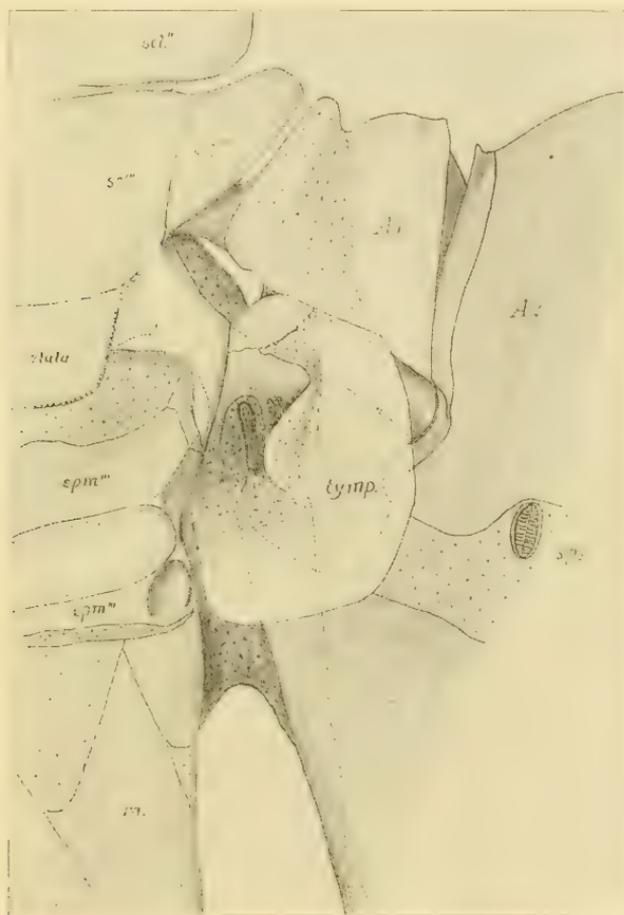


Fig. 3. Same view of *Catocala parta*, showing third, or usual Noctuid type of tympanum. The cover, or alula of the hind wing is drawn forward, and the posterior edge is turned back to expose the spiracle and structures within the tympanum.

The third, or Noctuid type, is perhaps the most interesting of all, being at once the most complex, and that occurring in the largest family. (Fig. 3.) Here there is no simple rounded bulla, either subdorsal or subventral, but the whole spiracular region is deeply excavated, the excavation including the posterior region of the thorax as well. This cavity in the more typical case is roofed over by the alula of the hind wing, which is largely developed, especially in such *Quadrifidæ* as *Catocala* and the *Euteliinæ*, and is enclosed behind by a large flap, developed behind the spiracle. It seems to be the same pleurite that has formed this and the bullæ of the *Arctioids*, but the development has been behind, not above the spiracle, and is of a wholly different character, as the figure shows. Another interesting development is a deep fovea in the parapleural region of the thorax, across which the suture between postscutellum and epimeron may sometimes be traced. In this series the epimeron, often heavily chitinized, tends strongly to break up, and to develop more complex sculpturing, as is notable in *Catocala*. *Alypia* and the *Notodontidæ* (Fig. 5) show interesting variants of this type. In the latter the lateral cavity is present, but slightly developed, and the alula is rudimentary, not covering

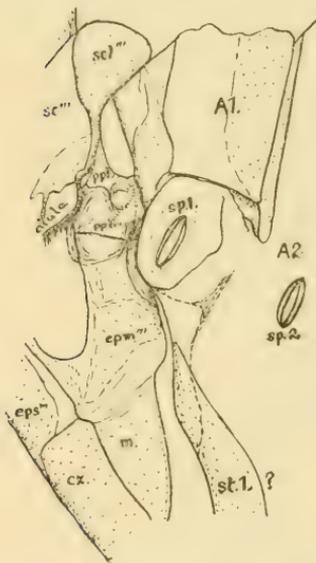


Fig. 5. Same view of *Datana ministra*.

it, the lateral flap behind the spiracle is also absent, though the material from which it forms is indicated as a chitinized area about the spiracle that already tends to overgrow the lateral groove. The parapleural fovea is well marked, however, and already undercuts a portion of the parapleura, which makes a stiff and solid connection with the abdomen (partly broken in the figure). This type could well represent the point of origin of the Noctuid one, but is wholly unlike the simple structure of *Apatelodes*. In *Alypia* (Fig. 4) we have a second rather simple modification. The parapleural fovea is well marked, but the region about the spiracle is reduced, without any spe-

cial sclerites, and in this case the hollow area which normally exists dorsally between thorax and abdomen is very much enlarged, extending back into the second segment, as a thin-walled balloon. In all variants of type three this fold seems much better developed than in the primitive condition.

As to the evolution of these forms I have little doubt that I am correct as to the primitive condition, since it occurs generally in both Micro- and Macrolepidoptera; from it I should derive type three (in its simpler Notodontid subtype) directly, and from that the more specialized subtypes and type two. Type one seems, however, independent. Working this out as a genealogy we will have a first dichotomy between the primitive condition

(plus type one) and types two plus three. This corresponds (so far as I recall, exactly) with the division between upright and flat egg, and between the caterpillars with hooks in a single length and those alternately of two lengths, and in those two particulars would dispose of the anomalous position of the Notodontidæ (excluding Apatelodes). It would leave, however, the Notodontidæ as a solitary trifid family in a mass of Quadrifidæ, and would similarly maroon the Lasiocampidæ in a wilderness of trifidæ. Possibly the importance of the position of M^2 in the fore wing is less than it has been considered. Already we give little weight to it in the hind wing, and in certain Hydrimenid Geometridæ, such as Eudule.

FAMILIES EXAMINED.

Primitive type.

Microlepidoptera.	Bombycidæ.
Cossidæ.	Saturniidæ.
Eucleidæ, etc.	Sphingidæ.
Eupterotidæ (Apatelodes).	Lasiocampidæ.

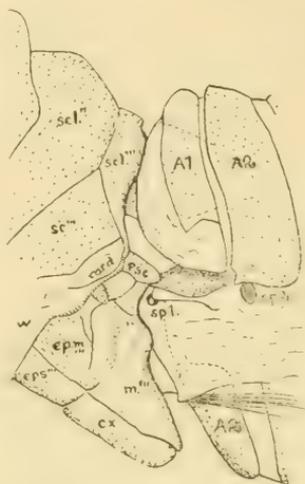


Fig. 4. Same view of *Alypia oclomaenulata* (Agaristidæ). The internal expansion of the fold between thorax and abdomen is indicated by the dotted lines. A strong suggestion of this structure occurs in some Noctuidæ.

Type 1 (subventral tympanum). Pericopidæ.
 Geometridæ only. Herminiini and Epizeuxis of
 the Noctuidæ.

Type 2 (subdorsal bulla).
 Lymantriidæ. *Type 3 (parapleural fovea.)*
 Arctiidæ. Notodontidæ.
 Nolidæ. Noctuidæ.
 Syntomidæ. Agaristidæ.

It should be noted that Brues and Melander, in their key to the families of Lepidoptera erroneously refer to this organ in the Pericopidæ and Geometridæ, as the spiracle; it is perfectly distinct from the spiracle, lying above it in the former, and below in the latter case. So far as I know the spiracle itself is always small and normal, and varies very little in position. It should be noted, however, that the "tympanic opening" of the Dioptidæ (PSYCHE, XXI, 59, alternative 32) is not homologous with that of the Geometridæ, but is the rudimentary structure noted in Apatelodes, and which becomes enlarged in the Agaristidæ. In the case of the Pericopidæ (alternative 48) the separation from the Arctiidæ is slender, while the majority of Noctuidæ of course completely lack the bulla. The key would really be cleared up by transferring Haploa to the Pericopidæ, where it would not be as wholly out of place as one might think. The Pericopidæ certainly belong here rather than in the neighborhood of the Notodontidæ or Bombycidæ.

SUMMARY AND CONCLUSIONS.

A study of the base of the abdomen in certain Lepidoptera suggests:

1. The Notodontidæ are better placed near the Noctuidæ than near the Geometridæ and Bombycidæ.

2. Apatelodes is not Notodontid, but may be Eupterotid, agreeing in general with the Bombycid series.

3. The Lymantriidæ, Arctiidæ, Nolidæ, Pericopidæ and Syntomidæ are undoubtedly close relatives, agreeing in a unique specialization.

4. The Noctuidæ, Agaristidæ and Notodontidæ are similarly

grouped, and no reason has developed to separate them widely from the preceding group.

5. The Bombycidae, Lasiocampidae, Saturniidae, Sphingidae, Apatelodes, and their relatives also form a distinct group, but as they are associated by the absence of specializations in the structures studied, they may be justly divided up on other characters.

6. The tympanic bulla of the Geometridae is not homologous with that of the Arctiidae, etc., being developed on the opposite side of the spiracle.

7. A new subfamily, *Cimeliinae*, is needed for the genus *Cimelia*, based mainly on the following characters: Tympanum absent; Sc of hind wing not angulate at base, without a brace connecting it with the base of the frenulum, closely parallel to R to a point well beyond the end of the cell. Structure otherwise as in the lowest Geometridae (Enochrominae).

SUPPLEMENTARY NOTE: Since writing this article, the Diop-tidae, Thyatiridae, and Drepanidae have been examined. The Diop-tidae show no tympanum of any kind and will make a first exception to the rule that uniordinal hooks on the prolegs are co-ordinated with a tympanum of Arctiid or Noctuid type. The egg is described as spherical, and so may be of either type. In the Thyatiridae and Drepanidae there is a new type of tympanum; the tergopleural suture is modified into a large cavity, *opening backward*, which lies beneath the spiracle, and there is a large double chitinized structure subventrally which does not open to the exterior unless it communicates with this tergopleural opening. The structure is so complex, and so similar in the two families as to make their association almost certain, especially as the larval and venational characters are rather similar.

EXPLANATION OF FIGURES.

A = Lower edge of subdorsal muscle with nerve-supply.

A¹, A² = First and second segments of abdomen.

A¹ ant. n. = Anterior nerve trunk of first segment of abdomen.

B = Supposed sensory end organ of tympanum.

conn. = Connective.

cx. = Coxa.

epm. = Epimeron (of metathorax).

eps. = Episternum (of metathorax).

int. = Portion of digestive system.

m. = Meron of hind leg.

post. n. = Posterior nerve trunk of first segment of abdomen.

ppl., psc. = Parapleura, or exposed lateral end of postscutellum.

sc'', sc''' = Scuta of meso-, and metathorax.

scl'', scl''' = Scutella of meso-, and metathorax.

sp¹, sp² = First and second abdominal spiracles.

subal. = Subalar sclerite of metathorax.

tymp. = Tympanum.

1. Side view of metathorax and base of abdomen of *Apateledes torrefacta* (Eupterotidæ), showing primitive macrolepidopterous arrangement of sclerites.

2. Same view of *Hemerocampa leucostigma* (Liparidæ), showing second type of tympanum.

3. Same view of *Catocala parta*, showing third, or usual Noctuid type of tympanum. The cover, or alula of the hind wing is drawn forward, and the posterior edge is turned back to expose the spiracle and structures within the tympanum.

4. Same view of *Alypia octomaculata* (Agaristidæ). The internal expansion of the fold between thorax and abdomen is indicated by the dotted lines. A strong suggestion of this structure occurs in some Noctuidæ.

5. Same view of *Datana ministra*.

6. Tympanum with its principal muscles and nerve connections, of the Geometridæ (drawn from *Biston ursaria* and *Phigalia titea*). Only two of the numerous air-sacs are indicated, the one lying ventrad of the nerve, and along which the nerve runs from the tympanum to the spiracle, and the large double one connecting the tympana. The latter appears ventral in the dissection, which was opened out on the middorsal line, but in fact lies above the digestive system. When the dissection is first opened it is normally filled with air and may be the most conspicuous object in the field.

BOOK REVIEWS.

THE RHYNCHOPHORA OR WEEVILS OF NORTHEASTERN AMERICA. By W. S. Blatchley and C. W. Leng.

This important work is the first general treatment of any considerable portion of the Rhynchophora of North America for forty years and is even more comprehensive than that of LeConte and Horn for the chosen district. Its possession should remove from the collector of eastern North America any temptation to throw away or even neglect his captures of this suborder.

In this work of 682 pages the coleopterist will find efficient keys to the families, tribes, genera, and species known to occur east of the Mississippi River. Full descriptions of 1,084 species are given. It is illustrated by 155 very good figures, 21 of which, together with about 7 pages of text, are devoted to the explanation of the structures used in the classification. Four new genera, 74 new species and 5 new varieties, the majority of them from Indiana and Florida, are described by the pen of the senior author.

The general scheme of the "Coleoptera of Indiana" has been followed throughout the text, with the addition of seven pages of Bibliography and a 3-page index to the plants mentioned in the generous notes on distribution, occurrence and habits that follow the description of each species. The classification used is mainly that of LeConte and Horn, modified where necessary by the results of recent studies in the suborder.

The amount of work represented by this volume can better be appreciated after reading the Introduction. In all cases where possible the descriptions have been written from the actual specimens themselves and in connection with the original descriptions, while the senior author has visited the principal museums and many public and private collections in the East to compare doubtful specimens with the types. It is very evident that the authors have spared no efforts to present accurate determinations and careful descriptions, and the results of their labors should stimulate the study of this somewhat neglected group of beetles.

We hope that the coöperation by which the scope and usefulness of this work has been increased will not escape the appreciation of

its students, for each author has sacrificed his partly completed work to this end. No such example of the subordination of self to the interests of science has been placed before the American Coleopterists since the days of LeConte and Horn.

C. A. FROST.

It is with great regret that we have to record the passing of Otto Heidemann, who died on November 17, 1916, at the age of seventy-three. For many years he has been in charge of the Hemiptera in the United States National Museum, faithfully performing the arduous routine duties of the position, and yet finding time to publish a considerable number of contributions to the literature of his specialty. More than this, he was always ready to share his great knowledge of the Hemiptera with all who sought his advice, and it can safely be said that a large part of the hemipterological work published in America since the days of Uhler has been based upon his store of information, avowedly or not. Thoroughness in his work, kindness in his relations with others, and self effacement when his own interests were at stake went to make up a rare nature which can ill be spared.

Through the kindness of Mr. John Howard Paine we are enabled to present in this issue a very excellent and characteristic portrait of Mr. Heidemann.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's *Insects of New Jersey*.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; *Insect Life*; Harris's *Insect*; many others.—J. F. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parsbley, Bussey Institution, Forest Hills, Mass.

Wanted: *Psyche*, Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: *Transactions American Entomological Soc.*, Vol. 4; *Entomological News*, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinae of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: *Transactions American Entomological Society*, vol. 4. Also will purchase specimens of *Catocola Sappho*.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: *Old Series Entom.*, Bul. 1, 2, 3, 33; *Technical Series* 4, 6, 7; *Insect Life*, vol. 4-6; *Jour. Applied Microscopy* I, N. Y. State Entom. Rep. 3, 4; *Fitch Rep.* 7, 8, 13.—Philip Dowell, Port Richmond, N. Y.

Would appreciate receiving date, stage and mode of hibernation of insects of all orders. J. P. Baumberger, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: *Ill. Ent. Rpts.* 2, 3, 5, 7, 9, 10, 11, 12, 13, 19; *Hensham's List of the Coleoptera of America North of Mexico*, 1895. For *Exchange Bulletins and Circulars U. S. Bur. Ent.*—J. S. Wade, Wellington, Kan.

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PSYCHE.

INDEX TO VOL. XXIII. 1916.

INDEX TO AUTHORS.

- Andrews, H. A New Ant of the Genus *Messor* from Colorado, 81.
 Bradley, C. J. Taxonomic Notes on Agathinæ, 139.
 Brues, C. T. A New Species of *Aphiochaeta* (Diptera, Phoridae) from New England, 175.
 Brues, C. T. A New Species of *Lepidopria* from North America, 126.
 Chamberlin, R. V. Two New Texan Parajuli, 33.
 Cockerell, T. D. A. The Panurgine Bees of the Genera *Hesperapis*, *Zacesta* and *Panurgomia*, 176.
 Cole, F. R. New Species of Asilidæ from Southern California, 64.
 Crampton, G. C. A Comparative Study of the maxillæ of the Acrididæ, Phasmidæ and Phyllidæ, 83.
 Davis, J. J. A Nematode Parasite of Root Aphids, 39.
 Dow, R. P. Plaster-casting Insect Burrows, 69.
 Ferris, G. F. Notes on Anoplura and Mallophaga from Mammals, with Descriptions of New Species and Varieties of Anoplura, 97.
 Forbes, W. T. M. On the Tympanum of Certain Lepidoptera, 183.
 Frost, C. A. Review: The Rhynchophora or Weevils of Northeastern America. By W. S. Blatchley and C. W. Leng, 193.
 Girault, A. A. New Encyrtidæ from North America, 41.
 Hood, D. J. Two New Thysanoptera from West Africa with a Note on the Synonymy of the Phlæothripidæ, 6.
 Howe, R. H. A Preliminary List of the Odonata of Concord, Mass., 12.
 Hyslop, J. A. Prothetely in the Elaterid Genus *Melanotus*, 3.
 Hyslop, J. A. The Host of *Zelia vertebrata* (Diptera, Dexiidæ), 24.
 Hyslop, J. A. Elateridæ and Throscidæ of the Stanford University Expedition of 1911 to Brazil, 16.
 Johnson, C. W. The *Volucella bombylans* Group in America, 159.
 Johnson, C. W. Parasites of *Archips cerasivorana* Fitch, 81.
 Johnson, C. W. Some New England Syrphidæ, 75.
 Johnson, C. W. Further Studies on the Platypozidæ, 27.
 Leonard, M. D. The Immature Stages of *Tropidostepes cardinalis* Uhler (Cap-sidæ), 1.
 Malloch, J. R. Three New North American Species of the Genus *Agromyza* (Diptera), 51.
 Morse, A. P. A New England Orthopteran Adventive, 178.
 Parker, R. R. Sarcophagidæ of New England, III, *Sarcofahrtia ravinia*, New Genus and New Species, 131.
 Parshley, H. M. On Some Tingidæ from New England, 163.
 Parshley, H. M. Review: A new list of North American Hemiptera, 128.
 Patch, M. E. A Psyllid Gall on *Juncus* (*Livia maculipennis* Fitch), 21.
 Van Duzee, E. P. Notes on the Genus *Hyoidea* Puton (Hemiptera), 141.
 Van Duzee, M. C. Tables of Males of North American Species of the Genus *Asyndetus* with Descriptions of Six New Species, 88.
 Weiss, H. B. *Monarthropalpus buxi* Lab. in New Jersey, (Dip.), 154.
 Weiss, H. B. The Coccidæ of New Jersey Greenhouse, 22.
 Wickham, H. F. A New Brachyelytrous Trogositid Beetle from Colorado, 146.
 Williams, F. X. The Pupa of *Boreus brumalis* Fitch, 36.
 Williams, F. X. Notes of the Life History of *Methoca stygia* Say, 121.
 Williams, L. T. Notes on the Egg-parasites of *Malacosoma americanum*, 148.
 Williams, L. T. A New Species of Thripoctenus, 54.
 Wheeler, W. M. A Phosphorescent Ant, 173.

- Wheeler, W. M. Questions on Nomenclature Connected with the Ant Genus *Lasius* and its Subgenera, 168.
 Wheeler, W. M. An Anomalous Blind Worker Ant, 143.
 Wheeler, W. M. Note on the Brazilian Fire-ant, *Solenopsis savissima*, 142.
 Wheeler, W. M. Some New Formicid Names, 40.
 Wheeler, W. M. Ants carried in a floating log from the Brazilian Mainland to San Sebastian Island, 180.

INDEX TO SUBJECTS.

(New species and new names are indicated in boldface type.)

- Aberus clisiocampæ*, 149.
 Agathomyia, table of Species, 27.
 Agathomyia **cushmani**, 30.
 Agathomyia **ubia**, 28.
 Agathomyia **fulva**, 29.
 Agathomyia **perplexa**, 29.
Agathomyia pulchella, 31.
 Agathomyia **vanduzeei**, 29.
 Agromyza **albidohalterata**, 52.
 Agromyza **nigrisquama**, 53.
 Agromyza **subangulata**, 51.
 Aneristus **oculatifennis**, 42.
 Anoplura and Mallophaga, 97.
 Aphiochæta **johnsoni**, 175.
Aphænogaster bakeri, worker of, 143.
Aphycoideus io, 153.
Archips cerasivorana, parasites of, 81.
 Asyndetus, table of species, 88.
 Asyndetus **caudatus**, 92.
 Asyndetus **cornutus**, 89.
 Asyndetus **johnsoni**, 93.
 Asyndetus **latus**, 91.
 Asyndetus **nigripes**, 91.
 Asyndetus **texanus**, 90.
 Berecyntus **bakeri**, var. **arizonensis**, 50.
 Berecyntus **bakeri**, var. **gemma**, 49.
 Book reviews, 128, 193.
Boreus brumalis, pupa of, 36.
 Brazil, Elateridæ and Throscidæ of, 16.
 Brazilian ants, 180.
 Callimymia, table of species, 31.
 Callimymia **proxima**, 32.
 Callimymia **velutina**, 32.
 Callimymia **venusta**, 33.
Camponotus (Myrmophyma) inflatus, 40.
 Capsidæ, immature stages of Tropicod-
 teptes cardinalis Uhler, 1.
 Ceraptroceroideus **cinctipes**, 47.
 Colorado, New Ant (Messor) from, 81.
 Colorado, New Beetle from, 146.
 Cophura **highlandica**, 64.
 Cylidrella **championi**, 147.
 Dictynota **tricornis**, var. **americana**, 164.
 Drasterius **manni**, 19.
 Egg-parasites of *Malacosoma ameri-*
canum, 148.
 Enderleinellus **kellogi**, 105.
 Enderleinellus **longiceps**, 105.
 Enderleinellus **sphærocephalus**, 107.
 Enderleinellus **suturalis**, 108.
 Enderleinellus **uncinatus**, 108.
 Epanusia **albiclava**, 44.
 Epidinocarsis **subalbicornis**, 44.
Eumerus strigatus, 80.
 Exchange Column, 26, 62, 95, 130, 157,
 195.
Fahrenheitia pinnata, 102.
 Fahrenheitia **tribulosa**, 102.
 Formicencyrtus **thoreauini**, 45.
Hæmodipsus ventricosus, 102.
 Hapithus **vagus**, 178.
 Hesperapis, table of known forms,
 176.
 Hoplopleura **arboricola**, 112.
 Hoplopleura **hesperomydis**, 112.
 Hoplopleura **hirsuta**, 112.
 Hoplopleura **quadridentata**, 116.
 Hoplopleura **trispinosa**, 111.
 Hyoidea **puton**, 141.
 Lasiopogon **drabicolium**, 65.
 Lepidopria **aberrans**, 126.
 Lestomyia **montis**, 67.
 Lestomyia **redlandæ**, 65.
Linognathoides insenatus, 100.
Linognathoides montanus, 99.
Livia maculipennis, 21.
 Mammalian hosts of Anoplura and
 Mallophaga, 117.
 Melanorhopala **obscura**, 167.
 Melanostoma **notivagum**, 78.
 Merodon **equestris**, 79.
 Messor **lobognathus**, 82.
 Metapogon **pictum**, 65.
Methoca stygia, 121.
Microdon megalogaster, 76.
Microdon tristis, 75.
Microdus divisus, 140.
Microdus fasciipennis, 140.
Microdus fulvescens, 140.
Monarthropalpus buxi, 154.
 Monocrepidius **bakeri**, 20.
 Monocrepidius **madeirensis**, 20.
 Nebaucharis **hemipterus**, 43.
 Nematode parasite of Aphids, 39.

- Neohæmatopinus antennatus*, var. *semifasciatus*, 100.
Neohæmatopinus pacificus, 100.
Neohæmatopinus scinropteri, 107.
Neosigniphora elongata, 41.
 New England, new Aphiochaeta from, 175.
 New England Orthopteran adventive, 178.
 New England Sarcophagidæ, 131.
 New England Syrphidæ, 75.
 New England Tingidæ, 163.
 New Jersey, Coccidæ of, 22.
Nicocles lomæ, 67.
 North America, Lepidopria from, 126.
 North America, new Encyrtidæ from, 41.
 North America, Asyndetus from, 88.
 North America, New Species of Agromyza from, 50.
 Odonata of Concord, Mass., 12.
Oöencyrtus clisiocampæ, 151.
 Orthoptera, Study of the Maxillæ, 83.
Paracopidosomopsis floridanus, 49.
Parajulus texanus, 33.
Parajulus victorianus, 35.
Pheidole grallipes, 40.
Pheidole peregrina, 181.
 Phosphorescent ant, 173.
Physatocheila plexa, 165.
Physatocheila variegata, 166.
 Plaster-casting Insect Burrows, 69.
 Platypezidæ, 27.
 Podothrips, Key to species, 9.
Podothrips denticeps, 9.
Podothrips semiflavus, 9.
Polyplax auricularis, 99.
Polyplax spinulosa, 99.
Polyrhachis (*Campomyrma*) *macropus*, 40.
 Prothetely in the Genus *Melonotus*, 3.
Pselaphothrips pomeroi, 11.
Sarcophartia ravinia, 131.
Signiphora flavopalliata occidentalis, 41.
Signiphora thoreauini, 41.
Solenopsis savissima, 142.
 Southern California Asilidæ, 64.
Sphærophoria, table of species, 76.
Sphærophoria novæangliæ, 76.
Sphærophoria strigata, 77.
Syrphus xylotoides, 80.
Telenomus clisiocampæ, 151.
Tetrasticus sp. 151.
Tetrasticus (sens. lat.) sp., 152.
 Texan New Parajuli, 33.
Thripoctenus, new species of, 54.
Thripoctenus nubilipennis, 55.
 Thysanoptera, new from W. Africa, 6.
Trichodectes geornydus, 99.
Trichodectes mephitidis, 99.
Trichodectes qudraticeps, 99.
Trichodectes retusus, 98.
 Tympanum of Certain Lepidoptera, 183.
Volucella bombylans, 159.
Xanthoencyrtus (*Scelioencyrtus*) *nigroclavatus*, 43.
Xylota nemorum, 80.
Zaommoencyrtus submicans, 46.
Zelia vertebrata, Host of, 24.

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