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A NEW GENUS AND FIVE NEW SPECIES OF THYSANOPTERA FOREIGN TO THE UNITED STATES.[1]

BY A. C. MORGAN.

EUPATHITHRIPIDAE, Bagnall, 1915.

CELETOTHRIPS, n. gen.

Head nearly twice as long as prothorax, not twice as long as width at base, sub-carinate, slightly constricted at base, cheeks converging posteriorly and bearing only a few spines, not set in large tubercles. Eyes not as large or as approximate posteriorly as in either *Eupathithrips* or *Sedulothrips;* ocelli very large, set on a very prominent hump, the anterior ocellus directed forward and overhanging front of head. Antennae with first joint stout and approximate; joints 3 and 4 not nearly so slender as in the other genera of the family. Sense cones shorter than in *Eupathithrips.* Mouth cone slender, reaching beyond base of prosternum. Fore legs stout in both sexes, although larger in male than in female; femur with a heavy cone-shaped tubercle near tip within; tibiae strongly incurved in first fourth and bearing tubercles successively larger from base to tip, the tubercle or spine nearest tip being flat and knife-shaped when viewed from above. Tarsi bear a very stout tooth in both sexes.

Prothorax not emarginate anteriorly, the usual spines present, slightly dilated at tips.

Celetothrips breviceps, n. sp.

Female.—Measurements: length 4.29 mm.; head, length .45 mm.; width through eyes .293 mm., at neck-like constriction .215 mm.; prothorax, length .603 mm., width through coxae .56 mm., exclusive of coxae .44 mm.; width mesothorax .603 mm., length of tube .40 mm., width at base .137 mm.

Antennal segments, in microns:

Segment	1	2	3	4	5	6	7	8
Length	77	86	155	165	163	116	112	50
Width	51	43	57	60	47	35	30	17

Color, dark brown to blackish brown; tarsi and fore tibiae light brown; all antennal segments slightly lighter than the body color. Wings very light brown, the posterior wing in posterior half much darker than in anterior half,

[1]Types to be deposited in the United States National Museum.

darkest along median longitudinal vein and fading out toward posterior margin to general color of wing.

Head indistinctly laterally striate, broadest in anterior half, in posterior half gradually converging to neck-like constriction near posterior margin, slightly carinate medially; eyes large, not protruding, finely facetted, occupying about two-fifths the length of the head and only a little more than two-thirds its width; ocelli very large, situated on a conspicuous hump which overhangs base of antennae and bears anterior ocellus at its extremity, directed forward. Posterior ocelli situated just in front of middle of compound eyes and contiguous thereto, sides of head nearly smooth, bearing one large conspicuous spine set in a small cylindrical tubercle just before neck-like constriction and directed forward at an angle of 45°; close behind the large spine there is usually a smaller spine set and directed forward similarly to the larger spine; other spines few and small. Postocular bristles rather short and slender, antennae, approximate, situated low in front, very nearly twice as long as the head; segment 1 cylindrical; 2 with a neck-like constriction at first fourth; 3–6 inverted, cone-shaped in first halves, enlarged in third quarter, thence narrowing rather abruptly; 7 mildly fusiform, 8 cone-shaped and pointed; sense cones conspicuous, about half as long as segments upon which they are borne, placed as follows: 3 each on 3 and 4, 2 on 5, and 1 on 6; each cone is subtended by a hair nearly equaling it in length. A ventral comb of sense hairs extends from tip of 8 to about middle of 7. Mouth cone long and pointed, reaching across prosternum. Maxillary palpi long and slender, first joint very short.

Prothorax subcarinate medially, spines at posterior angles largest, those at anterior angles nearly as large and larger than lateral and marginal spines. Fore femora enlarged, about two-thirds as broad as head, armed with a short, stout, blunt tooth near the tip within. Fore tibiae strongly incurved at first fourth, and bearing on inner surface at extremity of the curve a short, stout, blunt setigerous tooth—much smaller than the one on femur; near the center of the segment within is a somewhat larger setigerous tooth shaped like the preceding; at about the third fifth there is a large broad flattened wedge-shaped tooth which bears a large seta about the middle of its inner face. Between this tooth and the tip stands a strong spine somewhat longer than the tooth opposite the wedge-shaped tooth; on the outer margin is a more slender spine about twice as long as the preceding one, and near the tip without is a spine very similar in size to the one on inner margin. The tarsus bears a very strong stout tooth approximately as long as the tarsus (excluding bladder). Mesothoracic angles rather broadly rounded; metathorax narrowed behind. Intermediate pair of legs scarcely as long as fore pair, their femora swollen in distal half; posterior pair of legs slightly longer than anterior pair, their femora only slightly thickened. Wings slender, nearly straight, anterior wing about fifteen times as long as its breadth at middle, margins nearly parallel to the last fifth, in which posterior margin curves forward so that at the tip the width is only about half the width at middle. Near the tip on posterior margin the fringe is double for about 44 hairs. Fringe on both wings long and thick. At base of wing on vein stand three spines, the first with expanded tip, second blunt, and third very long and sharp-pointed.

Abdomen rather slender. All spines sharp and gray, only moderate in size, except those at tip of ninth segment, which are brown and slightly more than half the length of the tube. Spine at tip of tube very slender and less than half the length of the tube.

Described from four females collected under bark, Carmelina, Honduras, February, 1920. W. M. Mann, collector.

Celetothrips breviceps, n. sp.

Allotype.—Measurements: length 4.24 mm.; head, length .43 mm., width .25 mm.; prothorax, length .293 mm., width through coxae .59 mm., exclusive of coxae .48 mm.; mesothorax, width .603 mm.; tube, length .327 mm., width at base .12 mm.

Dimensions of antennal segments, in microns:

Segment	1	2	3	4	5	6	7	8
Length	85	86	155	172	163	120	112	47
Width	60	47	58	61	56	38	34	17

In coloration and size the male differs very little from the female, except that the fore femora are about seven-eighths as broad as the head and the spines on the fore legs are somewhat stouter than in the female.

Described from two males collected in company with the females.

Eupathithrips bagnalli, n. sp.

♀.—Length 5.45 mm.; width mesothorax .79 mm.

Head, length .72 mm.; width through eyes .34.

Length antennal segments, in microns:

Segment	1	2	3	4	5	6	7	8
Length	94	94	293	298	293	189	120	51

Length of sense cones on 3 and 4 about 189 microns, on 5 about 155 microns.

Wings about half as long as entire body, and at middle about one-twentieth as broad as long.

Color.—Very dark brown with orange pigmentation in prothorax and connective tissue. All tibiae and tarsi yellow; intermediate tibiae at sides on basal third, and posterior tibiae on basal half tinged with fuscus. Antennal joints 1 and 2 light brown, 3 yellow with very slight brownish tinge, 4, 5, basal half of 6, and basal third of 7, very light brown, distal half of 6, distal two-thirds of 7, and all of 8 darker brown.

Head.—Length 2.1 times as long as width through eyes; the width at the middle from tip to tip of spiniferous tubercles the same as through eyes. Cheeks each bear 7 prominent spiniferous tubercles. A spine behind each eye about one-third the distance from eye to posterior margin of head, fairly long and knobbed. Eyes large, finely facetted, rounded, contiguous in front and very nearly so behind, dorsally protruding, and *very* slightly less than two-fifths of length of head. Ocelli large and almost completely surrounded by the eyes. Antennae set ventrally below anterior part of eyes and between ventral portions thereof; basal joint cylindrical, second slightly narrowed at base, joints 3 to 6 roughly claviform, 7 fusiform and 8 cone-shaped; 3–6 beyond broadest part produced into a narrow stem which is longest in 5, and in 4–6 longer than in 3. Sense cones long, slender and placed and protected as in *dentipes*, Bagn. Mouth cone long and sharp, reaching beyond base of prosternum; maxillary palpi long and slender, the first joint being very short.

Prothorax trapezoidal, one-half as long as head, and through and including coxae 2.25 times as broad as long. Posterior, midlateral, anterior, and anterior marginal spines present, well developed, and swollen at tips. Coxal spine also swollen at tip.

Pterothorax about as long as broad, reticulated medially. Wings reach to sixth abdominal segment, slightly tinged with yellow, midvein brown to dark brown; 3 basal spines on vein long, stout and slightly swollen at tips, both fringes long, thick and fine, posterior fringe of forewing doubled for fifty-nine hairs.

Legs fairly long, posterior and intermediate femora slightly swollen, sparsely clothed with rows of small hairs, anterior femora considerably enlarged, sparsely clothed with fine hairs with sharp triangular tooth at tip within, and also bearing in its inner margin a double row of small spiniferous tubercles; all tibiae clothed with fine hairs, the fore tibiae with a double row of very small spiniferous tubercles; fore tibiae with minute tooth, middle and hind tibiae each with two short sharp spines at tip within.

Abdomen long and slender, tube very slightly more than half as long as head. Spines on lateral margins of abdominal segments light yellow, becoming progressively longer from 2 to 8, and all prominent ones swollen at tip except one pair on 7, which is sharp-pointed. Spines on 9 slightly longer than tube, slender and sharp. Spines on tube slender and sharp. Second abdominal segment is emarginate anteriorly to receive the bell-shaped reticulated chitinous thickening of the first abdominal segment.

♂.—Cleared specimen: Length 4.17 mm. Width of mesothorax .65 mm. Head, length .65 mm., width through eyes .31 mm. Eyes in relation to size of head and insertion of antennae same as in ♀. Tubercles on side of head not quite so well developed as in ♀. Length of antennal segments, in microns:

Segment	1	2	3	4	5	6	7	8
Length	86	77	250	258	258	168	108	51

Unfortunately, the fore legs of the ♂ are lacking, but since the male agrees so closely with the female in other respects I feel sure that it will not be difficult to place. Posterior fringe double for only 41 hairs.

Described from one ♀ and one ♂ collected by Mr. W. M. Mann, from beneath bark, February, 1920, Carmelina, Honduras.

I take pleasure in naming this well-marked species after Mr. Richard S. Bagnall, that eminent English Thysanopterist, who described the genus and family to which this species is referred.

✓ Anomalothrips amygdali, n. sp.

Female.—Color, yellowish brown, head, light brown, slightly tinged with yellow; first antennal segment light brown; legs light brown, the femora and tibiae shaded darker at the sides and somewhat darker than tarsi; second antennal segment rather dark brown; third to seventh segments intermediate in color between first and second segments, fourth and 5th segments gray at base; prothorax somewhat darker than the head, mesothorax yellowish brown; wings light brown, abdomen darker than prothorax. Eyes black by reflected light, ocelli gray, margined inwardly with light orange crescents.

Head nearly twice as long as wide, retracted within prothorax, arcuate between eyes; cheeks roughened and arched rather suddenly behind the eyes; eyes occupy about half the width of the head and a little more than half the length, rather closely faceted with medium facets, slightly pilose; ocelli larger than facets of eye, placed well back on the head, the posterior ones very close to margins of compound eye. Spines on head minute and sparse, one spine directly behind, and one in front of each posterior ocellus near margin of compound eye, a few inconspicuous spines behind each compound eye, and one small spine on the arched cheek. Antennae nearly three times as long as head, segment 1 slightly rounded much the broadest; 2 rounded, only about three-fourths as broad as 1, and one and three-fourths times as broad as segments 3 to 6; 3 to 6 capilliform; 3 bears above a slender, branched, sense cone somewhat removed from the tip, and 4 a similar cone below near the tip. A few short brown spines in 2 and 4 similarly are found in the apical third of 3. Mouth slender, reaching three-fourths across prosternum, constricted at the middle. Maxillary palpi well developed, three-segmented, segment 1 being equal in length to 3, and second segment three-fifths as long. Labial palpi small and slender.

Prothorax one and one-half times as wide as long, its anterior margin straight, sides nearly straight, posterior angles broadly rounded and bearing two stout spines of medium length, posterior margin convex. Anterior angles bear one short, stout, anteriorly directed spine and much smaller dorsally directed spine. Other spines small and inconspicuous, mesothorax broad and heavy, bearing a few short spines. The metascutum bears two rather heavy spines near the meson. Wings broad and heavy, reaching nearly to tip of abdomen, forewing at basal fourth one-tenth as broad as long; costa and veins thickly and regularly set with short, sharp, dark-brown spines; costa bears 40; fore vein 33; hind vein 22; scale 7, interior of scale 1. Fringe present in both margins of both wings, long, wavy, and brown in posterior margins, straight in anterior margins, thick except in anterior margins of posterior wings. Legs strong, of medium length, regularly set with rows of small spines which are strongest on the posterior pair and weakest in the anterior pair. Posterior tibiae armed at the tip with three very heavy dark-brown spines, and along its inner side for about half its length with a row of about 10 spines which are much heavier than the other spines clothing the legs. Median tibia with two slender, light-brown spines, at the tip within, and the anterior tibiae each with two slender, lighter-brown spines.

Abdomen with sides nearly straight to the eighth segment, thence tapering suddenly and evenly to the tenth, which is conical. A broad, dark band crosses segments 3 to 8 dorsally near the anterior edges. Posterior margins of ninth and tenth segments set with a ringlet of about eight well developed spines, of which the dorsal four are much the strongest; those on the ninth segment are much stouter and longer than those on the tenth. Segment 9 on its dorsal surface bears, about half-way between the meson and the lateral margin and about one-third the length of the segment from its anterior margin, a heavy, very dark-brown spine, which is directed posteriorly and inwardly. Stout spines, also brown, are at the posterior lateral margins of segments 5 to 8, one each on segments 5 and 6 and two each on segments 7 and 8. Segment 10 is split open above for about half its length.

Measurements of holotype: Length 1.44 mm.; head, length .112 mm., width .21 mm.; prothorax, length .163 mm., width .258 mm.; mesothorax, width .405 mm.; abdomen, width .37 mm.; antennal length 1, 36.7 μ; 2, 42.8 μ; 3, 65.3 μ; 4, 70 μ; 5, 53 μ; 6, 73 μ; 7, 16 μ; segments, width 1, 36.7 μ; 2, 28.5 μ; 3, 16 μ; 4, 16 μ; 5, 16 μ; 6, 16 μ; 7, 10 μ. The sixth segment is constricted 20.4 μ from the tip to very nearly the diameter of the base of the seventh segment. Total length of antennae .356 μ.

Described from one specimen taken in flowers of almond, Branxton, New South Wales, by W. W. Froggett, Quaintance No. 4458.

Holopothrips fulvus, n. sp.

Female.—Length about 1.7 mm. Color by reflected light: Eyes and ocellar crescents, red; first two antennal segments, base of mouth cone, and ninth abdominal segment dark, blackish brown; tube black; outer half of seventh and all of eighth antennal segments dark brown; intermediate antennal segments gray; remainder of body, including legs, lemon yellow, clearing to gray in some portions. By reflected light the eyes are black, intermediate antennal segments light lemon, the remainder of body deep yellow, except ninth abdominal segment, which is brown, and the tube is blackish brown in proximal half, lighter in distal half.

Head about as broad as long, broadest at the third fourth; greatest width across eyes *very* little more than four-fifths the greatest width of head. Eyes large, occupying about three-fifths the length of the head and almost enclosing the ocelli, their interval in front and behind being only about one-fourth the greatest width of the eye. Ocelli large and situated anteriorly. Cheeks convex. Posterior margin of head very little wider than is head at posterior margin of eyes. Weakly striate behind eyes and bearing a few small spines. Postocular spines wanting. Mouth cone reaches a little more than half across prosternum. Antennae about 1.6 times as long as head, segment 1 slightly wider than long, segment 2 subcylindrical, 3 claviform, pedicellate; 4–7 subfusiform; 8 cone-shaped.

Prothorax about three-fifths as long as head, and, inclusive of coxae, twice as wide as long; only slightly wider behind than in front; spines capitate, those at anterior angles about half as long as those at posterior angles; midlaterals about half as long as those at anterior angles; anterior marginals wanting; posterior marginals about three-fourths as stout and long as those at posterior angles. Pterothorax heavy and with sides nearly parallel. Legs of moderate size and length, tibiae and tarsi without teeth. Wings reaching to about seventh abdominal segment, rather slender, not narrowed in center; fore wings with six interlocated hairs on posterior margin. Wings hyaline in distal half, light yellow in proximal half.

Abdomen slender, no wider than pterothorax. Bristles capitate except the terminal ones and those at posterior margin of ninth abdominal segment, all of which are long and slender, those on ninth segment being almost as long as the tube and only slightly longer than the terminal bristles.

Measurements of holotype 1.89 mm.; head, length .236 mm., width .224 mm.; prothorax, length .138 mm., width through coxae .302 mm.; pterothorax, width .363 mm.; abdomen, width .363 mm.; tube, length .179 mm., width at base .089 mm., at tip .038 mm. Antennal segments in microns:

Segment	1	2	3	4	5	6	7	8
Length	32.6	48.9	69	57	66	50	36.7	28.5
Width	36.7	32.6	28.5	28.5	27	25	20.4	12

Described from three females taken on cotton, Bahia, Brazil, June 14, 1923, by Seignor G. Bondar.

Male colored like female, more slender than female. One of the specimens before me measures in length 1.32 mm., the other 1.8.

Described from two specimens collected with the holotype.

This species, in form, suggests the type of the genus, *signatus*, but may be easily distinguished therefrom by the coloration and by the absence of postocular spines.

Heliothrips braziliensis, n. sp.

Female.—Length 1.04 mm.; head, length .11 mm., width .161 mm.; prothorax, length .11 mm., width .183 mm.; mesothorax, width .257 mm. Dimensions of antennal segments, in microns:

Segment	1	2	3	4	5	6	7	8
Length	18.3	36.7	44.1	44.1	40.3	25.7	14.7	29.4
Width	25.7	31.2	22.0	22.0	18.3	16.5	—	—

Head and prothorax rather finely and deeply reticulate, metascutum reticulate a little less finely than head or prothorax, mesoscutum reticulate at the meson on cephalic margin, the sides and caudal margin finely striate, abdomen weakly reticulate upon cephalic margins of notal plates, striate on sides.

Color: Head, thorax, and abdomen, deep brown; all femora brown; tibiae brown, but grayish yellow in distal fourth, and only slightly so in proximal sixth, tarsi pale yellow; antennae, first, second, sixth to eighth and distal end of fifth light brown, remainder gray. Fore wings with basal fourth gray, except for small smoky areas each side of median vein, another gray band crosses the wing near tip, occupying about one-fifth the length of wing, remainder of wing light brown, the median brown band occupying nearly half the length of the wing; hind wings gray, slightly fuscous along median vein and toward tip.

Head nearly rectangular, slightly constricted at base, arcuate above and between antennae; antennae well separated at base, normal to the genus; eyes coarsely faceted, occupying about three-fifths the length of head and about half its width; ocelli situated on slight hump, approximate, opposite center of compound eyes, margined inwardly with orange crescents, ocellus scarcely larger than facets of compound eye.

Prothorax with sides slightly arched, mesothorax with anterior angles distinctly shouldered; legs moderate in size; wings well-developed, reaching slightly past tip of abdomen, at their middle about one-twelfth times as broad as long; costa bears about 20 spines interspersed with shorter slenderer hairs; fore vein bears 3 colorless slender spines in the clear basal area, two to three dark stout spines near branching of hind vein and two other dark well developed spines near the tip; the hind vein bears 5 to 7 spines of which one or two stand within clear area.

Abdomen normal to the genus; spines upon ninth segment well-developed and reaching past tip of tenth segment. Second to eighth segments with a transverse chitinous thickening near anterior margin. Tenth segment entire above.

Described from four females. Locality Brazil, food plant not given. Collected by Prof. Carlos Moreira, November, 1922.

Heliothrips bruneri, n. sp.

Female.—Length 1.10 mm. Head, length .110 mm.; width .139 mm.; prothorax, length .110 mm.; width .169 mm.; mesothorax, width .220 mm.

Antennal segments, in microns:

Segment	1	2	3	4	5	6	7	8
Length	18.3	36.7	47.7	38.5	33	27.5	14.7	33
Width	23.8	29.4	22.	22.	20.2	18.	—	—

Color: Head and thorax brown, body dark brown, slightly lighter on tenth segment; all tarsi and fore tibiae yellow; middle tibiae yellow but slightly fuscous at middle; hind tibiae yellow in extreme thirds, brown at center; anterior femora light brown in basal half, remainder yellow, middle femora light brown, yellowish at tip; posterior femora brown like thorax; eyes dark brown, ocelli large, yellowish, approximate, margined inwardly with brown crescents; situated on sides of a hump, the anterior ocellus directed forward. Antennae with second segment dark brown, sixth segment pale brown, seventh progressively paler brown than sixth, fifth segment gray brown, third to fifth gray, wings gray brown, the basal fourth almost clear except for a small irregular brownish area along scale, veins prominent and dark brown at their branching at beginning of second quarter of wing and again on margin around tip of wing in distal sixth. Hind wing yellowish gray.

Head rectangular, cheeks nearly straight and parallel arcuate above base of antennae, the front of head at center on a line with base of second antennal segment, a deep notch between compound eye and basal segment of antenna; eyes large, occupying fully three-fifths the length of the head and slightly more than half its width, facets large; ocelli subapproximate situated on sides of a hump just caudad of center of compound eye, the posterior ocelli directed slightly caudad, the anterior ocellus sharply directed cephalad; ocelli about a third greater in diameter than facets of compound eye. Head deeply and plainly striate-reticulate. Antennae normal to the genus, the third segment stalked, first to third each, having two pairs of long grayish brown spines. Mouth cone reaching across prosternum, stout and tipped with black. Maxillary palpi three-segmented.

Prothorax as long as head and one and one-half times wider than long, reticulate like head, spines minute. Mesothorax heavy; mesoscutum finely longitudinally striate on each lateral fourth, the mid-section transversely finely striate: Metascutum and metascutellum reticulate. Wings reach to tip of abdomen. Costa of forewing bears 18 to 21 long, slender, grayish-brown spines, fore vein bears three spines before origin of hind vein, 2 to 3 spines at and near juncture of veins and 2 spines near tip of wing, hind vein bears 5 spines, all situated in the second and third quarters of vein.

Abdomen normal to genus, striate on sides, anterior margins of first to ninth segments reticulate, second to eighth segments with a row of comb-like teeth on lateral fourths; third to eighth segments with a transverse chitinous thickening extending entirely across the dorsum near anterior margin. Ninth segment bears six rather long spines, the two near meson being dark brown and not quite attaining tip of tenth segment, the other four spines longer and yellowish, one pair near laterocaudal margin, the other pair on lateral margin and inserted cephalad of insertions of mesal spines. Tenth segment split open above for about three-fourths its length.

Described from 11 females, collected on sugar cane, Las Vegas, Cuba, July 13, 1921, H. C. Bruner, collector, in whose honor I have the pleasure of naming the species.

THREE NEW AMERICAN CHIGGERS (ACARINA: TROMBIDIIDAE).

By H. E. Ewing, *U. S. Bureau of Entomology.*

Two of the three new chiggers here described were taken by Raymond C. Shannon while collaborating in research work on verruga for the International Health Board of the Rockefeller Foundation, one being taken from the house cat and one from a lizard. The other new species was taken from a mole in Oregon.

Trombicula shannoni, new species.

In general appearance the larvae are similar to the well known *T. irritans* Riley. Palpi with femur strongly rounded outwardly. First palpal seta with several barbs; second seta with two or three barbs; third seta with several long barbs. Palpal claw trifurcate, the inner and outer prongs being smaller than the middle one and about equal. They arise far from the base of the main claw. Chelicerae strongly curved and simple except for a single, minute, recurved ventral tooth. Dorsal plate broader than long, somewhat incurved along the front margin between the central and antero-lateral setae; posterior margin of the plate much more strongly arched near the median line. Pseudostigmatic organs very long, flagelliform and well barbed for the distal two-thirds of their length. Anterior eyes larger than the posterior ones. Dorsal setae forty-six. Legs of medium length. Dorsal spine of tarsus I entirely dorsal in position and situated about its length from the base of the segment; dorsal spine of tarsus II smaller than the one on tarsus I but similar in its position. Tactile seta on tarsus III about as long as the tarsus itself, simple, situated about the width of the tarsus from the base of the same.

Length of unengorged larva, 0.20 mm.; width, 0.13 mm.

Type host.—House cat, *Felis domestica.*

Type locality.—Verrugas Cañon, Lima, Peru.

Type slide.—Cat. No. 986, U. S. N. M.

Described from many specimens mounted on seven microscope slides. They were taken from the ear of the host by R. C. Shannon, May 28, 1928.

This species is related to the *Trombicula autumnalis* (Shaw) of Europe, but has forty-six dorsal abdominal setae instead of twenty-eight or thirty. Also the dorsal plate is more strongly outcurved along the posterior margin near the median line than it is in *autumnalis. Trombicula irritans* var. *tropica* Ewing has been reported from Peru, but in this variety the palpal claw is bifurcate instead of trifurcate as it is in *T. shannoni.*

Trombicula australis, new species.

Capitulum of the *irritans* type. Femur of palpus only slightly swollen laterally. First palpal seta either simple or with one or two inconspicuous barbs; second seta with as many as five barbs but usually with less; third, apparently simple. Palpal claw bifurcate, with accessory claw element about as large as terminal one and placed ventrally near tip. Chelicerae upcurved rather strongly toward their tips; each with 3–4 very minute teeth above and 1 below near the tip. Dorsal plate broader than long, front margin almost straight, posterior margin outwardly rounded; pseudostigmata large, each situated slightly less than its diameter from median line; pseudostigmatic organs long, flagelliform, with 1–3 barbs. Eyes prominent, first pair slightly larger than the second. Abdomen with 44 rather short, pectinate, dorsal setae. Tarsi I and II each without the dorsal spine; tarsus III without the simple tactile hair.

Length of unengorged larva, 0.29 mm.; width, 0.16 mm.

Type host.—*Tropiduras peruvianus* (a lizard).
Type locality.—Verrugas Cañon, Lima, Peru.
Type slide.—Cat. No. 987, U. S. N. M.

Described from several specimens taken from type host by R. C. Shannon, April 15, 1928. This species is very distinct in the type of chelicerae, having 3–4 small teeth on dorsal margin. The palpal claw is similar to that of *irritans*, but *irritans* has only a single dorsal tooth on each chelicera.

Trombicula oregonensis, new species.

Palpi with second segment broadly rounded on outside; first palpal seta with many barbs, second with several barbs, third with from two to four barbs; palpal claw bifurcate, inner prong being much the largest. Chelicerae each with a single dorsal tooth and apparently with a single ventral tooth. Dorsal plate much broader than long, front margin about straight, posterior margin outwardly curved; pseudostigmata situated much nearer the posterior margin of dorsal plate than the front margin; pseudostigmatic organs long, flagelliform, simple. Eyes situated about their diameters from the lateral margins of dorsal plate, front and posterior corneas subequal. Dorsal setae forty, not counting a lateral posterior pair. Dorsal spine of tarsus I situated its length from the base of the segment; dorsal spine of tarsus II sharper than the one on tarsus I and similarly situated. Last pair of legs each with at least four long, simple, tactile setae.

Length of unengorged larva, 0.30 mm.; width, 0.18 mm.

Type host.—A mole.
Type locality.—Corvallis, Oregon.
Type slide.—Cat. No. 990, U. S. N. M.

Described from two lots of material as follows: "Five specimens taken from type host at Corvallis, Oregon, June 3, 1912, by A. J. Stover and eleven specimens taken from type host at the same place May 17, 1912, by a student. This species is most nearly related to *Trombicula bruyanti* (Oudemans) but differs from Oudeman's species in having the pseudostigmatic organs simple instead of pectinate and in having forty dorsal setae instead of twenty-eight.

A NEW VARIETY OF INSCUDDERIA WALKERI HEBD. FROM VIRGINIA (ORTHOPTERA: TETTIGONIIDAE).

By A. N. Caudell.

At Cape Henry, Virginia, the extensive sand dunes annually encroach some distance into a large cypress swamp, thus gradually burying the tall cypress trees growing in the swamp. The tops of dead trunks project above the sand dunes here and there as monuments, testifying to the former grandeur of these ancient trees. The dunes end abruptly, dropping in an incline of forty-five degrees into the swamp some forty to eighty feet below, and on this steep incline the tops of partially buried, but still living, cypress trees are found. These tops afford an easy and unique opportunity for the exploration of the insect fauna of the cypress, which under normal conditions is well nigh inaccessible.

While investigating this fauna July 15–25, 1927, Mr. August Busck collected some slender green katydids, the color of which blended effectively with the foliage of the cypress. Additional specimens of this insect were obtained two months later, September 20, 1927, on cypress in the identical locality, by Dr. E. A. Chapin. These specimens prove to represent a variety of *Inscudderia walkeri* Hebd., which I take pleasure in naming in honor of my friend, Mr. Busck, who repeatedly has added to our knowledge of American Orthoptera by his assiduous collecting, although he is primarily interested in a very different group of insects, the Microlepidoptera.

Inscudderia walkeri var. **buscki,** new species.

Size about as in *taxodii* Caud., decidedly smaller than *walkeri* Hebard; in color agreeing with both the above species in the characteristic marking of the tegmina, etc.

The male has the last dorsal segment of the abdomen almost exactly as described and figured by Mr. Hebard for *walkeri*, and the terminal tooth of the cercus also agrees in length and shape with that of Hebard's species; the decidedly larger size and the northern habitat will, however, serve to distinguish it from the typical southern form as described and figured in Hebard's paper of 1925.[1] The supraanal plate, which, as in other species of this genus, is deflexed beneath the last dorsal segment of the abdomen and thus generally seen with difficulty, is elongate, about as long as one of the cerci and so deeply sulcate dorsally as to appear divided for almost its entire length. The female shows no differentiating characters of importance; the superior valves of the ovipositor are either as long as, or very slightly longer, than the inferior ones, there being but little variation in the specimens examined, in this particular apparently agreeing more nearly with that of *taxodii*, as noted in the description by Hebard in the above noted article.

Measurements (in millimeters): Length, pronotum, ♂ 4, ♀ 4.5; tegmen, ♂ 25, ♀ 26.5; posterior femur, ♂ 20.5, ♀ 23; ovipositor, 8; width, pronotum posteriorly, ♂ 3, ♀ 3; tegmen at apical fourth, ♂ 3, ♀ 3.5; posterior femora at widest point, ♂ 2, ♀ 2.5.

Holotype, ♂, Cape Henry, Virginia, July 20, 1927, August Busck, collector; allotype, ♀, same data; paratypes as follows: One adult female and a large female nymph, same data as the holotype and allotype; two male and six female adults from same

[1]Trans. Amer. Ent. Soc., vol. li, p. 321–330, pls. x–xi.

locality on September 20, 1927, E. A. Chapin, collector. All taken on cypress, *Taxodium distichum* Richard.

Type material in the collection of the U. S. National Museum.

Type catalogue No. 40719, U. S. N. M.

The measurements in millimeters of typical *walkeri*, as given by Hebard, are as follows: Length, pronotum, ♂ 4.8, ♀ 5.1; tegmen, ♂ 30.4, ♀ 31.8; posterior femur, ♂ 23.8, ♀ 26.2; width, tegmen, ♂ 5, ♀ 5.2.

Were it not for the geographical features involved and the rather decided difference in size, this might be considered as typical *walkeri*. In consideration of the above features, however, there seems little doubt of the varietal distinctness of the form here noted.

In order that this beautiful little katydid may be recognized by interested persons other than orthopterists, the following brief nontechnical description is given:

A small slender katydid barely one and one-half inches in length, inclusive of the wings. The outer wings, or tegmina, are narrow, about six times as long as broad, and of the semi-opaque horny texture usual in katydids. The under wings are broad, membranous and transparent with the tips tinged with green and, when folded, project a short distance beyond the outer wings. The legs are long and slender, especially the hind ones, the femora, or first half, of which reaches the tips of the closed outer wings. The female bears at the tip of her body a short, flat up-curved egglaying organ called the ovipositor; this is about one-third as long as the outer wings and about one-fourth as broad as long, and the tip is pointed. From the lower part of the tip of the abdomen of the male is a narrow gently up-curved prolongation extending well beyond the rest of the abdomen and above this is a pair of short apically swollen projections with an apical incurved tooth on each.

The general color is green with the outer wings marked lengthwise with a couple of narrow black streaks and with a few short diagonal marks of the same color projecting from the upper edge of the closed wing.

So nicely do specimens of this insect blend with the colors of the cypress foliage on which they occur they are very liable to be overlooked unless especially sought for.

A NEW INJURIOUS PINE MOTH (LEPIDOPTERA: GELECHIIDAE).

By August Busck, *U. S. Bureau of Entomology.*

Recurvaria condignella, new species.

Second joint of labial palpi black, slightly sprinkled with white scales on the inner sides and with apex narrowly pure white; terminal joint white with extreme base and two annulations, one on the middle and one just before apex, black; extreme tip white. Face white, bordered with black scales. Head and thorax white, mottled with black scales. Antennae yellowish with narrow black annulations. Forewings white, thickly mottled with black; a con-

Recurvaria condignella Busck. Male and female genitalia.

spicuous deep black longitudinal streak from base of costa through the middle of the wing nearly to apex, partly edged with white scales; a thin, faint arrow-shaped transverse white fascia, pointing toward apex at apical fourth; a short black dash on the middle of the wing between the costal edge and the central longitudinal black streak; three groups of raised scales, predominately black, on dorsal part of the wing below the central black streak; cilia dark fuscous. Hindwings light fuscous, in the male with a long ochreous yellow tuft of dilated hairs on base of dorsum. Palpi and venation typical of the genus. Abdomen dark fuscous, in the male with three first joints light velvety yellow above. Legs black with narrow white tarsal annulations and with tuft on posterior tibiae conspicuously white.

Alar expanse: 13–15 mm.

Habitat: Prescott, Arizona; Valparaiso, Florida.

Foodplant: Yellow Pine.

U. S. N. M. Type No. 41690.

Reared from yellow pine in Florida by Mr. E. W. Gemmer of the Forest Service, and at Prescott, Arizona, by Mr. L. G. Baumhofer of the U. S. Bureau of Entomology, the larvae "infesting new growth on Western yellow pine of sapling size, the small yellow larvae were abundant in the tips in certain localities. Work similar to the tip moth. Moths issued July 3–11, 1928." (Baumhofer.)

By far the most conspicuously marked of our described American species of the genus, nearest in pattern to the oak-feeding *R. quercivorella* Chambers but bolder in design and color. From the two other North American pine feeders of the genus, *R. pinella* Busck and *R. moreonella* Heinrich, the present species is at once separated by the predominating black central streak on the forewing.

The genitalia of all the American species of the genus (except the genotype, the introduced European *R. nanella* Hubner) are remarkably alike, conforming to a very distinct generic type, though easily separated specifically by small but constant differences in details; they all exhibit the same bilobed hooded uncus, the triple hooked gnathos, the asymmetrical winged tegumen, the slender asymmetrical harpes, of which one is commonly three to four times as large as the other, and the projecting curved hooks (sicae) from the vinculum. The two European species differ somewhat from this type, especially in having symmetrical harpes, and, as before suggested, it may eventually be sounder to restrict the generic name to these, and to revive one of the American names which have been made synonyms of *Recurvaria*, for the American species, but this may well be postponed until a revision of the family is undertaken.

The somewhat surprising occurrence of *R. condignella* in two so widely separated regions may be accounted for by the reforestation projects in Florida, where the species presumably has been introduced with nursery-stock from the West.

DROSICHA BURMEISTERI WESTWOOD APPARENTLY REDISCOVERED (COCCIDAE).

By T. D. A. Cockerell.

Last February, on the slope of Doi Sutep, in northern Siam, Miss Alice Mackie collected a male *Drosicha* which does not belong to any of the species tabulated in Morrison's recent admirable revision. The very broad wings with black costa, the dark thoracic dorsum and pale red scutellum, the broad red abdomen with relatively stout penis sheath, and five pairs of marginal tassels, the first short, the others very long, are all characteristic features, and seem to refer the species to *D. burmeisteri*, described from an unknown locality. The size agrees well enough. The last (longest) caudal process is I think fully as long as the abdomen, a character of *D. burmeisteri* as against *D. leachii*. Westwood calls special attention to the long abdominal filaments and the broadly rounded hind margins of the wings. The specimen is now in the U. S. National Museum.

A NEW BENEFICIAL MOTH FROM PANAMA AND A SCAVENGER (LEPIDOPTERA, PYRALIDAE, PHYCITINAE).

By Harrison G. Dyar.

Vitula saissetiae, new species.

Under the number Z. 3049, Mr. J. Zetek sends a small moth the larvae of which feed upon the scale *Saissetia*. They form a fine web over the scales and the larva lives within this web. Material collected May 8, 1928, from Hibiscus on Barro Colorado Island, Canal Zone, Panama.

Palpi long, slender, obliquely upturned. Male antennae simple, a little thickened and flattened. Fore wing light gray, shaded with blackish; inner line white, followed by a black shade, sharply V-pointed, the upper limb very oblique to costa, the lower reversed to inner margin and shorter; more or less black shading filling lower part of median space; a double black discal dot; outer line white, preceded and followed by black shades, the costal segment tremulous, slightly retracted; a row of terminal black spots; fringe dark gray. Hind wing subpellucid smoky whitish, veins and termen darker, fringe pale. Expanse, male, 13 mm., female, 14 mm.

Type and allotype, male and female, No. 41389, U. S. Nat. Mus. Also 76 other specimens sent from the same rearing.

Very close to *Vitula rusto* Dyar, described from Paraiso, Canal Zone, and perhaps a variety of that; but in *rusto* the inner line is almost perpendicular to the costa and has only a little cusp-shaped point centrally.

Among these numerous specimens was a single specimen of *Ephestia declivella* Zeller, doubtless a scavenger in the débris, and another single specimen of a Tineid, which I handed to Mr. August Busck.

DESCRIPTION OF AN EGG-PARASITE OF EXOPTHALMUS QUADRIVITTATUS (OLIVIER).

By A. B. Gahan, *Bureau of Entomology, U. S. Department of Agriculture.*

The specimens which form the basis for the following description were received from G. N. Wolcott and according to Mr. Wolcott the new species is a common parasite of the eggs of *Exopthalmus quadrivittatus* in Haiti.

Tetrastichus haitiensis, new species.

Falls in the group having a single erect seta on the submarginal vein and resembles *T. ainsliei* Gahan but may be distinguished by the wholly pale yellow coxae, the smooth propodeum and the shorter antennae.

Female.—Length 1.2 mm. Shining black; scape, pedicel, legs including all coxae, basal one-fourth to one-third of abdomen above, and more than half of the abdominal venter pale lemon yellow; wings hyaline; venation and antennal flagellum brownish. The fore and hind coxae are sometimes slightly stained with blackish at extreme base. Antennae 9-jointed including one ring-joint; scape subcylindrical; pedicel a little more than twice as long as thick at apex; ring-joint small; funicle 3-jointed, the joints subequal and each about as long as pedicel; club indistinctly 3-jointed, about equal in length to the two preceding funicle joints and terminating apically in a short stiff stylus. Head shining, faintly shagreened, as broad as thorax; thorax not much longer than broad; mesoscutum and scutellum weakly shagreened; median groove on mesoscutum and two dorsal lines on scutellum present but very fine; propodeum smooth, without carinae; submarginal vein with a single erect bristle; marginal vein a little longer than submarginal, with about nine or ten marginal bristles; stigmal approximately one-third as long as marginal; marginal cilia of forewing short; legs normal; abdomen as long as head and thorax, as broad as thorax, ovate with the apex acute; tip of ovipositor barely exserted.

Male.—Length 1.1 mm. Antennae 10-jointed; scape slightly thickened toward apex; pedicel twice as long as thick; ring-joint minute; funicle 4-jointed, the funicle joints covered with long hairs which are as long or a little longer than the segments, first funicle joint a little less than twice as long as thick; second, third, and fourth subequal and each more than twice as long as thick; club hairy like the funicle, very slightly longer than two preceding joints, 3-jointed, the joints not distinctly separated, the apical joint terminating in a short stylus; abdomen a little narrower than the thorax. Otherwise like the female.

Type locality.—Port au Prince, Haiti.

Type.—Cat. No. 41081, U. S. N. M.

Described from forty-four females (one type) and ten males reared from eggs of *Exopthalmus quadrivittatus* (Olivier) by G. N. Wolcott, in March, 1927.

TWO NEW AMERICAN COLEOPHORIDAE (LEPIDOPTERA).

By Carl Heinrich, *U. S. Bureau of Entomology.*

The following new names and descriptions are offered in response to requests from correspondents of the Bureau of Entomology.

Coleophora salmani, new species.

Antenna with a very slight tuft on basal joint; beyond base white annulated with pale brown; basal joint pale gray brown. Palpus gray brown; semiporrect; third joint but slightly shorter than second and slightly upturned. Face and head pale gray brown, concolorous with basal tuft of antenna. Thorax and fore wing uniformly gray brown, darker than head and face; semilustrous; cilia concolorous. Hind wing blackish smoky fuscous, much darker than fore wing; cilia concolorous. Legs pale gray brown with paler dustings absent or very much obscured.

Alar expanse, 10.5–12 mm.

Type and paratypes.—Cat. No. 41631 U. S. N. M. Paratypes also in Canadian National, Barnes and Braun collections.

Type locality.—Mt. Desert Island, Maine.

Food plant.—*Betula.*

Described from male type and 8 male and 12 female paratypes all from the type locality and reared July 18, 1928, by Mr. K. A. Salman for whom the species is named.

Larval case ocherous, stout, cylindrical; posterior end triangularly compressed; mouth deflected to 45 degrees; 5–5.5 mm. long.

An unmarked species which goes in the first group of Forbes's handbook ("Lepidoptera of New York and Neighboring States").

It is closest to *fletcherella* and *occidentis* from which it differs in the color of head and hind wing. From *cerasivorella* and *zelleriella* it is separable by the lack of any pale shading at apex of fore wing; from *laricella* by its much darker color; and from *unicolorella* and *cinerella* by its very different larval case. Its genitalia also prevent its being identified with any of the above species.

Coleophora sparsipuncta, new species.

Antenna with short basal tuft; white without darker annulations. Palpus white with a faint streak of fuscous along under side; porrect, straight; no appreciable tuft on second joint; second joint long, third quite short. Face, head and thorax white or (in some specimens) pale cream white. Fore wing white with a few scattered black scales on outer half and in many of the specimens a very faint cream or ocherous shading through center and along dorsum of wing; cilia creamy white with a faint smoky tint behind tornus. Hind wing smoky fuscous; cilia concolorous except on costa where they are paler. Legs white with inner sides smoky fuscous and with a narrow ocherous or fuscous streak along outer side of hind tibia. Under side of fore and hind wings smoky fuscous.

Alar expanse, 12–18 mm.

Type and paratypes.—Cat. No. 41632 U. S. N. M. Paratypes also in American Museum, Canadian National, Barnes and Braun collections.

Type locality.—Lapel, Indiana (E. S. Cascadden, collector).

Food plant.—Aster.

Described from male type and 67 male and 60 female paratypes all from the type locality and reared during late June and early July, 1928.

The larval case is of the needle type, straight, slender, smooth, straw white in color and gradually tapering to a collapsible triangularly compressed apex; mouth deflected to about 45 degrees; length, 18–24 mm.; width, 1.5 mm.

This species is close to *argentella* Chambers and *wythiae* Walsingham, from both of which it is separable by its darker hind wings and the scattered black scaling of fore wing. Its larval case readily distinguishes it from the other known aster-feeding species. On the sum of its characters it is probably closest to *veroniaeella* Chambers and in the arrangement adopted for Forbes's "Lepidoptera of New York and Neighboring States" it would be associated with that species. From *veroniaeella* and its allies, however, it differs very markedly in genitalia.

A CORRECTION.

By Carl Heinrich, *U. S. Bureau of Entomology.*

In my description of the *Laspeyresia palmetum* published in the Proc. Ent. Soc. Wash., vol. 30, June, 1928, p. 109, I gave the foodplant as a small berry-like fruit, possibly *Icacorea paniculata.* This tentative identification was based upon a misunderstanding. I understood Mr. Jones to say the fruit was that of a small shrub. Since the publication of my article I have learned from him that it is the seed of the "Silver Palm," *Coccothrinax jucunda* Sarg. The food plant record therefore should be corrected accordingly.

A NEW SPECIES OF DANAIDAE FROM THE PHILIPPINE ISLANDS, IN THE UNITED STATES NATIONAL MUSEUM.

By W. Schaus, *Bureau of Entomology, U. S. Department of Agriculture.*

Euploea blossomae, new species.

Male.—Body black; large white points laterally on frons, and smaller points behind antennae, a pair on collar, others on shoulders, and underside of thorax; a white line below eyes; white streaks on coxae and tibiae. Abdomen below with white transverse lines connected with sublateral white spots. Wings above black suffused with dark iridescent blue except on outer margin. Fore wing: small white streaks at base of veins 6–10; a subapical white fascia cut by veins, the spots between veins 6 and 8 larger; a small outer spot above vein 2, and one above vein 3; a marginal series of white spots from just above vein 6 to vein 1; cilia in part faintly tipped with white. Hind wing: a double series of large marginal spots; costal margin white; a creamy white spot of androconia at upper end of cell; cilia well tipped with white. Wings below chestnut brown, the white marginal spots as above, the fore wing with also a white point near cell between veins 3 and 4, and a short spot between veins 2 and 3; on hind wing there is a small white spot beyond cell above vein 6.

Expanse.—66 mm.

Habitat.—Surigao, Mindanao, Philippine Islands.

Type.—Cat. No. 33528 U. S. N. M.

It is a pleasure to name this beautiful species in honor of Mrs. D. S. Blossom, who takes such a great interest in scientific work.

NEEDHAM'S ELEMENTARY LESSONS ON INSECTS.[1]

Successfully to select from a vast assemblage of material and to condense within the limits of slightly more than 200 pages a practical textbook on entomology is a task that only a teacher of long experience and a writer of rare skill and judgment could hope to perform. Professor Needham is to be congratulated on the fact that in the simplification necessitated by such severe abridgment he has avoided in large degree the half-truths which often mar the pages of elementary textbooks. The matter is presented in a logical and convenient form, embracing chapters on insect structure, development, habits and a brief survey of control methods. The chapter on collecting, preserving and rearing insects, which concludes the work, should prove especially valuable to the beginner in entomology. The book is well printed on excellent stock and illustrated with clean-cut, intelligently chosen line drawings, and is substantially and handsomely bound in blue and silver. As a textbook to serve both teacher and student as an introduction to the elements of entomology this work is in a class by itself.

—W. R. Walton.

[1]Ementary Lessons On Insects, James G. Needham, Springfield, Ill., 1928, Charles C. Thomas, $2.00.

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PROCEEDINGS OF THE

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NOTES ON THE LIFE-HISTORY OF EXOPTHALMUS QUADRIVITTATUS OLIVIER (COLEOPTERA).

By George N. Wolcott, *Service Technique, Port-au-Prince, Haiti.*

The grubs of the various species of the Otiorhynchid beetles of the genus *Diaprepes* are major pests in Porto Rico and the Lesser Antilles. They feed on and burrow into the roots of sugar-cane, and other crops, while the tender leaves of citrus trees often prove most attractive to the adults. It has been supposed that these beetles ordinarily have a one-year life-cycle under favorable conditions, but this is merely a supposition. It is based, not on definite and careful rearing befitting pests of such wide-spread economic importance, but rather on the more or less regular recurrence of an increasing abundance of adults during the spring, and their comparative scarcity at other times. While stationed in Porto Rico, the writer twice started to rear these grubs from egg clusters, but in both cases the material was neglected or thrown away during his temporary absence, and a favorable opportunity to recommence rearing experiments was not presented until the spring of 1927 while stationed in Haiti.

In the first large island to the westward of Porto Rico, Hispaniola, only a single species, *abbreviatus* L., of *Diaprepes* occurs (of which Dr. Marshall recognizes two varieties, *comma* Boheman and *doublieri* Guerin), and this species is found only in the eastern or Dominican end of the island. Several species of a closely allied genus, *Exophthalmus*, do occur throughout the island, and as the distinction between the two genera is due to a mere difference in the comparative length of the first joint of the funiculus, in the more general facts of their life-history, *Diaprepes* and *Exopthalmus* may be supposed to be essentially alike.

By comparison with near-by countries of similar size, Haiti grows comparatively little sugar-cane, and in none of the cane fields have grubs of *Exopthalmus* been noted in sufficient abundance to cause appreciable damage. At Leogane, adults of the largest species, *quadrivittatus* Olivier, were several times noted feeding on the leaves of *Sesbania sericea* in cane fields, and their grubs of course might be one more factor in addition to poor drainage, mosaic disease, etc., of the unfavorable complex adversely affecting this cane. In general, however, none of the species of *Exopthalmus* may be considered particularly common in Haiti, especially by comparison with the allied genus *Lachnopus*, of which both species and individuals are much more numerous.

In a small citrus nursery at the Experiment Station at Haina, Republica Dominicana, both *Exopthalmus quadrivittatus* and *Diaprepes a. comma* were found in considerable abundance by the writer in 1920, and in the spring of 1927 a comparable abundance of the former species was noted in a citrus nursery at Damien farm, near Port-au-Prince, Haiti. The beetles were feeding on the tender leaves or resting in clusters in rolled-up leaves. A closer inspection disclosed the fact that the females were depositing eggs between the leaves, irregular masses of from several scores to several hundreds of these being glued together in single layers between the edges of two adjoining leaves. From the economic standpoint, the most interesting observation on these egg clusters was the fact that over half of them were parasitized by an apparently undescribed species of *Tetrastichus*.[1] The wasps, on emerging, burrowed directly through the leaf tissue and often half a dozen or more such holes occurred in each of the leaves surrounding a parasitized egg cluster. Repeated collections of egg masses were made during the last of March and in early April, and the grubs hatching from some of these masses were used in attempting to determine by actual rearing, the minimum length of the larval period, and for making other life-history observations.

The individual eggs are cream-colored and barrel-shaped, measuring 1.28 to 1.44 mm. in length and .48 to .56 mm. in width. One egg cluster containing 140 eggs weighed .0305 gr., and one of 223 eggs weighed .0497 gr., which, making allowance for a small amount of cement holding the eggs together, indicates that the individual egg weighs about .00022 gr. The newly emerged larvae weigh .00014 gr., and ten live adults weighed 2.8157 gr., so that the adult weighs over 2,000 times as much as does its off-spring at the beginning of larval existence.

Before the larvae have half completed their growth they weigh as much as do the adults, and, most surprisingly, they appear to reach their maximum weight and size months before they are ready to transform to pupae. The weights of some larvae during different instars is shown in the following table:

Date of weighing	*Instar*	*Weight*
Aug. 11, 1927	6th	.3315 gr.
	7th	.5662 gr.
	8th	.5565 gr.

[1]This species was described by A. B. Gahan, Proc. Ent. Soc. Wash., Vol. 31, p. 17, as *Tetrastichus haitiensis* Gahan.

	8th	.5854 gr.	(molted Aug. 9)
	8th	.7108 gr.	(molted Aug. 9)
	8th	.9698 gr.	
Sept. 21, 1927	9th	1.018 gr.	
	11th	.834 gr.	

As the eleventh instar grub died a day or two after being weighed, and the other grubs remaining were too few in number to permit risking any additional unnecessary casualties, the weighing of the older grubs was reluctantly discontinued. However, it did not require a chemical balance to indicate that they were no longer making rapid gains in size and weight, for they were obviously smaller than they had been previously.

The rapid increase in size and weight during the earlier instars is most obviously reflected in the dimensions of the head. With a little experience, one can tell accurately the instar of the grub by looking at its head during the earlier instars, although as they become older, no apparent increase in head size can be noted with succeeding molts:

Instar	*Width of Head*
1st	.3–.32 mm.
2d	.5 mm.
3d	.68 mm.
4th	1.2 mm.
5th	2.54–2.6 mm.

Most of the grubs on molting to the sixth instar attain a width of head of 3.0 mm., or sometimes a little more, so that they can not readily be distinguished from those of the 7th and 8th instars, in which the width approximates 3.5 mm. This is the maximum size attained, and the later instars can only be determined by keeping each larva in an individual can, so that each cast skin can with certainty be assigned to the individual responsible for it. The inability of the grubs to make gains in weight and size after the ninth instar, despite the fact that they continue to feed and molt more or less regularly, is correlated with a deepening of their color, like the ageing of old ivory. When one considers the hardness and thickness of chitinization of the adults, it is hardly surprising that this requires adequate preparation by consolidation and dessication in the larval stages. Insects having a complete metamorphosis attain their maximum live weight towards the end of the larval period, and in most cases during the last larval instar. It would be interesting to determine whether the maximum *dry* weight of these grubs continues to increase in the later larval instars, instead of decreasing as does the live weight. In this connection, it should be noted that the maximum weight of the larva is over three times the weight of the adult.

The incubation period of the eggs is from eight to ten days. Eggs about to hatch turn somewhat brownish at one end, indicating the head of the contained larva. When the eggs hatch, the larvae wiggle between the leaves and do not burrow through the leaf tissue in emerging from the cluster. If one tears apart the leaves surrounding eggs that have recently hatched, many larvae are found resting on top of, or in the spaces between the flattened egg-shells, awaiting the hatching of other eggs at the edge of the cluster so that they can get out. The larvae crawl over the surface of the leaf with a galloping motion, but quickly drop to the earth beneath when the leaf slopes steeply from the horizontal. Placed on finely sifted soil in tightly covered tin salve boxes, they showed no haste to burrow beneath the soil, and even days later, when, after having been in the dark, they were suddenly exposed to the light and left in the light, they did not burrow away from it. They came readily to the surface of the soil also during the first instar, making little piles of fine dirt like those heaped up in a ditch by the little mole cricket, *Ellipes minuta* Scudder. Those whose instincts had not been disastrously affected by the artificial conditions provided by a closed tin salve box, however, promptly tunneled into the soil and to the bottom of the can, finding there soft kernels of corn, into which they burrowed.

The very young larvae are elongate and cylindrical, not pear-shaped, having a cream-colored body, a light yellow-brown head and darker mandibles. When about to molt, the larva ceases to be clean, as it is ordinarily, for the finer particles of soil at this time adhere to its skin. It also loses its cylindrical shape, and is considerably flattened ventrally. It rests quietly on its back in a cell only slightly larger than itself, with no exit or entrance, deep in the soil. Between molts, the larva is active in an elongate tunnel, at one end of which is its supply of food. The larvae appeared to prefer the kernels of corn for food, rather than its shoots or roots, although they often severed them, and even the yellow leaves were sometimes partly eaten. Bits of sweet-potato were not touched, and as the corn was most satisfactory in many ways for feeding them, no additional qualitative experiments in food material were tried.

A determination of the exact length of the larval instars of soil insects often can not readily be obtained. In the case of *Exopthalmus*, larvae at least, the disturbance incidental to examination even several days before or after molting often resulted in their death. This heavy mortality was not serious at first when one had hundreds of individuals, but proved disastrous later, when their numbers were greatly reduced, and additional material could not be obtained until the next season.

Most fortunately, however, the larger grubs often were in such a position that they could be observed without disturbance of the soil about them, and careful and exact examinations could be readily made.

In the can thoroughly examined most recently after all the larvae had hatched, which happened to be within eleven days, three larvae had already molted to third instar, one was in the second instar, while most of the larvae were still in the first instar. Those still in the first instar were apparently no larger than when they had first hatched, and presumably had not eaten, while those in the second and third instars were almost invariably found burrowing into kernels of corn. In another can examined twenty-three days after the hatching of the larvae, two larvae were found that had reached the fourth instar, although many first instar larvae were still wandering about, no larger than when they came from the eggs. The minimum length of the first instar is thus only a few days, and presumably not more than a week or ten days in any case where the larva does eat, grow and molt. First instar larvae were found alive and active even a month after hatching, but they had apparently not eaten during this time, and at the next observation, all had disappeared. The greatest mortality thus takes place during the first instar, but probably under natural conditions these grubs aimlessly wandering about, apparently lacking the impulse to eat, would fall an easy prey to ants and other predators long before they had starved to death.

The months during which the various instars occurred, and their relative abundance during the months, as shown by the rearing records, are noted in the following table:

Instars *1st*	*2d*	*3d*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*	*11th*	*12th*	*13th*	*Month*
v. many	many	6	2	—	—	—	—	—	—	—	—	—	April
many	v. many	v. many	49	14	—	—	—	—	—	—	—	—	May
none	2	8	5	10	12	—	—	—	—	—	—	—	June
				4	23	11	3	—	—	—	—	—	July
					2	3	10	4	—	—	—	—	August
						1	2	1	2	1	—	—	Sept.
								2	2	—	—	—	Oct.
									1	1	—	—	Nov.
											1	—	Dec.
												1	Jan.

After the grubs had begun to eat and grow, there appeared to be no delay in their continued growth until the sixth instar. The average length of the second, third, fourth and fifth instars was between two and two and a half weeks each, but some of the grubs in the sixth instar were very slow in transforming to the next instar. One grub which had molted to the sixth on May 25, did not molt again until August 6, while most of them required over a month for this instar. After the sixth instar, the remaining instars were of more normal length, although all were longer than before, from three to four weeks each. Although some grubs grew rapidly and molted promptly during one or more instars, they often appeared to stand still for weeks in some succeeding instar. As a result, the grubs which had hatched on the same day from the same egg-cluster, and a month later might be scattered over two or three or even four instars, in later months came to approach each other more closely in instar, and in size became practically indistinguishable.

One grub molted to the 11th instar on September 21, but on account of handling too soon afterwards, while being weighed, died a day or two later. One other grub molted to the 10th instar on the same date, and died soon afterwards. A third grub molted to the 10th instar on October 25, and was found dead two weeks later. On March 30, 1928, the only remaining grub, of the hundreds with which rearing operations had been commenced 10 months before, was found crushed. It was then in the 15th instar, having molted for the last time on March 16, 1928. The record of larval molts for the individual and its companions follow.

Record of Larval Molts.

March	23	egg mass collected.
March	31	hatching.
April	2	all hatched.
April	18	many in 2d and 3d instar.
May	4	3 in 4th instar, 4 in 3d instar.
May	11	1 in 3d dead.
May	16	3 in 4th, 1 in 3d.
May	18	2 in 4th removed.
May	23	1 in 5th, 1 in 3d instar.
May	29	added 1 5th from 4.
June	7	1 5th only.
June	13	1 6th.
June	20	1 6th.
July	13	1 7th.
July	26	molted to 8th.
Sept.	6	molted to 9th.
Sept.	15	fed sweet potato.
Oct.	5	molted to 9th (must be 10th).
Nov.	19	molted to 11th.
Dec.	12	molted to 12th.
Jan.	4	molted to 13th.
March	3	molted to 14th.
March	16	molted to 15th.
March	30	accidentally killed.

THE LARVA OF THE WEEVIL EXOPTHALMUS QUADRIVITTATUS OLIVIER (COLEOPTERA: RHYNCOPHORIDAE).

By Richard T. Cotton, *U. S. Bureau of Entomology, Washington, D. C.*

The following description of the larva of *Exopthalmus quadrivittatus* Olivier has been prepared from material reared by Dr. George N. Wolcott at Port-au-Prince, Haiti.

Description of Mature Larva.
(Plate No. 1.)

Generalities:

The full grown larva (fig. 8) is about 16 mm. long and 6 mm. wide; it is cylindrical and slightly curved in the typical curculionid manner.

The head (fig. 2) is yellowish-brown with darker margins; each epicranial half has two well defined light colored areas.

The body is whitish in color, with a well defined yellowish-brown prothoracic shield. The spiracles (fig. 5) are large, bifore-annular, and somewhat pear-shaped. They are present on the mesothorax and the first eight abdominal segments. The mesothoracic spiracle is noticeably larger than the abdominal ones; it points upward and is located on a small lobe pushed into the posterior part of the prothorax. The abdominal spiracles are all of the same size and have the longitudinal axis pointing obliquely upward and forward; the eighth one is placed slightly more dorsal than the rest.

Head:

About as broad as long from anterior margin of frons to occipital foramen, the sides broadly rounded.

Epicranial suture distinctly longer than half of cranium. Each epicranial half with eight large and six minute setae as shown in figure 2.

Ocelli lacking.

Frons about four-fifths the length of the epicranial suture; frontal sutures forming an angle of about 120°; median frontal carina lacking. Two long setae, three minute setae and two sensory spots on each side of the frontal plate as shown in figure 2.

Antenna (fig. 6) small, two-jointed, basal joint with 7 small setae (in the preserved alcoholic specimens), apical joint broad and flattened.

Clypeus transverse; about three times as wide as long, and bearing on each side two setae at suture between clypeus and epistoma.

Labrum transverse, anterior margin convex and indistinctly trilobed; slightly more than twice as wide as long. Dorsal face (fig. 2) with four setae on each side. Anterior margin (fig. 9) with a group of three lateral and a median group of two setae on each side (one of the median setae similar in size to the lateral setae, the other much shorter). Ventral face (or epipharynx) (fig. 9) on each side with two setae and one small group of sensory spots inside of the epipharyngeal rod (er).

Mandible (fig. 4) subtriangular, somewhat larger at base than apically; inside slightly concave, distally bluntly pointed without teeth. Two setae on dorso-external face.

Maxilla (fig. 1): Cardo (ca) smooth, yellowish-brown. Stipes proper (st) smooth, yellowish-brown with one large seta, one minute seta and sensory spot. Palpiger (g) soft, with two setae and a sensory spot on ventral face. Maxillary lobe (or mala) (m) single, large, tip obtuse and rounded, reaching about to middle of apical joint of palpus; on ventral face with two large and two small setae and a sensory spot; on buccal face with about eight stout setae. Maxillary palp (p) short, with two joints; basal joint slightly longer and about twice as wide as the apical, which is conical, obtuse and about twice as long as wide; basal joint with one seta and two sensory spots; apical joint papillose at tip, with one sensory spot.

Subfacial area (sf, fig. 1) fleshy, and probably formed by a fusion of the mental, submental and maxillary articulating areas; it carries three setae on each side.

Prementum (=the fused labial stipites) (pm, fig. 1) posteriorly and laterally limited by a well defined, curved chitinization which in the middle line extends like a heavy stick both anteriorly and posteriorly; one seta and one sensory spot on each side. Labial palp two-jointed; basal joint about as long as and twice as wide as apical, which is conical; basal joint with one sensory spot; apical joint papillose at tip, one sensory spot. Ligula well developed, thick and fleshy; ventral face (li, fig. 1) with one small seta and one sensory spot on each side; dorsal face (ln, fig. 3) with one small seta and one sensory spot on each side, lateral margins on the dorsal side setose.

Paragnath (pgt, fig. 3) a setose lobe.

Hypopharynx (hyp, fig. 3) fleshy, membranous, longitudinally wrinkled, supported on each side by a chitinous rod.

Thorax:

Tergum of prothorax simple, not differentiated into tergal areas; each side with a lightly chitinized, indistinctly defined, yellowish-brown shield. There are on each side 11 setae arranged as shown in figure 8. Mesothorax and metathorax with tergum divided into prescutum (psc), scuto-scutellum (sc-scl) plus alar area (a) and post-scutellum (pscl). Prescutum (psc) with one seta on each side; scuto-scutellum with 4 setae on each side; alar area with two setae.

Epipleurum (e) of prothorax large, lobe-like with distinct pre-epipleural section (ea). The epipleurum of mesothorax large with well-developed pre-epipleural (ea) and small post-epipleural (eb) sections, two setae on epipleurum proper, one on pre-epipleural section. The metathoracic epipleurum without clearly defined pre-epipleural section, otherwise similar in form to the corresponding mesothoracic area.

The hypopleural and sternal areas of all thoracic segments are very similar in size and arrangement.

Hypopleurum (h) situated below the ventro-lateral suture with two fine setae on the prothoracic lobe and one on each of the mesothoracic and metathoracic lobes.

Presternum absent in each segment, eusternum (est) large, unpaired, with one seta on each side. Parasternum (or coxal lobe) (cx), triangular, with rounded swelling below hypopleurum; 7 either normal or small setae present. Poststernellum (post) small, spindle-shaped without setae.

Abdomen:

The first eight segments are almost identical in all respects, the two last modified and reduced in size.

Tergum divided into prescutum (psc, fig. 8), scutum (sc), scutellum (scl), postscutellum (pscl) and alar area (a). The setal arrangement is on each side as follows: prescutum with one seta; scutum without setae; scutellum with 5 setae arranged as shown in figure 8; postscutellum without setae; alar area with two setae.

Epipleurum (e) ventrally limited by the ventro-lateral suture; median region with two setae.

Hypopleurum (h) below the ventro-lateral suture, with two setae.

Presternum wanting; eusternum (est) same as in thoracic segments but with two setae on each side. Parasternum (or coxal lobe) (cx) triangular, with one seta; poststernellum small, spindle-shaped, without setae.

Ninth abdominal segment smaller, with tergal areas less differentiated and with fewer setae.

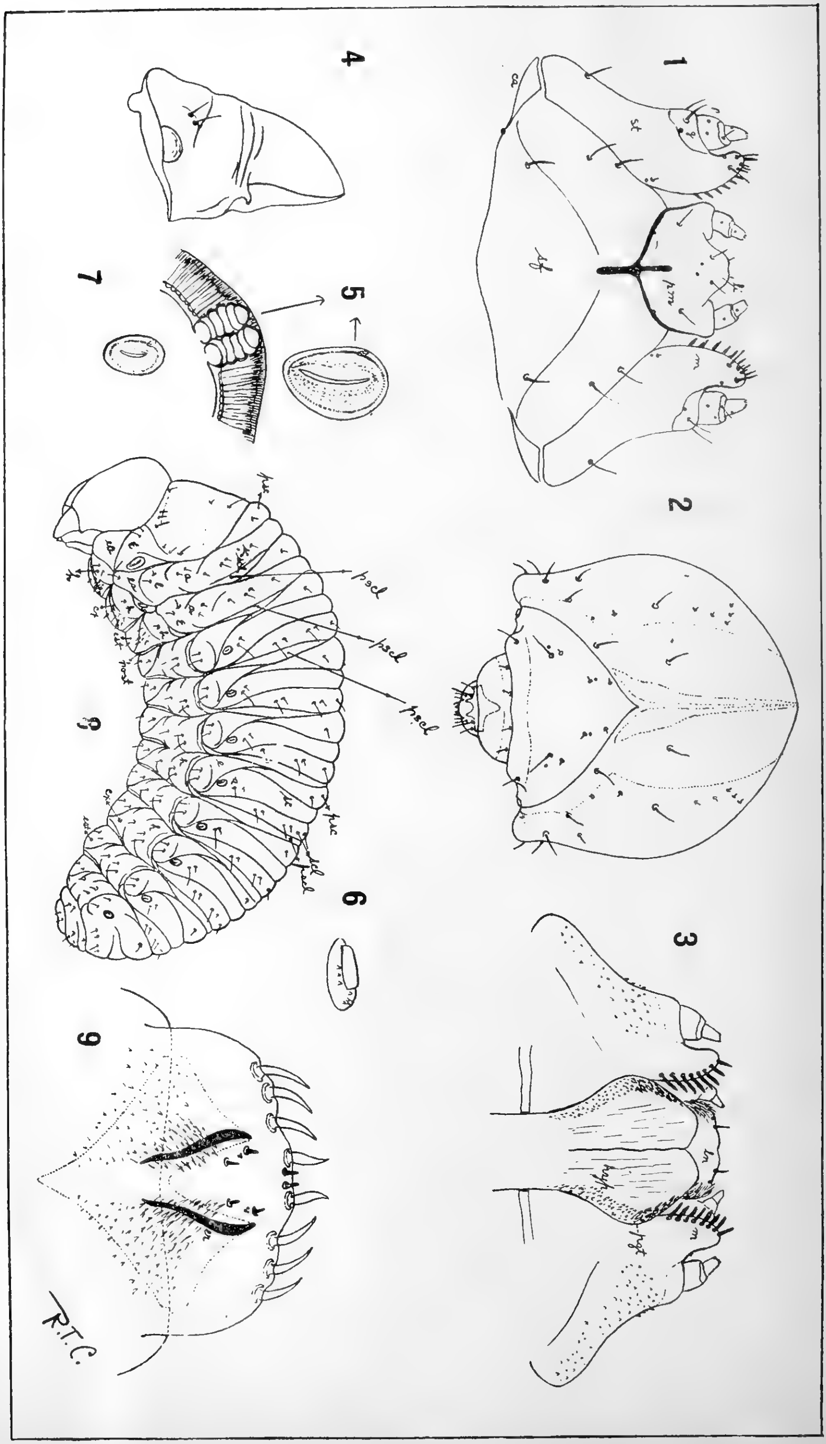
Tenth abdominal segment small, globular, or wart-like with about 8 setae.

Spiracles bifore-annular with a thick rim in which a pair of minute air tubes are located, a deeply hollowed mouth piece, beset with numerous fine, short spinulae, and a slit-like opening at the bottom.

Comments:

The larva of *Exopthalmus quadrivittatus* Olivier is almost identical in appearance with the larva of the closely allied *Diaprepes abbreviatus* Linnaeus. The larvae of the two species, however, may be readily distinguished by the size of the spiracles, the spiracles of *Exopthalmus quadrivittatus* (fig. 5) being almost twice as large as those of *Diaprepes abbreviatus* Linnaeus[1] (fig. 7). The measurements of the spiracles are as follows: *Exopthalmus quadrivittatus*, mesothoracic spiracle length 0.6 mm., width 0.4 mm.; abdominal spiracle length 0.37 mm., width 0.26 mm. *Diaprepes abbreviatus*, mesothoracic spiracle length 0.36 mm., width 0.25 mm.; abdominal spiracle length 0.23 mm., width 0.16 mm.

[1]The spiracles of the larvae of the genus *Diaprepes*, examined by the writer, are bifore-annular as in *Exopthalmus*. In a paper entitled "Some sugar-cane root-boring weevils of the West Indies" (Journal of Agric. Research, vol. IV, no. 3, 1915), the author, W. Dwight Pierce, has given a habitus-figure of the larva of *Diaprepes spengleri*, on which the spiracles appear to be annular; but no detailed description or figures of the spiracles are presented.



COTTON—EXOPTHALMUS.

EXPLANATION OF PLATE.

(Drawings by the author.)

1. Ventral mouthparts, ventral view: ca, cardo; g, palpiger; li, ligula; m, mala; p, palpus; pm, prementum; sf, subfacial area; st, stipes maxillaris.
2. Head capsule, dorsal view.
3. Ventral mouthparts, buccal view: hyp, hypopharynx; ln, ligula, dorsal face; m, mala; pgt, paragnath.
4. Mandible, dorsal view.
5. Mesothoracic spiracle with enlarged view of air tubes.
6. Antenna.
7. Mesothoracic spiracle of *Diaprepes abbreviatus* Linnaeus.
8. Larva, habitus from the side: a, alar area; cx, parasternum; e, epipleurum; ea, pre-epipleural lobe; eb, post-epipleural lobe; est, eusternum; h, hypopleurum; post, poststernellum; psc, prescutum; pscl, postscutellum; sc, scutum; scl, scutellum; sc-scl, scuto-scutellum.
9. Epipharynx: er, epipharyngeal rod.

A NEW VARIETY OF TARSONEMUS (ACARINA) FROM THE PACIFIC COAST.

By H. E. EWING, *U. S. Bureau of Entomology.*

On the Pacific Coast, Tarsonemid mites have been found infesting narcissus plants and bulbs and causing some injury to the same. They penetrate between the fleshy scales of bulbs and by their activities cause a deadening of the tissues they attack. This Tarsonemid mite, which is apparently undescribed, is frequently accompanied by a predaceous, beneficial, Gamasid mite, that should not be confused with the former.

Tarsonemus approximatus Banks, var. **narcissi,** new variety.

Female.—Of the type of *approximatus* Banks. Last segment of last pair of legs extending beyond the margin of the abdomen by about its length. This segment is a little over half as long as the penultimate.

Length of female, 0.23 mm.; width, 0.11 mm.

Male.—Capitulum almost circular. Posterior cephalothoracic bristles rather short and spinelike, in length equal to one and a half times the width of coxa II. Posterior lateral setae of abdomen spinelike, not equal to femur IV in length. Last pair of legs longer and stouter than the third pair; coxa somewhat triangular, as broad as long and without seta; femur longer than all the other segments taken together, swollen laterally and slightly emarginate on the inner border at the insertion of inner distal seta, which is straight and equal to the width of the femur in length, lateral seta of femur curved and reaching to the tip of the segment. Distal segment of last pair of legs slightly longer than broad, inner spine at tip of segment and about one-third as long as tarsal claw, outer seta clavate, situated almost at tip of segment and half as long as tarsal claw, ventral seta straight, slightly longer than tarsal claw and slightly surpassing the same; tarsal claw stout, slightly shorter than the last segment of the leg.

Length of male, 0.16 mm.; width, 0.09 mm.

Type locality.—California.

Type slide.—Cat. No. 960, U. S. N. M.

Described from many males and females taken from stems, leaves and flower buds of *Narcissus*, San Leandro, California, February 3, 1926, by C. F. Doucette; from stems and leaves of *Narcissus*, Natividad, California, January 28, 1926, by C. F. Doucette; from stems and leaves of *Narcissus*, Natividad, California, February 6, 1826, by C. F. Doucette; from *Narcissus* bulbs (alba plana odorata) from Bellingham, Washington, September 18, 1928, by David Griffiths.

This variety differs from *approximatus* Banks in having much shorter tarsal claws on the last pair of legs of the male. Also the ventral seta of the last segment of leg IV of the male is not more than half as long as it is in *approximatus* Banks.

The writer also examined some specimens of *Tarsonemus* taken by Doucette from *Narcissus* plants at Philadelphia, Pennsylvania, April 13, 1925, which may have been this variety, but he was unable to locate any males, hence could not definitely identify them.

NOTES ON SYNONYMY OF DIPTERA, NO. 3.[1]

By J. M. Aldrich, *U. S. National Museum.*

1. *Muscopteryx chaetosula* Townsend. This species, type of the genus, was described in the Canadian Entomologist, vol. 24, 1892, p. 171, from a single specimen said to be a male, from Chihuahua, Mexico. Coquillett in his Revision, 1897, p. 125, misidentified the species, and on p. 132 described the true *chaetosula* as *Brachycoma pulverea*, as I find by comparing both types. *Brachycoma* is a Sarcophagid genus, the postscutellum being undeveloped. The type of *chaetosula* is a female, not a male, and the term silvery as applied to the pollen should have been cinereous. It has a well-developed postscutellum. Besides the female type of *pulverea*, the National Museum now has a male of the species, collected by Townsend on the Rio Aravaipa, Arizona. In this male the width of the front at the narrowest, somewhat anterior to ocelli, is 0.16 of the head, and there are no orbital bristles; the fourth vein is more angular at

[1]The present paper is a continuation of two published in these Proceedings last year (Proc. Ent. Soc. Wash., 30, 1928, pp. 41–45 and 142–145); these were not numbered, but since others may follow from time to time, it seems desirable to number the parts hereafter.

the bend and the apical cell is not quite closed. In both sexes the fourth abdominal segment has a definite row of small bristles at the first fourth of the length, a row of large bristles at the middle, and a row almost as large just before the tip, together with some smaller at tip.

Townsend, in Journal N. Y. Ent. Soc., vol. 23, 1915, p. 219, says the specimen identified by Coquillett in 1897 as *chaetosula* is a male of *Muscopteryx tibialis*, described by Coquillett in Proc. U. S. N. M., 25, 1902, p. 115, which species Townsend makes the type of a new genus *Metopomuscopteryx*. This is certainly a valid genus, *tibialis* being a much more bristly species than *chaetosula*. On the same page Townsend describes *Paramuscopteryx genalis*, and mentions that Coquillett had labeled the type as *Muscopteryx chaetosula*, although it is a distinct species from the one mentioned in his Revision. The genus *Paramuscopteryx* (p. 218) has *genalis* as type, and I think is valid, although the description as far as it is a comparison with *Muscopteryx* is misleading, since Townsend had also failed to recognize his own species, designating Coquillett's *Brachycoma pulverea* as type of *Psammoppia* new genus in Proc. Biol. Soc. Wash., 28, 1915, p. 20.

Paramuscopteryx differs from *Muscopteryx* chiefly in having several irregular rows of bristles on the parafacials, instead of a single uniform row; antennae larger, third joint more elongated; hairs of back of head all dark; a pair of acrostichals just before suture; discals on first abdominal segment and prediscals on second and third; third vein with a single bristle at base, rarely two.

2. *Paratheresia signifera* Townsend. The history of this species is of considerable interest. It was reared by Rosenfeld and Barber at Tucuman, Argentina, in 1911 to 1913, from the sugar-cane borer, *Diatraea saccharalis*, and was discussed and figured by them without a scientific name in their extensive paper on the borer, in Revista Industrial y Agricola de Tucuman, vol. 4, 1913–14, p. 324, pl. 12. I find specimens in the National Museum from them dated 1911 to 1913, evidently sent here for identification, but at a time when there was no specialist in the group at the Museum.

Dr. Townsend described the species in Journal N. Y. Ent. Soc., 23, 1915, p. 65, from a single female which he found on the trunk of a tree in Peru; the habits of the species were of course unknown. In 1920 I identified Townsend's species in material brought by Dr. Wm. M. Mann from Monte Cristo, Honduras, which had been reared from *Diatraea saccharalis* there; also in 1924 the species was sent with the same habit by Osborn and Van Zwaluwenburg, from Potrero, Vera Cruz, Mexico. Van Zwaluwenburg published a note in Journal Econ. Ent., 19, 1926, p. 664, on his attempt to introduce the parasite into Sinaloa from Vera Cruz. Holloway, Haley and Loftin, Tech. Bull. 41, U. S. Dept. Agric., 1928, p. 44, have noted the same case; and Townsend has discussed the same parasitic habit in Peru in Bol. 1, Est. Exper. Agron., Lima, Peru, 1928, p. 24, figs. 29, 30.

Apparently in 1926 the Director of the Experiment Station in Tucuman requested the late Dr. Brethes, of the National Museum in Buenos Aires, to ascertain the identity of the parasites reared by Rosenfeld and Barber. Brethes then described the species as *Sarcophaga diatraeae* in Rev. Indust. y Agric. de Tucuman, vol. 17, 1927, p. 207. My attention was drawn to this description by Harold E. Box, who went to Tucuman about that time as entomologist. Through the kindness of Mr. Box I received one of the types of the Brethes species, and found it identical with Townsend's.

Thus it appears that the species is a rather common parasite of the sugar-cane borer throughout the sugar-growing region of North and South America.

3. *Trixoscelis cinerea* Coquillett. Described as *Parodinia cinerea* by Coquillett in Journal N. Y. Ent. Soc., 10, 1902, p. 186; it is the genotype of *Parodinia*. Coquillett described *Leria nuda* in Proc. Ent. Soc. Wash., 12, 1910, p. 130, from two specimens, one from Claremont, Calif. (Baker), the other from Santa Fe, N. M. (Cockerell). The latter specimen is the same as his types of *cinerea*, while the former is a different species which was described as *Trixoscelis prima* by Hendel in Wien. Ent. Zeit., 30, 1911, p. 43. It is necessary to designate one of the cotypes of *cinerea* as the type. I choose for this purpose the one from Claremont, Calif., although this has the regrettable effect of making *prima* a synonym. The types of *prima* were said to be from Claremont, N. H., but this was a geographical error in the State, as they came from Claremont, Calif., and bore identical labels with the type of *nuda*. Since I sent the material to Dr. Hendel, I am certain of this, although I do not have any of his types. Melander, in Psyche, 20, 1913, p. 169, says, "Hendel's *Trixoscelis prima* is the same as *Parodinia cinerea* Coquillett." I find however that besides the black third joint in *cinerea*, the species also has four or five irregular rows of acrostichals, while *prima* (or *nuda*) has wholly yellow third joint and two definite rows of acrostichals.

Coquillett's mistake in referring two species (as one) of this genus to *Leria* is similar to my own in putting my *Siligo* in Heleomyzidae. In admitting my mistake, in Canad. Ent., 42, 1910, p. 100, I excused myself a little by noting that Loew once described a *Geomyza* as a *Leria*. Frey, in Acta Soc. Fauna et Flora Fenn., 48, 1921, p. 220, proposed a family Trixoscelidae, next to Heleomyzidae, on the basis of his study of the mouth parts. This family is accepted by Hendel in his recent general paper on the families of Diptera (Tierwelt Deutschlands, Teil 11, Diptera II, 1928, p. 99).

4. Genus *Hippelates* Loew. Malloch published a revision of the genus and a few related forms in Proc. U. S. Nat. Mus., 46, 1913, pp. 239–266, with two plates. Shortly after the appearance of the paper I had occasion to examine his material and to visit the Museum of Comparative Zoology and examine the types of Loew's species. The results of this work have been awaiting publication until I could complete a manuscript on the family Chloropidae, or at least a part of it. Recently some of my findings were communicated to Professor Herms in connection with identification work, and have been published by him in Journal Econ. Ent. 21, 1928, p. 691. It seems desirable to publish the remainder of my notes, and for completeness I add what Professor Herms has already printed.

Hippelates nudifrons Malloch is *Hippelates flaviceps* Loew (published as *Oscinis*).

Hippelates nitidifrons Malloch is typical *flavipes* Loew.

Pusio Loew is *flavipes* of Malloch.

Pusio Malloch is a different form.

Malloch's key requires the following corrections as to the numbers in order to be workable:

Page 240, couplet 11, the second alternative should run to 20 instead of 21; couplet 12, the second alternative should run to 17 instead of 18. Page 241, left side, strike out the numbers 18, 21, and 23, as there are no such couplets.

5. *Admontia nasoni* Coquillett. Curran has described *Admontia ruficeps* in Canad. Ent., 59, 1927, p. 296, based on a male from Green Bay, Wis. This I believe the heretofore undescribed male of *nasoni*. I collected three of the very characteristic females of the species at Lafayette, Indiana, together with one male agreeing with Curran's description. It would appear that the male does not have the wing coloration which usually makes the female readily identifiable. Besides the type, from Algonquin, Ill., and the specimens already mentioned, the National Museum has three females from Germantown, Pa. (Harbeck), National Park, N. J. (Harbeck), and Colorado (Baker No. 2080). Townsend proposed the new genus *Euhyperecteina* for *nasoni* in Proc. Biol. Soc. Wash., 28, 1915, p. 19, but merely by designation of type, without description. I am unable to find sufficient differences between *nasoni* and the genotype of *Admontia* (*amicta* Meigen of Europe) to justify a separate genus for the former.

6. *Sturmia bakeri* Coquillett. This was described by Coquillett in his Revision of N. A. Tachinidae, 1897, p. 112. The description was based on a single male from Colorado (Baker No. 1580). Curran described what I believe to be the same species as *Laximasicera sexualis* in Canad. Ent., 59, 1927, p. 14; he had a male from Waterton, Alberta. The genus was characterized as like *Erycia* but without ocellars. Among other characters, the species is said to have the outer verticals developed in the male, and this sex also has a patch of fine hairs on each side of the under part of the third abdominal segment. With all details of Curran's description, *bakeri* is in agreement. I do not attempt to decide the validity of the genus *Laximasicera* at this time; there are so many other existing genera rather closely allied that I am at a loss to decide with which, if any, it might be synonymous. The National Museum has, besides the type of *bakeri*, the following specimens (Aldrich coll.): one male from Moscow, Idaho; two males and a female from the Turtle Mountains in North Dakota; and a male from Craig's Mt., Idaho.

7. *Sturmia schizurae* Coquillett. Townsend referred this species to *Argyrophylax* in Taxonomy of the Muscoid Flies, 1908, p. 98; and as there was already a species *schizurae* in the genus he renamed this one *piperi*. But the species has well-developed ocellars, and consequently would not go to *Argyrophylax* in his key on the same page; hence the new specific name was unnecessary. Having bristly facial ridges, bare eyes, strongly ciliate hind tibiae, etc., the species belongs in *Achaetoneura*, and is in fact a close relative of *frenchii* Williston.

8. *Neotrafoia incarum* Townsend. In these Proceedings, 30, 1928, p. 144, I discussed this species and Townsend's dissent from my conclusions on the basis of additional material which he had secured in Peru. In November last he visited Washington and gave to the National Museum two males of the species which in his discussion he had taken to be *Neotrafoia incarum*. On comparison with the types they turned out to be a new species, as he readily admitted. Hence my conclusions on the synonymy of *Charapemyia calida* are not affected by his published statements.

A NEW SPECIES OF ACROBASIS (LEPIDOPTERA: PYRALIDAE; PHYCITINAE).

By Harrison G. Dyar and Carl Heinrich.

(Plate 1.)

This species is of economic importance in Alabama and Georgia, being injurious to the Pecan, so that a name for it is desirable.

Acrobasis cunulae, new species.

(Latin: Cunulae, a little cradle, referring to the larval case.)

In general of a dark slaty gray, uniform, without red tint. Wings of the male without any black sex-marks beneath. Fore wing dark gray; inner line curved, moderately broad, pale gray, preceded on its lower two-thirds by a ridge of raised blackish scales; middle field uniform; discal dots two, blackish, generally separated, followed by a pale gray oblique streak to costa; outer line blackish, denticulate, inbent at submedian fold, followed rather broadly by pale gray; terminal line faintly darker. Hind wing gray, the membrane subpellucid, sordid, the veins and terminal line blackish, darker in the female than in the male. Expanse, 20–24 mm., the females but little larger than the males.

Genitalia figured from type (male) and paratype (female) from the type locality. The male genitalia are distinguished from those of other *Acrobāsis* species by the relatively broader lateral projections (1) of tongue of gnathos.

Cairo, Georgia, May 16, 1927 (G. F. Moznette); Mobile, Alabama, May 16, 1927 (G. A. Pfaffman); Auburn, Alabama, May 25, 1926 (J. M. Robinson); Dewitt, Georgia, May 31, 1928 (G. F. Moznette).

Type (male), *allotype* (female).—Cat. No. 41,598, U. S. N. M. (Mobile, Alabama); paratypes, 16, from this and the other localities mentioned. All specimens reared.

A distinct species easily recognized by its nearly uniform slate gray color and characteristic larval case. The latter is black, stout, ovoid with the open end decidedly tapering, from 18 to 20 mm. long and 4.5 to 5 mm. in diameter at its widest part.

Explanation of Plate.

Acrobasis cunulae, new species.

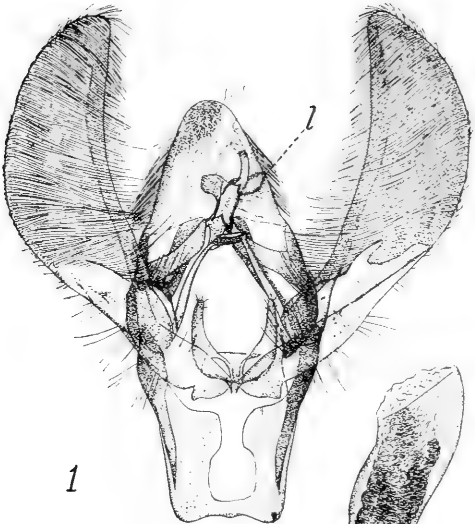
Fig. 1. Male genitalia; ventral view of organs spread, with aedoeagus omitted; 1 = lateral projection from tongue of gnathos.

Fig. 2. Aedoeagus and penis of male.

Fig. 3. Eighth abdominal segment of male showing modified scale tufts.

Fig. 4. Genitalia of female; Go = genital opening.

Drawings made under the author's supervision by Mary Foley Benson of the Bureau of Entomology.



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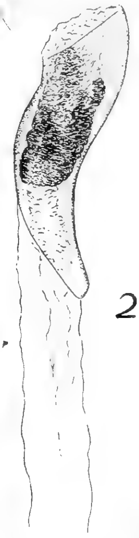

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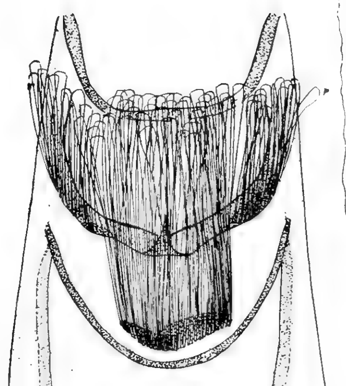

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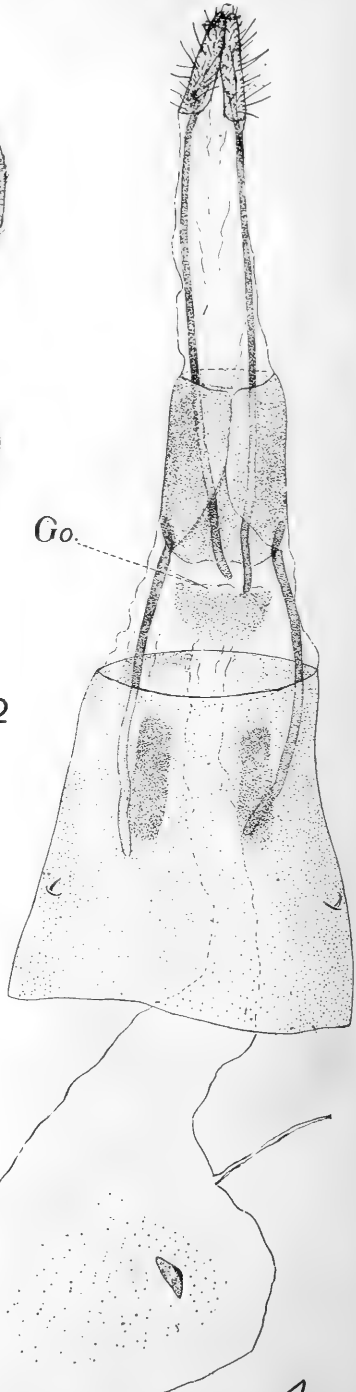

4

THE COWPEA BRUCHID (COLEOPTERA) UNDER ANOTHER NAME—A PLEA FOR ONE KIND OF ENTOMOLOGICAL SPECIALIST.

By John Colburn Bridwell.

In checking over the recent bibliography of the Bruchidae, this note was encountered in the Review of Applied Entomology, Series A, Vol. 7, p. 236, 1919: "A Bruchid, *Bruchus* (*Acanthoscelides*) *trabuti* is described occurring in the seeds of *Vigna sinensis* (cowpea) fiom Timbuctoo." Being interested in new Bruchidae from the cowpea and somewhat suspicious of them, though the U. S. National Museum Collection contains two which are at least unrecorded, the paper referred to by M. H. Caillol (Bull. Soc. Ent. France 1919) was examined and in it was found a careful and accurate description of the cowpea bruchid or so-called "four-spotted bean weevil." I speak of it thus so it may be recognized, for its nomenclatorial history suggests the Woman at the Well and the husbands she had had and him she then had who was not her husband. Names it has had but the one it now has is not legitimately its own.

It came to me with a shock that in 1919, one of the earliest described and best known of economic Bruchidae could be described as new in a genus not its own, by a competent entomologist, in a periodical published by the oldest entomological society in the world. It seemed incredible that it could be reviewed in such a journal as this, conducted by one of the ablest coleopterists working to-day and the fact escape notice not only then but during the ten years which have since elapsed,—yet this is what has happened.

How can this be? This can be answered but not in a word. The last general revision of the Bruchidae of the world was published by Schoenherr in 1833 and expanded by the addition of many species in 1839. Since then have appeared regional reviews of European species, by Allard using the names *Bruchus* and Bruchidae, by Baudi with *Mylabris* and Mylabridae, by Schilsky reverting to *Bruchus* and Bruchidae, local European treatment by Bedel and Reitter have *Laria* and Lariidae. Dr. Sharp and Horn and Fall in treating American species, all have used *Bruchus* and Bruchidae while Leng's Catalogue turns to *Mylabris* and Mylabridae; while the Pic catalogue of the species of the world holds to *Bruchus* and Bruchidae. But these nomenclatorial vicissitudes have been shared by all the Bruchids and the mere shifting of names should not have obscured such a species.

The cowpea bruchid has had an undue amount of confusion about it and its nomenclatorial tangle has so far baffled every student who has treated it so that when one begins to feel sure of his own decision regarding its proper technical name, modesty is likely to suggest caution in making positive assertions. For more than ten years the writer has been working on this group and for more than five of these he has been of the opinion that the technical name for this species should be *Callosobruchus maculatus* (Fabricius).

Fabricius 1775, Ent. Syst. 65, described *Bruchus maculatus* and in 1792, Syst. Ent. (1) 2: 371, *Bruchus 4-maculatus*. Fahraeus 1839 in Schoenherr Gen. Curc. 5:11, after examining the Fabrician types, considered them the same species but unfortunately continued to use the later, more cumbersome and less accurate name, in which he has been followed by other authors down to the present day. I know of no reason to doubt the soundness of his judgment of their specific identity, since no one since has had sounder knowledge of the Bruchidae than Schoenherr's three associates, Boheman, Gyllenhal, and Fahraeus who did the descriptive work on the Bruchidae in the Genera Curculionidum. We should then, it seems, use the first valid specific name applied to the cowpea bruchid, and that is *maculatus* of *Fabricius* 1775.

For the generic name, shall we use *Bruchus*, *Mylabris*, *Laria*, *Acanthoecelides* or *Pachymerus?* In my judgment none of these, which have been used, but *Callosobruchus*, which has not been used. Pic in 1902, describing some Bruchidae allied to *Bruchus chineneis* (Linnaeus) proposed for them and for *Chinensis* the subgenus *Callosobruchus*, but did not then nor since elaborate a description which would make *maculatus* congeneric with *chinensis* as I believe it to be. *Callosobruchus* as I understand it is a valid genus of the *Bruchinae* with the pronotum conical, its sides straight or a little concave, the pronotal margin obscured or absent, the pygidium oblique in the ♀, subvertical in the ♂, the hind femur flattened beneath and longitudinally bicarinate, each carina bearing a tooth near apex, the outer triangular, the inner more acute. The species are strongly sexually dimorphic and in some of them, such as *chinensis*, the ♂ antennae are strongly serrate, often being termed pectinate, while in *maculatus* the joints of the ♂ antennae are slender and subserrate. In form the species may be short and compact, even more so than *chinensis*, or more elongate, as in *maculatus*. Pic emphasizes the callous on the median lobe of the pronotum of *chinensis* which is present in a more or less developed condition in the species but is not diagnostic of the genus. Pic indicates in 1912, that he considers *chinensis* (Linnaeus) as the type but does not quite designate it as such. It is included in the original reference under the synonym *scutellaris* (Fabricius). Accordingly, in order to put the matter in definite form, *Bruchus scutellaris* (Fabricius) = *Curculio chinensis* Linnaeus 1758, is hereby designated as the genotype of *Callosobruchus* Pic. 1902.

Pachymerus has been used for our species by various authors but here there is no possibility of doubt. We have unfortunately two genera called *Pachymerus* among the Bruchidae, to say nothing of the genera of the same name in Ichneumonidae, Scarabaeidae, and Lygaeidae. The first of these genera to be established (Thunberg 1805) has for its type *Bruchus bactris* (Linnaeus) bred by Jacquin from the seeds of a palm of the genus *Bactris* and about as different from *maculatus* as any member of the family. But were this not the case and we were free to use the Schoenherrian *Pachymerus* our species is certainly not congeneric with *Bruchus brasiliensis* Thunberg, fixed by Schoenherr as the genotype. It can only have been placed there in the belief that *Pachymerus* should serve as a convenient resting place for Bruchidae with spinose femora regardless of cephalic, thoracic, antennal and other characters or of any similarity or difference of femoral structure even. While *brasiliensis* and *maculatus* may perhaps fall into the same subfamily, *Pseudopachymerus* Pic, which takes the place of *Pachymerus* Schoenherr, and *Callosobruchus* are quite as unlike as any two genera of the *Bruchinae*. The former is naturally confined to the New World and the latter was peculiar to the Old, until the accidents of commerce permitted three of its species to follow their host plants to the New World. *Laria*, *Mylabris*, and *Bruchus* are here excluded from consideration since they are synonyms for a genus differing in thoracic, secondary sexual and other characters and if my judgment is sound, worthy of being held distinct.

But my apology for M. Caillol and the others who contributed in continuing the error into which he has fallen is not complete. Doubtless he felt it hopeless to determine whether his species might have been described under *maculatus* or *quadrimaculatus*, or under *ornatus*, or *sinuatus*, or *ambiguus*, or *barbicornis*, or *bistriotus* which have been supposed to fall into this synonymy, or under other names not yet suspected. He doubtless felt that with the present imperfect descriptions he could not determine his insect and to give Dr. Trabut a name for his economic insect he proceeded to describe it as new. Still why should he place it in *Acanthoscelides?*

Here the answer, again, can not be in a word. Herr Schilsky in elaborating the European Bruchidae, like most other workers in the group, felt the need for more genera and transferred a majority of the species into *Bruchidius*, and after separating these from *Bruchus* and removing as many as he could to previously described genera, established a convenience genus *Acanthoscelides* for certain other species of exotic origin established in Europe, naturally without recognizing any very good limits for it. Had he had a large familiarity with the Bruchid fauna of the world such as he had of Europe, doubtless he would have realized that *Bruchus obtectus* Say 1831 (inadvertently treated under the later name *irresectus* Fahraeus 1839) would fall into a large American genus for which it would serve admirably as genotype. Since he did not and his genus still remains without a designated genotype, we may here attend to that most necessary formality. *Bruchus irresectus* Fahraeus 1839, is hereby designated as genotype of *Acanthoscelides* Schilsky. Basing the genus upon this type we find it the largest genus of American Bruchidae. The species have the pronotum conical with the surface even, the sides as seen from above straight or convex, the lateral margins rudimentary, not attaining the anterior margin; the front carinate; the hind femur feebly channeled beneath, longitudinally bicarinate and the inner carina with a strong tooth and beyond the tooth one, most often two, but exceptionally even three or four denticles; the abdomen with the intermediate sternites abbreviated and the pygidium oblique, often subvertical. Had the genus been described thus, M. Caillol would not have referred his species to *Acanthoscelides*. Since neither genus had been adequately described, M. Caillol's reference might well have been made by any coleopterist except those who would revert to the classification and place all Bruchidae in one or other of two genera.

Since 1920 it has been my fortune to examine the literature of the Bruchid genera and I feel quite safe in saying that of the 25, more or less, groups in the family of generic or near-generic rank proposed in the family, not one has been described so as to permit the common or ordinary coleopterist to include in it the species belonging to it and to exclude from it the species which do not, excepting only *Bruchus* as restricted by Schilsky.

Had the condition of the literature permitted M. Caillol to refer the material submitted to him by Dr. Trabut to its species he might have at once directed him to the rich biological and economic literature which records our knowledge of the Cowpea Bruchid (*Callosobruchus maculatus* (Fabricius 1775)).

It would be easy to duplicate this picture of confusion of nomenclature and the resulting disorder and delay in economic work in other groups. My purpose in this is to illustrate the necessity for a certain type of entomological specialist nowhere now supported officially and given freedom to work as any miner or creative artist or naturalist must work—*as the ore leads*.

The Bruchidae may serve as well as any other group to illustrate this need. Personal familiarity with this family calls up a multitude of instances which might be brought out to support my conviction that such specialists must be developed, supported, and used for the good of economic work.

Twelve species of Bruchidae have become established in the Hawaiian Islands, four of them having apparently arrived since my work upon them began there in 1918. Of these, four are of Old World origin and eight came from the warmer parts of America. All but one have considerable economic importance and have some economic literature concerning them. Two species are still undescribed but one of these has been discussed under a name based on a misidentification and all the economic literature of significance under this name (*Bruchus prosopis*) refers to this undescribed species. Of these Hawaiian immigrant Bruchidae, two have been referred to the genus in which I should place them. I should refer these twelve species to seven genera, for four of these genera available names are found in literature, while three of them require new names. Six of these species seem to be usually referred to by species names which are not those by which they should be known while five seem to be called by names properly their own. Not one seems legitimately referred to the genus under which it has been usually placed and every one excepting one of the two undescribed species is involved in nomenclatorial confusion such that the literature can not be read until unpublished corrections are recorded without erroneous ideas being communicated.

No one but a specialist in the study of the Bruchidae of the world can possibly handle intelligently the questions involved in the names, the habits, and their economics, and no specialist in Bruchidae is employed in the whole world, unless one man is so classed and his official duties are confined to the economics of two species.

Instances might be multiplied to weariness of Bruchidae attacking economic plants in all corners of the earth, awaiting the accidents of commerce to spread elsewhere, undescribed, or their habits unknown, or in nomenclatorial confusion, so that one species seems to be two or two to be one, of which we should know and let others know.

Such tasks as are thus suggested may be done only by one type of entomological specialist and it is hoped what is here written may further the development and support of such specialists. The tasks to be done by a specialist in Bruchidae are such as other specialists of the same type must do and an outline of some of them seems pertinent here.

Some eight hundred names have been given to Bruchidae and the habits of perhaps a hundred are known at least partially but no great advance in biology or economics are to be looked for until certain foundation work in taxonomy is done. Among the tasks which need doing are these:

Stabilization of the nomenclature, determining which generic name should be used for the type genus of the family.

Preparation of a catalogue of the binomial names established in the family, so coleopterists may determine if a name used or desired to be used is available or not. At present, no one can determine from any existing catalogue or by any reasonable amount of research whether a proposed binomial may or may not be used. Eleven of our 91 valid described species have recently been changed because of imperfect catalogue work in the past or now require changing.

Description of fifty genera, more or less, necessary in the Bruchidae to reduce the work of specific description and to clarify our ideas of distribution.

Establishment of a general knowledge among coleopterists of the characters by which Bruchid genera and species may be distinguished. To be secured by publishing properly described and figured Bruchid species and genera.

Criticism of published Bruchid host-plant records, classifying them as erroneous, doubtful and certain.

Distribution into as many centers of entomological work as possible, extensive collections of authentically named Bruchidae from all parts of the world so that local workers may have a basis for their work safer than that formed by descriptions.

These tasks completed as they may be in a very few years by a properly supported and assisted specialist, future work in the family would be carried on by local workers and we might hope soon to know the Bruchid enemies we shall need to fight and how to fight them and if, as may be the case, there are Bruchid friends which will help us in fighting plant enemies.

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

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PROCEEDINGS OF THE

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NEW SPECIES OF HETEROCERA (LEPIDOPTERA) FROM SOUTHERN BRAZIL.

By W. Schaus, *Bureau of Entomology, U. S. Department of Agriculture.*

Mr. E. Dukinfield Jones of England and Glendale, California, has generously presented to the United States National Museum a collection of Heterocera made on his last trip to Brazil. Besides the new species now described, there were a number of others including the previously unknown female of *Itambe fenestalis* Rag.

AMATIDAE

Cosmosoma nothina, new species.

Female.—Body above benzo brown; a pale orange yellow spot on collar externally, a white spot on shoulder; basal segment of abdomen with two white dorsal spots, subdorsal crimson spots, and a lateral white streak; subdorsal white spots on fourth and fifth segments, also lateral white lines. Body below fuscous; fore coxae cream white, and hind coxae with similar small spots; a lateral crimson spot below wings. Fore wing benzo brown; a medial trigonate hyaline spot in cell, and a larger spot below cell to submedian cut by the line on fold; a hyaline spot beyond cell cut by vein 6, extending somewhat between veins 6 and 5, below 5 reaching termen, but shorter below 4, not reaching vein 2 nor cell; a white streak at base of costa. Hind wing: a narrow postmedial hyaline fascia not reaching above vein 6, and below lower angle slightly inbent; inner margin crimson. Wings below similar.

Expanse 32 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33529, U. S. N. M.

LITHOSIINAE

Illice pacata, new species.

Male.—Head and thorax black slightly mottled with dark gray; a red point behind vertex; palpi grayish; throat flesh color. Abdomen eosine pink. Legs flesh color shaded with pale drab gray. Fore wing black irrorated with white especially on basal and terminal areas; a small eosine pink spot at end of cell; a short begonia rose streak at base of inner margin. Hind wing white suffused with La France pink on inner margin and shortly below median vein. Fore wing below drab gray. Hind wing below white faintly tinged with pink on inner margin; an oblong grayish patch on costa from beyond middle to apex.

Expanse 20 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33530, U. S. N. M.
Described from 3 males.

Adoxosia nydiana, new species.

Male.—Body black. Fore wing greenish black, faintly glossy. Hind wing rather duller. Wings below olivaceous black.

Expanse 22 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33531. U. S. N M.

CLEMENDANA, new genus.

Male.—Antenna faintly pubescent. Palpi upturned, reaching well above head. Hind tibia with medial and terminal spurs. Fore wing: venation as in Clemensia. Hind wing with venation as in Clemensia but veins 6 and 7 barely stalked at base. Wings without any secondary characters.

Type.—Clemendania pacifera.

Clemendana pacifera, new species.

Male.—Head, thorax, and fore wing dark drab; neck salmon pink. Abdomen above and hind wing geranium pink. Thorax below smoke gray, the legs deep mouse gray partly streaked with smoke gray. Abdomen below light ochraceous salmon. Fore wing: white irrorations medially from within cell to inner margin; and some scattered white scales on terminal third; a small white spot at end of cell, and a postmedial white point above vein 1. Hind wing: termen narrowly black from apex diminishing towards anal angle. Wings below paler, the white spot at end of cell on fore wing present.

Expanse 26 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33532, U. S. N. M.
Described from 3 males.

ARCTIINAE

Neidalia dulcicula, new species.

Female.—Head, thorax and abdomen orange buff; abdomen with lateral black spots; anal hairs whitish. Fore wing pale ochraceous salmon; costal margin, termen narrowly, and cilia orange buff; a fine black line from before middle of subcostal inbent to inner margin; a broken line on discocellular and all the veins beyond middle of wing, except subcostal and those on costa, with fine black lines. Hind wing nearest grenadine pink, the cilia maize yellow. Wings below light orange yellow, the discs suffused with safrano pink; fore wing with black lines on veins 5, 6, and 7.

Expanse 35 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33533, U. S. N. M.

NOCTUIDAE

Tripseuxoa deeringi, new species.

Male.—Body tilleul buff, the palpi below, the head and collar mottled with darker hairs; abdomen more whitish at base, otherwise dorsally irrorated with hair brown. Fore wing tilleul buff thinly irrorated with black scales; some small clusters of black scales at base, subbasally in cell, and antemedially on median and submedian veins; a black point as orbicular; two small black spots as reniform; a curved subterminal series of black points and a terminal series. Hind wing suffused with grayish olive, the costa and cilia white.

Female.—One specimen similar to the male, another more thickly irrorated with black, the spots faintly marked, a third specimen, larger, has the vein outlined with fuscous and probably belongs to *Tripseuxoa strigata* Hps.

Expanse: male 36 mm.; female 37 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33534, U. S. N. M.

Named in honor of Mr. Charles Deering, who has been generously interested in the museum collection.

Described from 7 specimens.

Porosagrotis carolia, new species.

Female.—Head and collar dusky drab, the front of collar paler shaded. Thorax dark vinaceous drab; a broad white streak on tegulae. Abdomen brownish drab with traces of dark segmental lines. Fore wing light vinaceous brown; costal margin to beyond middle pale grayish vinaceous with a black streak towards base; subcostal and median veins white from base to end of cell; an elongated black mark in cell forming an antemedial triangular streak, constricted just beyond middle of cell and forming beyond a quadrate spot edged above and on discocellular with buffish white; an antemedial white angled line below cell, defined by black and followed by the elongated black claviform; a warm blackish brown shade beyond cell limited by a dark wavy postmedial line, inbent from vein 3 to vein 1; veins on terminal space dark; traces of a brownish subterminal line; a dark terminal line. Hind wing drab, the veins darker; cilia white.

Expanse 38 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No: 33535, U. S. N. M.

Chabuata araneosa, new species.

Male.—Head, collar, thorax, and basal tuft on abdomen dark mouse gray. Abdomen buffy brown. Tarsi with white rings. Fore wing light grayish drab, the clearer spaces medially and terminally with scattered black scales, the markings black; a thick subbasal line not reaching inner margin; antemedial line double, vertical, somewhat lunular; reniform with some pale scaling in lower half; postmedial line dentate outcurved around cell, followed by black spots partly connected and almost forming a curved line; a black and fuscous patch on costa above reniform, and a smaller triangular subterminal spot on costa from which a fine broken line extends to inner margin; a wavy terminal line with black spots on interspaces; cilia with some pinkish buff spots. Hind wing cinnamon drab becoming broadly darker on outer margin with a faint discal spot and darker postmedial line; cilia mostly white. Wings below whitish irrorated with drab; forewing with disc largely suffused with hair brown, a dark line on discocellular and a thick, almost vertical postmedial line. Hind wing with a well marked discal spot and postmedial line.

Expanse: male 43 mm.; female 47 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33538, U. S. N. M.
Belongs to Sect. III A of Hampson.

Mictochroa caulea, new species.

Female.—Head whitish, probably green when fresh. Collar pale green edged in front with black. Thorax pale green; the tips of tegulae black, also black mottling on metathorax. Abdomen drab gray irrorated with black, the two basal segments whitish with dorsal black spots and scattered black scales. Fore wing lettuce green; some black scaling on base of costa and below cell; subbasal black scaling in cell and on inner margin; antemedial line whitish on costa with black marking on inner edge, below subcostal of ground color defined by double black lines, sinuous, and incurved on inner margin; space below cell to vein 1 and postmedial largely suffused with fuscous, crossed by a white line from median below the orbicular which is greenish white edged on either side by a black line; middle of cell fuscous not reaching subcostal, end of cell lettuce green and white; double medial, postmedial, and subterminal black spots on costa; from upper angle of cell a black incurved line along discocellular, then inbent to inner margin forming with the postmedial a fuscous fascia mottled with dark green, the postmedial being outcurved beyond cell, then wavily inbent to inner margin, a short black line from costa beyond and fine small black spots beyond the fascia; a triangular subterminal black patch between veins 4 and 7, and smaller spots above vein 3 and at fold; marginal black spots; two black lines on cilia at base, the cilia otherwise fuscous with whitish patches. Hind wing finely striated with light drab; the costa broadly white to near termen. Fore wing below aeneous dusky drab. Hind wing below white irrorated with deep purplish vinaceous, especially on terminal space towards apex; a dark discal point and medial line; a terminal fuscous line.

Expanse 24 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33556, U. S. N. M.

BOALDA, new genus.

Male.—Proboscis small; palpi upturned reaching vertex, the second joint long, well fringed in front, the third joint short, porrect; frons smooth; eyes large, round; antennae with short stiff pectinations. Thorax smooth, clothed with coarse hairs and scales; abdomen with dorsal tuft on basal segment; legs not hairy; hind tibia with two pairs of spurs. Fore wing: costa straight; termen nearly straight to vein 3, then slightly inbent; vein 2 well beyond middle of cell; 3 and 4 apart from lower angle; 5 above lower angle; 6 from upper angle; 7, 8 and 9, 10 from areole; 11 from cell. Hind wing: 3 and 4 from lower angle; 5 obsolescent from middle of discocellular; 6 and 7 stalked; 8 anastomosing with the cell near base only.

Type.—*Boalda gyona* Schs.

Boalda gyona, new species.

Male.—Head, collar, and thorax mottled white and light russet vinaceous; the collar edged behind with fuscous black. Abdomen white, the segments irrorated on anterior half with light russet vinaceous. Fore wing cinnamon brown, the markings mostly white; a subbasal broad line incurved from costa to base of vein 1, defined inwardly by a black line; medial space defined by an antemedial black line incurved from subcostal in cell and oblique to inner margin with a white streak above it on costa, and followed in cell by a U-shaped line partly irrorated with russet vinaceous, the outer branch of the U downturned on outer anterior edge of a narrow russet vinaceous reniform; oblique white streaks on costa above reniform; outwardly the medial space is defined by a white line, inwardly edged with black, wavy, slightly outbent from areole, rounded at vein 4, well incurved below vein 3, partly divided from vein 3 to inner margin by a fine ochraceous tawny line; between veins 5 and 6 the postmedial is connected with the subterminal by a white patch; subterminal line straight from costa to vein 6, incurved from 6 to 4, inangled between 4 and 3, incurved from 3 to tornus, all the veins beyond line white extending to tip of cilia. Hind wing white; a fine russet vinaceous terminal line.

Expanse 25 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33557, U. S. N. M.

Sotigena solivaga, new species.

Male.—Body fuscous; anal hairs white. Fore wing: basal half and costal margin pale brownish drab sparsely irrorated with brown, the outer portion from termen at apex to middle of inner margin benzo brown; a fuscous streak along median; a fine antemedial russet vinaceous line very oblique from costa to near vein 1 near middle, then incurved and mottled with white scales; postmedial line outbent to beyond cell, then incurved to inner margin near antemedial line; a black antemedial point in cell, and one at discocellular; a wavy subterminal series of black and white points on veins; terminal short white streaks on veins; cilia yellowish. Hind wing and underside hair brown.

Female.—Fore wing: basal and costal areas light vinaceous fawn and similar mottling above tornus; the transverse lines chestnut brown.

Expanse 34 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33539, U. S. N. M.

GEOMETRIDAE

Fulgurodes lilianae, new species.

Male.—Antenna black. Head mottled black and white. Thorax black, the tegulae with white patches; metathorax white. Abdomen grayish white with fine dark segmental lines. Fore wing white, the markings black; a fine subbasal line from costa outbent along vein 1, followed on costa by an elongated patch; a diffuse antemedial fuscous shade from subcostal to vein 1, indentate in cell and on fold, and outwardly parallel with medial line which consists of a thick line from a patch on costa, crenulate, slightly projecting at median and vein 2, then incurved and outangled at vein 1; reniform large, narrower in front, containing a large patch of similar shape; an elongated patch on costa above reniform; postmedial line thick, outcurved and dentate; subterminal line deeply dentate; termen black, its inner edge parallel with subterminal. Hind wing white, the veins and a streak in cell hair brown, a narrow spot at discocellular, its inner edge curved filled in with light drab; postmedial line drab, lunular dentate; subterminal line more deeply dentate; termen as on fore wing. Wings below largely suffused with drab, paler on interspaces before postmedial line; veins hair brown; postmedial line followed by white spots on interspaces; a lunular submarginal white line. Fore wing: a white spot at upper end of cell and white streaks above and below vein 7.

Expanse 60 mm.

Habitat.—Lages, Santa Catharina, Brazil.
Type.—Cat. No. 33551, U. S. N. M.

Named in honor of Mrs. S. (Lilian) Prentiss Baldwin.

Specimens occur in both sexes with the white portion suffused with drab, especially on fore wing. One male has the fore wing so completely suffused with fuscous that only the black postmedial line is defined and is followed on costa by a small white spot; the hind wing is irrorated with hair brown, very thickly on terminal space; the discal spot is larger in outline, the postmedial line well defined. For this well-marked form I suggest the name of *Fulgurodes baldwini* in honor of Mr. S. Prentiss Baldwin.

Type.—Cat. No. 33552, U. S. N. M.

Catophaenissa jonesaria, new species.

Female.—Palpi and head mottled white and fuscous with more white on vertex. Collar and thorax mostly isabella color, possibly greener when caught, the tegulae with some white scales. Abdomen fuscous black. Legs dark mouse gray with white rings. Fore wing from base to postmedial line chiefly light brownish olive; some grayish olive at base of inner margin; a white spot at base of vein 1 and median; antemedial line black inwardly edged with white outcurved in cell, from median to vein 1, and on inner margin; medial area with scattered black scales, and a black fascia, outbent from costa to lower angle of cell, then narrower, crenulate and incurved to inner margin; postmedial line fine, black, obliquely incurved to vein 4 broadly edged distad with white, below vein 4 crenulate on interspaces, slightly inbent below vein 3 followed by white with numerous black and light brownish olive striae, these striae also occurring from costa, but more remote from postmedial line; a broken subterminal white line preceded by a rather broad black space from costa to vein 4, also followed by brownish olive and black striae from costa to vein 4; some white scales at apex; some light brownish olive on termen from vein 4 to vein 2, the termen below vein 2 partly white, all with black striae; cilia with white spots on interspaces. Hind wing black; cilia white with black scaling at veins. Fore wing below deep mouse gray with some white scaling along subcostal, at apex and narrowly along termen; a broad black, oblique fascia from middle of costa to inner margin at postmedial, this line black defined by some white scaling and a broad white fascia from costa to vein 4. Hind wing below dark grayish olive irrorated with black scales, and slightly mottled with white on basal half to anal angle and partly on termen.

Expanse 48 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33542, U. S. N. M.

I take pleasure in naming this fine species in honor of Mr. E. D. Jones.

Nipteria petrova, new species.

Male.—Body and wings clear light drab, the space beyond postmedial line slightly paler. Fore wing: a fine darker transverse line from costa at 8 mm. from base, almost vertical; postmedial line straight, deep brownish drab at 5 mm. from apex of costa to 6 mm. from tip of inner margin; a slight dark line on discocellular. Hind wing: a postmedial faintly curved line at two-thirds from base. On both wings the postmedial is slightly paler edged outwardly. Wings below slightly darker from base to postmedial line.

Expanse 45–48 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33543, U. S. N. M.

Two males in collection.

Eudule allegra, new species.

Male.—Body above salmon orange. Palpi white in front; antenna black. Thorax below pinkish cinnamon; venter pinkish buff; anal segment and tufts black; a faint black dorsal line terminally. Fore wing salmon orange; costal edge and cilia on termen black; subcostal, median and submedian veins black except at base; veins 2, 3, 4 and 6 black more finely at termen. Hind wing orange chrome; termen at apex and cilia black. Fore wing below with apex black; no black on veins. Hind wing below as above.

Expanse 24 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33536, U. S. N. M.
Described from 2 males and 2 females.

Eudule sororcula, new species.

Male.—Body and wings English red; a black dorsal line from collar to black anal segment. Abdomen below pale olive gray. Fore wing: costal edge, termen narrowly and cilia black; veins more heavily black than in *E. allegra* Schs., but no black on vein 6; an oblique black line from upper angle of cell to vein 4 near termen. Hind wing with termen narrowly, at apex rather wider, and cilia black. Fore wing below with veins, apex broadly and termen from below vein 4 narrowly black.

Expanse 21 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33537, U. S. N. M.
A male and a female in collection.

Eudule nanora, new species.

Male.—Head, body, and wings capucine orange; antenna and tarsi black. Fore wing: costal edge from middle to apex finely black; cilia black from apex to vein 3, then only faintly tipped with black.

Expanse 26 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33548, U. S. N. M.

Eucymatoge perfica, new species.

Female.—Palpi grayish. Head white. Thorax black, the tegulae white edged with black dorsally. Abdomen white with dorsal black markings. Fore wing white, the markings black; an elongated spot from base of costa with a fine line to inner margin, followed by a smaller costal spot, then by a broad fascia slightly outcurved, its outer edge irregular, its central portion partly grayish or white; a fine wavy medial line followed by a postmedial fascia from costa to near vein 4, continued by two fine lines from either edge, more heavily defined from vein 2 to inner margin; a large subterminal patch from costa to vein 6 with a fine line from it to inner margin, followed by black spots from below vein 6 to vein 4 and from below vein 3 to inner margin; termen partly fuscous; cilia white with black spots. Hind wing light cinnamon drab, with traces of the lines of underside; a terminal black line; cilia white with black streaks at veins. Fore wing below largely suffused with light brownish drab with only traces of the white. Hind wing below whitish with hair brown subbasal, antemedial, double medial and postmedial lines; termen rather broadly dark.

Male.—Fore wing similar to the female. Hind wing almost white with traces of the lines.

Expanse: male 25 mm.; female 28 mm.

Habitat.—Santa Catharina, Brazil. Also a specimen received from Rio de Janeiro without precise locality.

Three males and three females in collection.

Type.—Cat. No. 33540, U. S. N. M.

A female is made type owing to its clearer markings.

Eucymatoge segnis, new species.

Female.—Head white. Thorax white irrorated with gray. Abdomen: base white, the second segment edged behind by a black line and then army brown; following segments grayish white with dorsal black spots. Fore wing: base broadly pale olive gray crossed by a fine inbent subbasal black line from a small spot on costa, followed by a drab gray fascia partly irrorated with white, inwardly edged by a distinct black line, slightly inbent, and outwardly by a fainter black vertical line; outer half of wing light drab partly irrorated with white, chiefly along costal third; a broken fuscous line from costa along discocellular; a postmedial fuscous black line outbent on costa and down turned from vein 6 to vein 4, inwardly shaded with fuscous, below vein 4 very faint, lunular, inbent, from costa to vein 4 outwardly edged with white and followed by a faint dark lunular line; traces of a subterminal whitish line; a fine dark terminal line; cilia mostly pale drab gray. Hind wing pale drab gray, the costa whitish; traces of lines on inner margin; a terminal dark line; cilia mouse gray. Wings below mostly drab gray; black streaks on discocellular; a distinct postmedial line; other lines on hind wing faint.

Expanse 26 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33541, U. S. N. M.

This species is allied to *E.* (*Perizoma*) *infimbriata* Dogn.

NARQUENA, new genus.

Male.—Antenna minutely serrate. Palpi short, upturned, barely reaching frons. Hind tibia with two pairs of spurs. Fore wing broad; costa convex; apex acute; termen slightly rounded; vein 2 well before angle of cell; 3 near angle; 4 from angle; 5 well above middle of discocellular; 6 from below angle; 7, 8, 9 stalked; 10 absent; 11 suffusing with 12. Hind wing: costa nearly straight, termen rounded, vein 2 well before angle; 3 close to angle; 4 from angle; 5 well above middle of discocellular; 6 and 7 stalked; 8 close to cell for half its length.

Type.—Narquena resalaria.

This genus belongs to the Hemitheinae.

Narquena resalaria, new species.

Male.—Head and thorax avellaneous, a white band across vertex. Abdomen light buff. Fore wing pale ochraceous buff; costal edge white; the two lines fine, hair brown consisting of lunules on interspaces; antemedial line slightly outcurved from subcostal to inner margin; outer line from costa near apex to middle of inner margin; a dark point at discocellular; cilia army brown.

Hind wing white. Wings below whitish; discal points on both wings. Fore wing: costal margin vinaceous fawn; outer line faint. Hind wing: traces of a broken subterminal line; dark terminal points on interspaces.

Expanse 20 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33550, U. S. N. M.

Anisodes vuha, new species.

Female.—Head and body above colonial buff, underneath and legs whitish. Wings above cream buff. Fore wing: a fuscous antemedial line, outbent on costa, outcurved in cell, also from cell to vein 1, faint on inner margin; space from antemedial to beyond cell and from subcostal to vein 1 suffused with mikado brown and fuscous, the latter forming a thick line from costa to inner margin; the veins to postmedial line partly crossed by mikado brown striae; postmedial line fine, lunular and outcurved from costa with some black points on veins. Hind wing: a fine wavily outcurved subbasal line followed from within cell to inner margin by a large patch as on fore wing, the darker medial line reaching costa; postmedial line as on fore wing; cilia on both wings faintly reddish. Wings below whitish, the dark patches visible in transparency; postmedial line distinct somewhat lunular dentate.

Expanse 25 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33549, U. S. N. M.

This species bears a strong resemblance to some of the species of Semaeopus.

NOTODONTIDAE.

Rifargia mildora, new species.

Female.—Head and thorax benzo brown. Abdomen above drab, underneath light cinnamon drab. Fore wing brownish buff; lines on costa black, the subbasal, antemedial, medial, and postmedial double; a double subbasal line not reaching inner margin; a broad antemedial fuscous suffusion outbent to below cell; a similar narrower medial suffusion outbent to below reniform which is outlined in black and filled in with cinnamon buff; postmedial line outangled at vein 7, then fine, black, crenulate and wavy, closely followed by a diffuse black line narrowest between veins 4 and 6; a pale buffish subterminal line, slightly sinuous with a few white scales on it at veins 2 and 1, and followed on interspaces by short black streaks, ending on termen in faint pale lunules and black points. Cilia fuscous with buffish spots. Hind wing: base buffish to buffy brown, the outer half benzo brown; cilia light buff; a small black and white spot above anal angle. Wings below dull brownish drab, the termen narrowly, and cilia warm buff; a wavy dark terminal line more noticeable on fore wing.

Expanse 48 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33553, U. S. N. M.
Comes nearest *R. bocra* Schs.

MEGALOPYGIDAE.

Microrape shilluca, new species.

Male.—Antenna with shaft white, the pectinations light buff. Body white; fore legs light drab. Wings white somewhat silvery and rather thinly scaled.
Expanse 22 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33555, U. S. N. M.
Male genitalia.—Strikingly different from those of any other species in the genus Sacculus of divided harpe ventrally placed, almost as broad as long; apex sharply hooked; similar in general shape to the sacculus of *Norape tosca* Hopp. (Comp. Hopp's fig. 176, in Mitteilungen Aus den Zoolog. Mus. Berlin, Band 13, Heft. 2, 1917, p. 327.) Costal element of harpe slender, smooth, very slightly longer than sacculus. Uncus covered with hair-like spines; dorsally flattened, about one-third as broad as long, from middle to apex triangular and sharply tapering; from base to middle with sides nearly parallel. Aedoeagus moderately long, evenly tapering and with apex sharply curved, smooth; cornuti absent. (C. Heinrich.)

Sulychra mataca, new species.

Male.—Antenna with shaft white, the pectinations light ochraceous buff Body white; palpi and throat black; fore and hind legs mostly mouse gray. Wings white, the costal edge of fore wing black.
Expanse 25 mm.

Habitat.—Rio de Janeiro, Brazil.
Type.—Cat. No. 33554, U. S. N. M.
Male genitalia.—Similar to those of *S. argentea* Butl. as figured by Hopp except: costal element of harpe bulged and broader toward base; from basal fourth to apex slender and of even width. Cornuti a cluster of very short, broad, flat, triangular spines, evenly distributed and filling the aedoeagus. (C. Heinrich.)

HEPIALIDAE.

Aepytus helga, new species.

Female.—Body and fore wings apricot buff, the latter with very faint darker annuli and lines on terminal third and along inner margin. Hind wing salmon buff, the termen apricot buff; a broad subterminal series of grayish olive lines along veins partly connected by similar shading. Wings below dusky vinaceous fawn, the termen cinnamon buff.
Expanse 57 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33544, U. S. N. M.

Aepytus munona, new species.

Male.—Head and thorax cinnamon buff, the abdomen faintly paler. Fore wing ochraceous buff becoming paler at termen; costal edge dark brownish drab; small brownish drab spots along costal margin, not entering cell, a few spots on inner margin and faint terminal points on interspaces; a slight darker shade from base below cell to middle of inner margin, the space below it pinkish buff. Hind wing pale orange yellow. Wings below duller, the costa of fore wing suffused with drab gray.

Expanse 35 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33545, U. S. N. M.

Aepytus verresi, new species.

Male.—Antenna with shaft white, the pectinations pale drab gray. Head, thorax and terminal half of abdomen dorsally hair brown; base of abdomen above light cinnamon drab. Fore wing largely drab gray; costal margin darker, the edge fuscous, with a medial, postmedial, and more remote white spot; an antemedial oblique semilunar silver spot in cell edged with mars brown; a triangular mars brown spot at end of cell crossed by an oblique silver line which follows its lower edge, is inbent and interrupted at median vein with a yellow ocher patch below it in extra cell; postmedial space broadly pale drab gray limited by a fine dark outer line parallel with termen; a broad white space from line to termen from vein 5 to above vein 6; terminal white lunules at tornus edged above with mars brown. Hind wing drab partly suffused with cinnamon drab.

Expanse 35 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33546, U. S. N. M.
Comes nearest *Aepytus oreas* Schs.

PYRALIDAE.

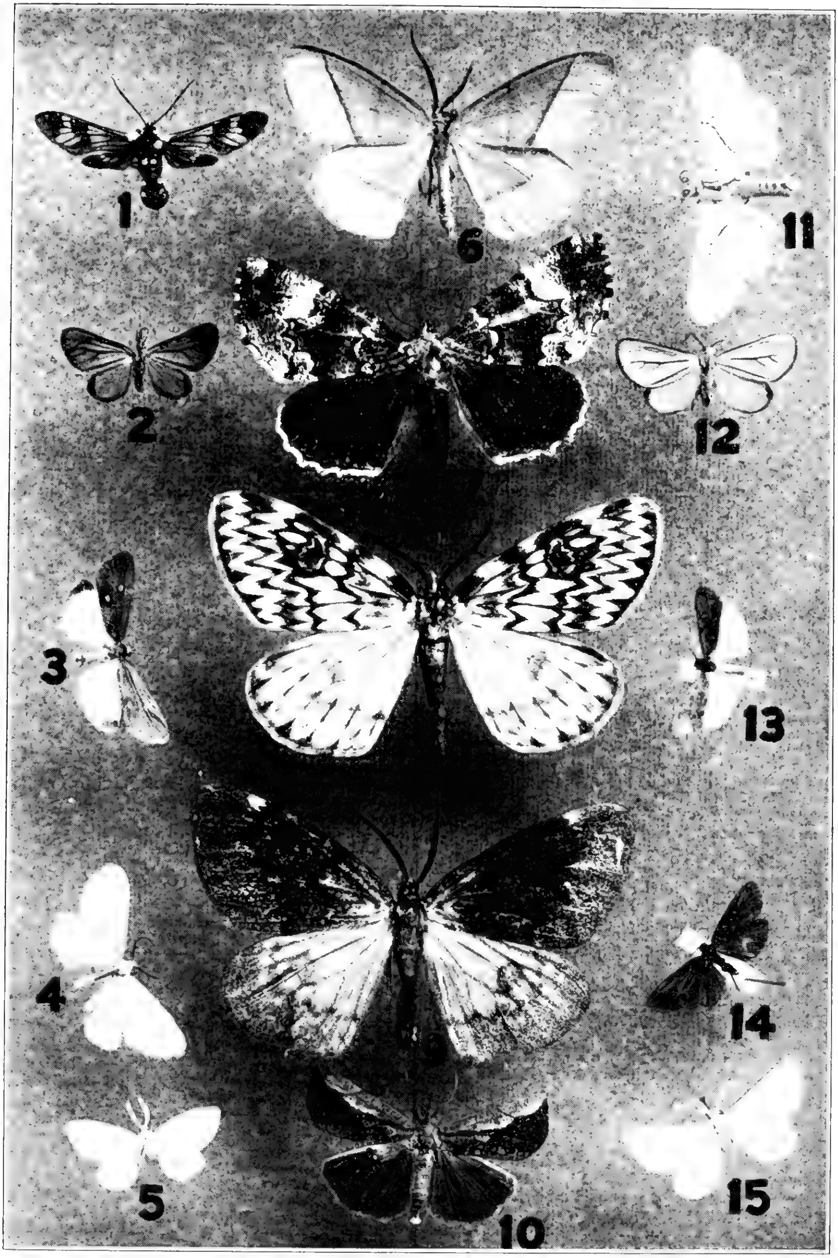
CRAMBINAE.

Erupa nampa, new species.

Female.—Head and thorax cinnamon drab, the abdomen silky brownish vinaceous. Fore wing purplish cinnamon drab faintly irrorated with darker scales; a small dark medial spot in cell at subcostal vein; a slight dark shade on discocellular and a fine fuscous line from it to middle of inner margin; a remote postmedial series of black points on veins followed by a series of small angled spots on interspaces; cilia tipped with fuscous. Hind wing silky light pinkish cinnamon.

Expanse 45 mm.

Habitat.—Santa Catharina, Brazil.
Type.—Cat. No. 33547, U. S. N. M.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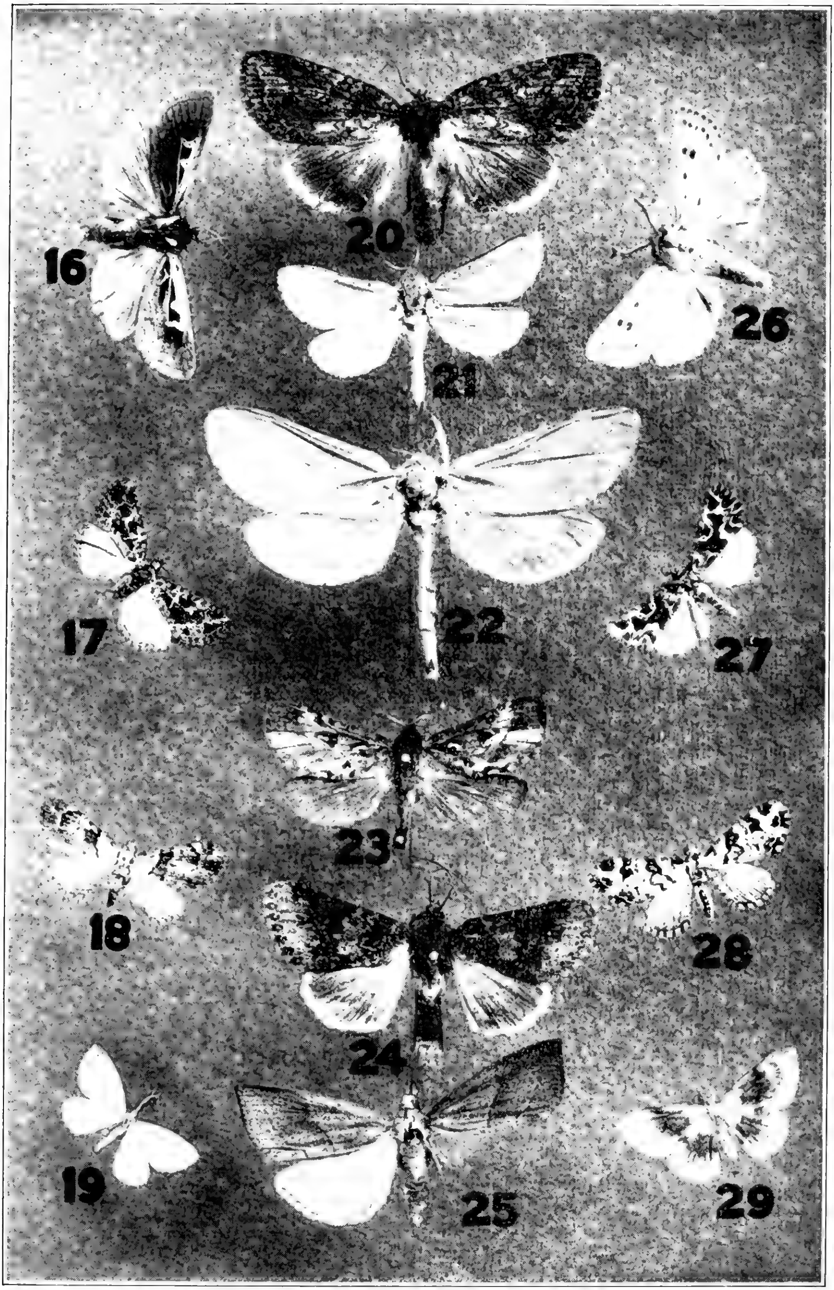
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PLATE I.

1. *Cosmosoma nothina.*
2. *Eudule sororcula.*
3. *Clemendana pacifera.*
4. *Eudule nemora.*
5. *Microrape shilluca.*
6. *Nipteria petrova.*
7. *Catophaenissa jonesaria.*
8. *Fulgurodes lilianae.*
9. *Fulgurodes baldwini.*
10. *Sotigena solivaga.*
11. *Neidalia dulcicula.*
12. *Eudule allegra.*
13. *Illice pacata.*
14. *Adoxosia nydiana:*
15. *Sulychra mataca.*

PLATE II.

16. *Porosagrotis carolia.*
17. *Mictochroa caulea.*
18. *Eucymatoge segnis.*
19. *Narquena resalaria.*
20. *Rifargia mildora.*
21. *Aepytus munona.*
22. *Aepytus helga.*
23. *Aepytus verresi.*
24. *Chabuata araneosa.*
25. *Erupa nampa.*
26. *Tripseuxoa deeringi.*
27. *Boalda gyona.*
28. *Eucymatoge perfica.*
29. *Anisodes vuha.*

A NEW MOSQUITO FROM THE PHILIPPINE ISLANDS.

BY HARRISON G. DYAR.

Rachionotomyia microcala Dyar, new species.

Female.—Palpi very short, dark. Proboscis long, curved, not as long as the abdomen, black. Occiput with broad grayish black scales and a continuous white border behind the eyes, narrow above, broader ventrally. Prothoracic lobes with broad gray-white scales; mesonotum with rather broad curved scales, dark gray with a slaty cast. Pleurae grayish white scaled. Postnotum with a patch of very fine, rather long hairs posteriorly, not at all bristle-shaped. Abdomen slaty black above, venter and straight continuous lateral line, as well as the top of the last segment grayish white scaled, the lateral white slightly notching the dark at the segmental incisures. Legs black, the femora white-lined below. Wing-scales narrow, dark. Length without the proboscis about 4 mm., being a rather large species.

Male.—Coloration of the female. The palpi are broken in the single specimen of this sex. Hypopygium: General structure as in *Rachionotomyia powelli* Ludl. Side piece short, stout, blunt, simple, the hairs on the inner side toward base fine and short. Clasper with enlarged base, slender, long, curved, the tip distinctly inflated and with a short subterminal point. Tenth sternites forming a small central cone. Ninth tergites conical, as in *Aëdes*, each with long dense bristly setae.

Type, ♂, Cat. No. 41861, U. S. N. M.
Allotype, ♀, Cat. No. 41861, U. S. N. M.
Paratypes, 2 ♀, Cat. No. 41861, U. S. N. M.

One male, three females, raised from larvae from a Pitcher Plant from the Bamban River, Pampanga, Luzon, Philippine Islands, by Captain F. O. Stone, Medical Corps, U. S. Army, December, 1927.

The comparatively short proboscis is uncharacteristic of *Rachionotomyia*, as well as the absence of the usual brilliant coloration. Prothoracic lobes with irregularly distributed setae; two proepimeral setae; two fine spiracular setae; sternopleura bare and darkly colored except its posterior third, which has dense scales and setae, but no setae above this area; two prealar setae.

Perhaps allied to the Australian *Rachisoura sylvestris* Theobald; but the wing-scales are all hair-like, not rather broad as in Theobald's figure of *sylvestris*.

A NOTE ON THE SYNONYMY OF A BIRCH LEAF MINER.

By S. A. Rohwer,
Plant Quarantine and Control Administration, Washington, D. C.

Within the last few years a species of sawfly has been attracting considerable attention by the mining of leaves of birches in parts of Maine and of Canada. The species responsible for the damage belongs to a genus not native to the American continent, although adults of it were described in 1909 by Dr. MacGillivray as a new genus and species, *Phlebatrophia mathesoni*. An examination of the series of American specimens of the birch leaf miner in the collection of the National Museum and a comparison with European material and literature convince me that the species described by MacGillivray is, as he suggests, the same as the European form, *Phyllotoma nemorata* (Fallén). The Museum collection contains adults of this leaf miner from New Glasgow, Nova Scotia (paratypes), and from Fredericton, New Brunswick, and Bar Harbor, Maine. These specimens vary some in color and some of them differ in minor details of color and venation from the paratypes of MacGillivray's species. The variation in color is not greater than that recorded for *nemorata* by such writers as Cameron, Morice and Enslin, and the variation in venation is of a type which would be expected in species of the genus *Phyllotoma*.

In describing the species, Dr. MacGillivray placed it in a new genus, *Phlebatrophia*, which he differentiated from *Phyllotoma* Fallén largely because the base of the radial sector was atrophied. While this character exists in his specimens and is more or less distinct in all of the other specimens before me, I do not believe it is of generic importance. An examination of other species of the genus *Phyllotoma* from Europe indicates that they could not be satisfactorily separated into two genera by means of this character alone. There are a few structural differences between the genotype of *Phlebatrophia* and *vagans* (Fallén), the genotype of *Phyllotoma*, but these differences are not, in my opinion, of sufficient importance to justify recognition of two genera. I believe that *Phlebatrophia* MacGillivray should be considered a direct synonym of *Phyllotoma* Fallén.

Omitting the numerous references to the European literature and the synonymy as it has been determined in Europe and published by Enslin and others, the following references apply to the American form:

Phyllotoma nemorata (Fallén).

Hylotoma nemorata FALLÉN, Svensk. Vet-Akad. Handl., vol. 29, 1808, p. 47, n. 23.

Phyllotoma nemoralis FALLÉN, Monogr. Tenthred. Suec., 1829, p. 35, n. 18.

Phyllotoma nemorata (FALLÉN) Enslin, Deutsch. Ent. Zeit., 1914, Beiheft, pp. 257–258.

Phlebatrophia mathesoni MACGILLIVRAY, Can. Ent., vol. 41, 1909, p. 345.

Cameron, Enslin, and others have commented that the male of this species is not known. All of the American specimens before me are females.

AMERICAN PSYCHODIDAE (DIPTERA) III.[1]

By HARRISON G. DYAR.

Pericoma signata (Banks).

Psychoda signata Banks, Can. Ent., xxxiii, 274, 1901.
Pericoma megantica Curran, Can. Ent., lvi, 217, 1924.

Specimens before me from the vicinity of Washington, D. C., do not agree well with Banks's description, although determined under this name. It is possible that his specimens were in indifferent condition, as is too often the case with captured Psychodidae. I have also a specimen of *megantica*, determined by Dr. Curran. The species is in general similar to *Pericoma americana* Kinkaid (= *interrupta* Banks = *satellitia* Dyar) and was found by me in the same location, although on a different date. It is easily distinguished in good specimens by the two raised black tufts on the disk of the wing, the row of whitish patches between the veins along the outer margin, and the three last black joints of the tarsi. Adults were found flying on a large moist rock in dense woods.

The antennae of the two sexes are much alike (Figs. 1 and 2), 17-jointed, the last joint forming a thick "spike," the second or spherical joint larger in the male than in the female. The upper pair of claspers of the male hypopygium terminate in four, five or even six appendages (Fig. 3); the aedoeagus stem is slender, widening into a sheath-like tip (Fig. 4).

Localities before me are: Niagara Glen, Ontario, June 1,

[1]Dr. Dyar died January 21, 1929.

1926 (G. S. Walley); Franconia, New Hampshire (Mrs. A. T. Slosson); Marlboro, Maryland, May 13 (H. S. Barber); Plummers Island, Maryland, September and October, 1905 (Barber & Schwarz); Cabin John, Maryland, September 18, 1927 (H. G. Dyar); Pimmit Run, Virginia, September 26, 1913 (F. Knab).

Psychoda helicis, new species.

Specimens preserved in alcohol and practically denuded; darkly colored, the wing membrane dusky, apparently sparsely covered with dark gray hairs without tufts or markings; a thick tuft at base of wing below. The antennae are 16-jointed in both sexes, the last three joints small and spherical, those of the male (Fig. 5) with larger joints and longer necks than those of the female (Fig. 6). The female abdomen is bluntly ended without trace of ovipositor apparent. Male hypopygium (Fig. 7) with the upper claspers arising from a large excavated plate, finely hairy, with two long conspicuously inserted filaments at tip. Lower claspers reduced, the basal joint setose on one side and tip only; second joint cleaver-shaped, flat, with reduced setae on one margin. The legs are dark with small whitish rings at the apices of the tarsal joints.

Type, male, No. 41,186, U. S. Nat. Mus.; paratypes, males and females, 17 mounted on slides, 5 dry on card-points, Central Jaronú, Cuba, September 26, 1927, reared from snails (H. K. Plank, through W. A. Orton, Director of the Tropical Plant Research Foundation).

No pupae or larvae of this Psychodid were sent, but in the same bottle were many larvae and pupae, together with two adults (winged males) of a Phorid, which Mr. C. T. Greene has determined as *Puliciphora borinquensis* Wheeler. Mr. Greene says that the Phorid breeds in dead and decaying snails, which is probably true of the Psychodid also. The Psychodid apparently develops faster than the Phorid, since only adults of the former were sent, and of the latter mostly larvae and pupae.

COCCONOTUS SCHUNKEI, NEW NAME (ORTHOPTERA: TETTIGONIIDAE: PSEUDOPHYLLINAE).

By A. N. Caudell.

The *Cocconotus similis* described by the author[1] from Peru is found to be a prime homonym of the previously described *Cocconotus similis* of Giglio-Tos,[2] a species from Ecuador now referred to the genus *Acanthodiphrus*. A new name being required for *Cocconotus similis* Caudell, the specific name *schunkei* is here proposed for that purpose.

[1]Ins. Insc. Mens., vol. vi, p. 39 (1918).

[2]Boll. Mus. Torino, vol. xiii, No. 311, pp. 97, 98 (1898).

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A NEW SPECIES OF TRIGONALID OF THE GENUS POECILOGONALOS.

BY S. A. ROHWER, *Bureau of Entomology*.

Mr. C. P. Clausen has made some very interesting observations on two species of the genus *Poecilogonalos*. One of these forms appears to be new and the following description is presented so the observations on its habits may be recorded under a name.

Poecilogonalos henicospili, new species.

Allied to *Poecilogonalos mimus* Cockerell and *P. fulvoscutellata* Ayyar but differs from both of these forms in having the scutellum largely black. From *mimus* it also differs in the tridentate mandibles.

Female.—Length 8 mm. Mandibles tridentate, teeth large; clypeus feebly and sparsely punctured, the anterior margin with a shallow, arcuate median emargination; frons with close distinct punctures; vertex and orbits shining, with distinct well separated punctures; scutum and scutellum closely and rather coarsely reticulato-granular; punctures on second tergite close, sometimes confluent. Castaneous with yellow and black markings; antennae castaneous; mandibles (except apices), two large, nearly confluent spots on clypeus, spot at base of each antenna, inner orbits, narrower near top of eye, a diagonal mark from inner orbital spot to near lateral ocellus, triangular spot below anterior ocellus, lateral posterior margin of pronotum, sides of prescutum, spot on side of scutellum, three nearly confluent spots on metanotum, two large ovate spots on propodeum, apical margin of first tergite, apical margin of second tergite (narrowing and slightly interrupted medianly), large spots on lateral margin of fourth and following tergites, apical margin of first and second sternites, and spots above mid and hind coxae *yellow* or *yellowish*; legs yellowish, a brownish spot on anterior face of hind coxa, dorsal margin of femora more or less blackish, tibiae suffused with brownish apically; prosternum, mesosternum, sides and median line on propodeum, and base of second tergite and sternite blackish. Wings subhyaline, the usual dusky spot covering the second and third cubitals and apical part of radial cells. Head and thorax with white hair.

Male.—Length 7 mm. Yellow markings similar to those of female but the castaneous color is replaced almost entirely by black. The apical margin of third tergite is castaneous. The second sternite is flat, not convex as in female.

Type locality.—Jorhat, Assam.

Type, allotype and paratypes.—Cat. No. 40978 U. S. N. M.

Described from four specimens, type, allotype, and two paratypes, reared by C. P. Clausen from cocoons of *Henicospilus rufus* Tosq. in March, 1927, and recorded under Clausen No. 2084.

Poecilogonalos thwaitesii (Westwood).

Schulz, 1907, Genera Insectorum, fasc. 61, p. 9, uses the name *pulchella* Westwood for this species but it seems desirable to adhere to the principle "Once a homonym, always a homonym," and use the new name suggested by Westwood in 1874.

A good series of specimens which agree very well with Westwood's description were secured by C. P. Clausen at Jorhat, Assam. These specimens have the castaneous replaced by black and show some variation in the extent of the yellow markings. In one female the yellow on the head is unusually extensive. Two specimens have the second recurrent wanting or only faintly indicated. There is some variation in the closeness of the punctures on the frons.

Poecilogonalos mimus Cockerell.

Poecilogonalos mimus Cockerell, Proc. Ent. Soc. Wash., vol. 20, no. 7, 1920, p. ~~181.~~ 191 Issued October 30, 1920.

Professor Cockerell requested that his type of *P. mimus* be compared with the original description of *P. fulvoscutellata* Ayyar. The type of Cockerell's species agrees very closely with Ayyar's description for *P. fulvoscutellata* and at first it seemed that the two were synonymous. The mandibles of *mimus* are quadridentate while Ayyar described his species as having tridentate mandibles.

The number of the Records of the Indian Museum[1] containing Ayyar's paper was not received in Washington until after Professor Cockerell's paper was published but it is presumed that it was issued prior to the October number of the Proceedings of the Entomological Society of Washington.

[1]Records Indian Mus., vol. 16, pt. 7, Dec. 1919, p. 471. Received Washington, November 29, 1920.

BIOLOGICAL STUDIES ON POECILOGONALOS THWAITESII (WESTW.), PARASITIC IN THE COCOONS OF HENICOSPILUS (HYMEN: TRIGONALIDAE).[1]

By Curtis P. Clausen, *Entomologist, United States Department of Agriculture.*

In July, 1921, Mr. Cho Teranishi, then assistant in the investigations upon the parasites of *Popillia japonica* in Japan, observed a female Trigonalid in the act of oviposition upon the foliage of bamboo at Sapporo, Hokkaido. This female was captured and placed in a breeding cage for observation. Several thousand eggs were laid upon the foliage provided, and always upon the under surface, a short distance from the margin. This peculiar habit of oviposition was of exceptional interest, as the only other hymenopterous groups known to have a similar habit were the Perilampidae (*Perilampus*), which oviposit on the leaf in the vicinity of the host, and the Eucharidae (*Schizaspidia*) which deposit the eggs en masse within the buds of trees. In both of these cases the planidia make their way to the host after hatching.

A search was made for additional material, and in the following September the writer secured a series of six females at Jozankai, about twenty miles from Sapporo. These were found along a shaded forest path, and were depositing their eggs exclusively upon the foliage of clover. Some eggs were later secured in cages, but these, as well as the lot secured by Mr. Teranishi, failed to hatch. The following season a search was made for further material, but without success, and no additional progress could be made at that time in the study of this most interesting group of parasites.

During 1925 the writer had occasion to visit the Indian Tea Planters Experiment Station at Tocklai, near Jorhat, Assam, India, and in the insect collection at that station a number of specimens of a Trigonalid were observed, with the cocoons from which they had emerged. Mr. E. A. Andrews, entomologist of the station, stated that these cocoons had been secured from the soil when the tea gardens were hoed during the winter. At this time the coolies employed in such work were usually instructed to collect all insect cocoons, pupae and larvae encountered, and these were either set aside for parasite emergence or destroyed. Through the courtesy of Mr. Andrews the writer was enabled to make extensive collections of cocoons during the following two seasons.

In February, 1926, a series of 28 cocoons were secured, and from them emerged late in April and early in May two males and five females of the Trigonalid found in the Tocklai collection. Specimens submitted to Mr. S. A. Rohwer have been

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[1]*Contribution No. 45, Japanese Beetle Laboratory, Moorestown, N. J.*

determined as *Poecilogonalos thwaitesii* (Westw.). Examination of the cocoons from which these adults emerged showed conclusively that the species was a secondary parasite, and the further rearings established the fact that the cocoons were those of *Henicospilus rufus* Tosq.[1] The host of this Ichneumonid is not known, but a study of the host records of other species indicates that it is a lepidopterous larva, probably of the Noctuidae.

THE LIFE HISTORY OF POECILOGONALOS THWAITESII.

During the seasons of 1926 and 1927 extensive collections were made of *Henicospilus rufus* cocoons for study and rearing, and a total of 356 of these was secured at this time. The primary object of the study was to determine the manner of hatching and to secure the first-stage larva for comparison with the first-stage larvae of other Hymenoptera of similar habit. Although this object was not accomplished, a considerable amount of information was secured regarding the biology of this obscure group. A considerable number of adults were reared out and caged in pairs for mating. This was never actually observed to occur, though in every case a few days confinement resulted in serious mutilation of the males, the legs and antennae being bitten off and the wings lacerated. It is possible that this occurred during or after attempted mating.

Oviposition.—In depositing her eggs the female first runs rapidly over the upper surface of the leaf, and when satisfied as to its suitability, approaches the margin, turns and curves the tip of the abdomen under it, and places the egg about .5 mm. from the margin. Only an instant is required for the operation, and it may be repeated immediately. This egg (fig. 2) measures only 0.12 mm. in length, is ellipsoidal in form, and its ventral surface is flat. It is covered with a white, vitreous shell bearing from five to seven longitudinal ridges, which also extend ventrally entirely around the egg and converge at the anterior end. This shell is very tough, though flexible, and is complete upon the mature eggs in the ovarian tubes. The egg when deposited upon the leaf adheres only lightly to it.

The maximum number of eggs obtained from a single female was 10,641. In this instance oviposition extended over a period of fourteen days. Another individual laid a total of 4,376 eggs in a single day. A third female was observed to

[1]Determined by Mr. G. R. Dutt, Agricultural Research Institute, Pusa, Bihar, India.

deposit twenty-seven eggs within one minute. This is a rate of oviposition far in excess of that recorded for any other parasitic hymenopteron, and provides for an exceptionally high percentage of mortality in the early stages. In the case of one gravid female dissected, the ovaries were found to comprise a total of 657 ovarioles, and in them were contained 8,218 mature eggs and an undetermined number in various stages of development. It is probable that the normal number of eggs deposited in the field is in excess of that here given for a caged female.

Oviposition was obtained upon the leaves of a wide range of plants, and little preference seemed to be shown except in the case of citrus, which was largely refused. Leaves having a serrate margin seemed to be favored, though not to a marked extent. Eggs were laid freely upon the leaf petioles and even upon stems, not exceeding four millimeters in diameter, provided they were in a horizontal position. A considerable number of eggs were deposited upon the edge of paper strips in the feeding tubes, and even upon the edge of a glass slide which had been smeared with a decoction of tea leaves. Where abundant upon leaves these eggs appeared as a fine, white line one-half millimeter within the margin on the lower side. A total of many thousands of these were secured for experimental purposes, upon various surfaces and upon growing plants.

The first lot of eggs secured was found upon Euphorbia leaves in April, 1926. These were kept in vials, under conditions of moderate moisture throughout the summer, and examination at intervals revealed that sufficient development had taken place for the general form of the body to be well defined, though eventually all the incipient larvae died without hatching. Further material was secured in 1927, with a like result. It was finally surmised that these eggs must be eaten by the secondary host to provide the necessary stimulus for the completion of development and hatching, a requirement known to exist among several species of Tachinidae. Owing to the pressure of other work at the time it was not possible to investigate this point experimentally, and no proof is as yet available to support the conjecture. The fact that three lots of eggs, each numbering several thousand, died after reaching a certain stage of development would indicate some departure from the normal mode among the Hymenoptera, and point to the eating of eggs by the host as very probably essential to development.

The First Larval Stage.—Although living larvae of this stage have not as yet been secured it was possible to determine their general form from a dissection of the eggs containing the partially developed embryos. The form is in general similar to that of *Perilampus*, having a well defined head and tapering body. Neither the head nor the body was as heavily chitinized as a fully developed larva, and the ventral plates, with their spines and setae, were not distinguishable; but the three ventral hooks upon the thorax, similar to those of *Perilampus*, were distinctly evident. It may be assumed therefore that the primary larva of *Poecilogonalos thwaitesii* is of the planidium type, and capable of both locomotion and penetration. Its length is approximately .12 mm.

THE POST-EMBRYONIC FORMS.—In view of the fact that it was not possible to study the life history of the species in its logical order from the egg to the adult, it was necessary to work backwards from the successive known forms. In this instance the pupa was recognizable without possibility of confusion with other forms present, and with this identification as a beginning it was necessary to associate each successive known stage with the one immediately preceding it. To do this two means were employed; first, the dissection of host cocoons during the late winter and early spring, while development from the first larval stage to maturity is proceeding quite rapidly, and, second, the examination of the contents of cocoons from which *Poecilogonalos* had already emerged. Using the first method, a total of 187 fresh cocoons were cut open and the contents examined under the binocular microscope and a record made of all parasitic forms, of whatever stage, contained in them. In the examination of 64 empty cocoons from which *Poecilogonalos* had emerged, a record was likewise kept of all larval remains found, principally mandibles, and these were compared with the living forms obtained from the former lot. In the living material a total of 28 distinct larvae of different stages and species were found, and the problem was then presented of isolating the relatively few *Poecilogonalos* from among them. Several Chalcidoidea, parasitic externally and internally, were readily distinguishable and segregated, but the various other Ichneumonoidea present involved greater difficulties. Those others, however, were found in relatively small numbers as compared with *Poecilogonalos*. The number of additional parasite species actually reared from the several hundred *Henicospilus* cocoons collected and set aside for emergence was nine, none of which was responsible for more than 3 per cent of the total parasitism.

THE FIFTH LARVAL STAGE.—In many instances the cocoons dissected showed a large robust larva with distinctive tridentate mandibles (Plate 5, fig. 6) feeding externally upon the dead prepupa of *Henicospilus*. These larvae were set aside for development, and in due time reached the pupal stage and finally emerged as adult *Poecilogonalos*. Further, these distinctive mandibles were always found in the pupal chamber from which *Poecilogonalos* had emerged, and consequently this form could be definitely listed as the final larval stage of *P. thwaitesii*.

In one instance an empty cocoon was found to contain two pairs of these tridentate mandibles. The dissections of living cocoons had failed to show a single case in which two individuals

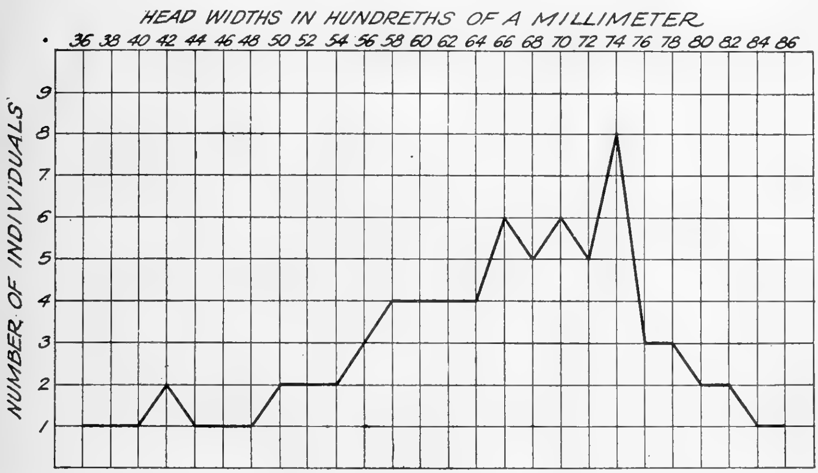

Fig. 1. Frequency curve showing the measurements, in hundredths of a millimeter, of the head widths of 75 third-stage larvae of *Poecilogonalos thwaitesii*.

had reached the final larval stage on the same host, and rearings never yielded more than one. This recovery, of two pairs of mandibles, in conjunction with the finding of a fifth-stage larva containing within its body a larva of the third stage, would indicate that the presence of the two pairs of mandibles above referred to had come about by the one larva reaching the final stage and then succumbing to the attack of the larva of an earlier stage within its own body, this later one then giving rise to the adult which finally emerged. Such a course of development would call for penetration by the planidium, first, of the tertiary (lepidopterous?) host, second, of the larva of *Henicospilus* and finally that of its own species.

THE FOURTH LARVAL STAGE.—The fourth larval stage is much less robust than the fifth, and has small, simple mandibles.

Its relation to the latter was established by the finding of nine larvae of the fifth stage, with the cast skin only partially removed from the body, and of one of the fourth stage, showing clearly the developing tridentate mandibles just back of the head. This is the stage in which emergence from the body of the host is effected, and it may be found either within the host or outside of it.

THE THIRD LARVAL STAGE.—This large-headed larva is most distinctive as compared with all the others observed, and was linked to the fourth by the finding of four individuals in the process of molting. The wide variation in head widths among those observed, ranging from 0.36 mm. to 0.86 mm., led first to the assumption that two species were involved, but this was later disproved by the presence of head capsules of all sizes in the cocoons from which *Poecilogonalos* had emerged. The measurements of the head widths of 75 individuals gave a uniform gradation, as shown in the accompanying figure, and no basis could be found for a division into two groups.

Several observations of interest in connection with this stage were made during the course of the dissections. The maximum number of larvae of the third stage found in a single host was four, with an average of 1.8 for all parasitized *Henicospilus* prepupae. In this third stage the *Poecilogonalos* larvae show a pronounced canibalistic tendency, and when a number are present in the one host body several of them are usually dead owing to lacerations produced by the heavy, sickle-shaped mandibles. However, not all which fail to reach maturity die in this manner; many are apparently driven to the posterior portions of the body of the host, where they fail to effect emergence, and eventually die. In two instances larvae of this stage were found parasitic internally within others of the same species and stage, and one was found within a fifth-stage larva. This situation is quite distinct from canibalism, the usual means of elimination of the surplus numbers of an internal parasite, and is a phenomenon seldom recorded heretofore. It would tend to show in this case that the *Poecilogonalos* planidium exhibits little discrimination as to the sort of host larva which it enters and would appear to be able to develop within almost any hymenopterous larva which might be present in the body of the secondary host. Two individuals were actually reared from undetermined Ichneumonids parasitic upon *Henicospilus*.

THE SECOND LARVAL STAGE.—The second larval stage has not yet been definitely associated with the planidium or with the distinctive third stage, but is included on the assumption that an intermediate form must occur between these two.

The planidium measures approximately 0.12 mm. in length, while that which is termed the third stage averages 2.5 mm., the heavily chitinized head alone having an average width of 0.66 mm. With such a disparity in size between the two forms the requirement for an intermediate stage can hardly be questioned, and three individuals (Plate 5, fig. 3), which alone fulfilled all requirements, were actually observed. These measured from 0.8 to 1.2 mm. in length, and possessed large, globular heads, unchitinized, and with simple mandibles widely spaced ventrally. This form could not be associated with any of the other parasites contained in the material examined, but, likewise, could not be recovered from the empty parasitized cocoons. The failure to recover it may be attributed to the lack of any well defined parts that could be recognized after molting, and in the earlier dissections such a form was not anticipated. The relatively small number recognized may be due to the difficulty of detecting them and, again, to a probable relatively short duration of the period.

Summary of Dissections of Henicospilus Cocoons:

Number of fresh cocoons dissected	187
Number containing *Henicospilus* pupae	11
Number containing unparasitized *Henicospilus* larvae or prepupae	47
Number containing parasitized *Henicospilus* larvae, prepupae or pupae	129
Of this number there were:	
Fifth-stage *Poecilogonalos*	7
Fourth-stage *Poecilogonalos*	8
Third-stage *Poecilogonalos*	79
Second-stage *Poecilogonalos*	3
Pupae, *Poecilogonalos*	4
Various stages of other species	28
Percentage of parasitism of the fresh cocoons by *Poecilogonalos*	54

In the 64 empty cocoons examined the tridentate mandibles of the fifth stage were always recovered in the pupation cell of those cocoons from which *Poecilogonalos* had emerged, as were also the large, heavily chitinized heads of the third stage, while only 39 of that number yielded the remains of the fourth stage. In this case there was no certainty as to the location of the cast skin, as it might be within the decaying body of the host or external to it, or, finally, it might be retained as a light pad at the caudal end of the fifth stage larva and thus be included in the contents of the pupation chamber. Of the 10 cocoons which yielded other Ichneumonoidea none showed the tridentate mandibles, though 4 were found to contain the large head capsules similar to, but distinguishable from, the third stage of *Poecilogonalos*.

THE DEVELOPMENT OF POECILOGONALOS THWAITESII.

On the basis of dissections made during 1926 and 1927 it appears that *Poecilogonalos thwaitesii* passes the early part of the winter in the first larval stage within the mature larva of *Henicospilus*, the cocoon of which is normally formed in the soil. Emergence of *Henicospilus* under natural conditions at Jorhat takes place in March, with *Poecilogonalos* appearing slightly later. The material collected during January and February and taken to Shillong (elevation 5,000 ft.) for emergence, yielded adult *Henicospilus* from March 7 to April 6 and the *Poecilogonalos* adults appeared from March 8 to April 24. The peak of host emergence was about March 15, whereas *Poecilogonalos* was quite evenly distributed throughout its longer period. The January and February collections were made too late to include the planidium stage, as development had already progressed beyond that point.

THE THIRD LARVAL STAGE.—The third stage is a very robust larva and moves freely through the body of its host. At this time the host is approaching pupation, but becomes greatly weakened through the feeding of the parasite. With only a single larva within its body the host usually remains alive until the emergence of the larva for external feeding, but when two or more are present death occurs as the prepupal stage is reached, and while the *Poecilogonalos* larvae are still in the third stage. The parasites are able to feed and develop for a relatively considerable time following the death of the host, and mature without difficulty. In the normal course of development, however, the third stage completes its feeding in the living host. When the prepupal stage of the latter is reached the parasite is situated in the thoracic regions, and when ready to transform to the following stage it takes up a position immediately under the derm and within the eye, already somewhat pigmented, of the developing pupa. Here the molt takes place, and the new fourth-stage larva immediately makes an incision in the derm of the host at that point and emerges to feed externally. The developing host pupa dies at this time and shortly becomes a putrefying mass. This procedure is rather unusual, as with parasites of this type decay does not normally set in until feeding is complete. In the case of hosts that are killed by an excessive number of third-stage *Poecilogonalos* within the body, putrefaction also sets in immediately, in spite of the fact that there has been no break in the body wall; yet this incident does not hinder the development of the parasite through the succeeding stages. Less than half of the body contents of the host are normally consumed.

THE FOURTH LARVAL STAGE.—In approximately twenty per cent of the individuals examined the *Poecilogonalos* fourth-stage larva emerged from the fully formed pupa of *Henicospilus* rather than from the developing prepupa. The point of exit in each case was the same, the eye being invariably chosen. For a relatively short period feeding takes place externally at the single puncture, followed by transformation to the fifth, and final larval stage.

THE FIFTH LARVAL STAGE.—The fifth stage is equipped with heavy tridentate mandibles and a large suctorial disc for feeding. The mandibles, however, are of little use, as only a portion of the fluid contents is sucked out, and no part of the solid tissues or of the derm is consumed.

When feeding is ended the mature larva forms for itself a pupation chamber of irregular outline at one side of the host cocoon, thus separating itself from the large mass of putrefying matter which constitutes the remainder of its host. The envelope is thin, parchment-like and light brown in color. After a few days the meconium is discharged, this being viscid and black in color, as compared with the chocolate-brown to brick-red color of the meconium of its host. Pupation occurs in this cell, and the adult emerges by cutting an irregular hole at the side, near the anterior end of the cocoon. This hole is readily distinguished from that made by *Henicospilus*, which is smoothly cut and at right angles to the axis of the cocoon.

From the data available it seems probable that both *Poecilogonalos* and its host, *Henicospilus rufus*, have a single generation each year, the latter parasitizing its lepidopterous (?) host during the summer and passing the autumn and early winter in the mature larval stage in its cocoon in the soil. The *Poecilogonalos* planidium gains access to the body of its secondary host at some time in the summer, and then enters such *Henicospilus* larvae as it may find there In this stage a considerable period of time is apparently passed, and development through the succeeding larval stages occurs quite rapidly during the early spring. At Shillong the pupal stage covers three weeks in March, but this time is probably reduced to about two weeks under the conditions of temperature prevailing at that time of the year at Jorhat. A period of gestation of two or three weeks brings the time of oviposition to April and May, and apparently the egg stage may be greatly prolonged.

The adults of *Poecilogonalos* are very readily distinguishable in the field by the general form of the body, particularly the pronounced ventral curving of the tip of the abdomen, and by the position of the wings. While resting at intervals during the day, or while feeding, the abdomen is held elevated at an angle of forty-five degrees from the horizontal, and at this time, as well as when in movement or ovipositing, the wings are held spread at right angles to each other and with the tips trailing upon the surface of the leaf or other object upon which the insect may be found. During protracted periods of rest, or at night, the wings may be placed one above the other over the abdomen. These positions of the wings and abdomen, in conjunction with quick, jerky movements when this parasite is running about the leaf, serve readily to distinguish members of the family when found in the field.

Such Trigonalid females as have been observed in the field seem to prefer the somewhat shaded places. Those collected in northern Japan were found exclusively along shaded forest paths where very little direct sunlight reached the undergrowth upon which they were resting or ovipositing. In the laboratory oviposition took place most readily in slightly darkened places.

Poecilogonalos henicospili, Rohwer.

From the material of *Henicospilus rufus* collected during 1927 for the rearing of Trigonalidae there emerged four individuals of a species other than the common *Poecilogonalos thwaitesii* (Westw.). These have been examined by Mr. S. A. Rohwer and described by him as a new species under the above name. An examination of the remains of this species in the host cocoons showed the head characters of the last three larval stages to be indistinguishable from those of *P. thwaitesii.*

Oviposition by one of the females was readily brought about, and a total of 5,782 eggs were deposited in a period of six days. The egg is equal in length to that of *P. thwaitesii*, though slightly narrower, and the outer shell has the usual longitudinal ridges, but is more transparent than that of the latter species.

THE RELATION OF THE OVIPOSITION HABIT OF THE TRIGONALIDAE TO THE PROBLEM OF PARASITE REARING AND INTRODUCTION.

Owing to the habit of the Trigonalidae of ovipositing upon foliage apparently without any relation to the host itself, another complication enters into the problem of rearing and importation from one country to another of Ichneumonoid and Tachinid parasites. This is true whether hatching takes place in the normal way or following ingestion of the eggs by the secondary host. The present record of the manner of oviposition of *Poecilogonalos* increases to four the number of families of parasitic insects which place their eggs upon foliage, the other three families being the Tachinidae (a relatively few species), the Perilampidae and the Eucharidae. The members of the last-named family, so far as known, are exclusively primary parasites of ants, and may therefore be disregarded in this connection. The Tachinids are primary parasites while *Perilampus* may be either primary or secondary. Presuming a Trigonalid or Perilampid parasitic upon *Crossocosmia* or any of the other leaf-ovipositing Tachinidae to attack, for instance, lepidopterous larvae, it would be possible to have both primary and secondary parasitism of these caterpillars without either of the parasite species having had access to the host. The high degree of parasitism evidenced by *Poecilogonalos thwaitesii* upon *Henicospilus* in India would prove a serious handicap to the attempted introduction of such a species, besides the danger that the hyperparasite itself might escape and become established. It is becoming more and more evident that rearing the primary host in insect-proof cages is not a sufficient precaution, and the presence of the above-mentioned parasites makes necessary a similar protection of the sources of food supply.

LITERATURE ON THE BIOLOGY OF THE TRIGONALIDAE.

In the literature to date there is an almost complete lack of information upon the life history and habits of this most interesting group of parasites. The following list comprises all of the known records of host relationships of the family:

Species	*Host*
Bareogonalos canadensis Harr.	*Vespa occidentalis* Cress.
Lycogaster pullata Shuck.	*Ophion macrurus* L. from *Telea polyphemus* Cr.
Nomadina cisandina Schulz.	*Polybia dimidiata* Oliv.
Pseudogonalos hahni Spin.	*Ophion distans* Thoms. from Lepidoptera
	Trogus sp.
	Vespa germanica F.
Tapinogonalos pulchella Cress.	*Exorista lobeliae* Coq. from *Acronycta lobeliae* Guer.
Trigonalys costalis Cress.	*Acronycta lobeliae* Guér.
Seminota depressa Deg.	*Polistes canadensis* L.
Seminota mejicana Cress.	*Parachartergus apicalis* F.

A consideration of the foregoing list indicates that the family is largely parasitic in the nests of vespoid Hymenoptera, though whether in the role of primary or of secondary parasite is not known. Of the ten host records above given five are of this family of social wasps. Next in importance may be mentioned those which are secondary parasites of Lepidoptera, and probably Hymenoptera (Tenthredinoidea) as well, with an Ichneumonoid as the primary host. The single record from a Tachinid, *Exorista lobeliae* Coq., itself a parasite of *Acronycta*, would indicate a mode of development similar to that of *Poecilogonalos*.

The occurrence of Trigonalidae as parasites of Vespidae is of particular interest in view of the information now available regarding *Poecilogonalos*. Its frequency as a parasite of that group would seem to contradict the theory advanced by the writer that the eggs are eaten by the secondary host, as the Vespidae are not phytophagous. Dr. L. O. Howard has suggested, however, that in the case of *Polistes* and other Vespidae, the adults of which are known to feed upon the body fluids of caterpillars, the Trigonalid planidia, hatched from eggs ingested by the caterpillars and floating in the body fluids, might thus be taken up by the wasps and carried to the nest in the food supplied to the larvae. The roving habits of these wasps when in search of food, and the fact that the females return frequently to the nest to feed the larvae during their period of development, would permit the planidia to reach the nest in the same manner as do those of *Schizaspidia* upon ants, presuming that normal hatching takes place. The records of a European species (*Pseudogonalos hahni* Spin.) upon *Vespa*, *Ophion* and *Trogus*, respectively, would indicate an identical habit throughout the group and it would be of exceeding interest to clear up the still obscure manner of hatching and the manner in which the planidium gains access to its primary host.

Bugnion,[1] in his study of the anatomy of *Pseudogonalos hahni*, mentions from 300 to 400 ovarioles in each ovary of the female, a number equal to that found in *Poecilogonalos*, and an average of about five mature eggs in each. These are stated to be 0.18 mm. in length, or considerably larger than those of *P. thwaitesii* and *P. heniscopili*.

DESCRIPTIONS OF THE IMMATURE STAGES OF POECILOGONALOS THWAITESII. (Plate 5.)

The Egg (Fig. 2). Length 0.12 mm., width 0.07 mm., ellipsoidal in form and white in color. The ventral side flat, with the dorsum not greatly arched. The outer covering vitreous, with 5 to 7 longitudinal ridges extending entirely around the egg and converging at the anterior pole, the ridges occasionally branched.

First-Stage Larva. Unknown, though partially developed embryos dissected out from the egg showed it to be of the planidium type, and possessing three large ventral hooks on the thorax.

Second-Stage Larva (Fig. 3). Thirteen-segmented, and 1.2 mm. in length. The head large, almost spherical in form, very lightly chitinized and with large simple mandibles set widely apart ventrally. Body segmentation indistinct, the caudal segments narrow. One pair of spiracles on the anterior margin of the second thoracic segment. No dermal setae or spines.

Third-stage Larva (Fig. 4). Fourteen-segmented, 1.5 to 2.8 mm. in length and widest in the thoracic region. One pair of large spiracles situated as in the preceding stage.

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[1]Bugnion, E. La Structure Anatomique du Trigonalys hahni Spin. Mitt. Schweiz. Entom. Gez., vol. 12, pp. 14–20, illus., 1910.

The head very large, heavily chitinized, and deep brown in color. Average width 0.66 mm. Sharply constricted in the posterior region, forming a distinct neck. Mandibles (fig. 7) 0.35 mm. in length, and sickle-shaped. The maxillae large, conical in form, and extending much beyond the anterior margin of the head and mandibles. One pair of light spots, possibly sensoria, ventrally behind the middle transverse line.

The body segments decreasing in width caudad, with the anterior margin of each having a minutely pebbled appearance, this being uniform over the last two segments.

Fourth-stage Larva (Fig. 5). Fourteen-segmented, 3.5 mm. in length and 0.9 mm. in width. Eight pairs of spiracles, the first, on the second thoracic segment large, the remaining seven small and inconspicuous, possibly not open. The lateral trachael trunks heavy, with large anterior and posterior commissures. The head large but not heavily chitinized, and with simple mandibles (Fig. 8) 0.18 mm. in length. The body segments subequal in length except the last two, which are longer, the caudal one being much extended. No dermal setae or spines.

Fifth-stage Larva (Fig. 6). Fourteen-segmented, 9 to 11 mm. in length, very robust, and largely brown in color because the contents of the digestive tract show through the derm. Eight pairs of open spiracles, situated on the second and third thoracic and the first six abdominal segments.

The head relatively large, and truncate in form. The mouthparts comprising a large suctorial disc and tridentate mandibles (Fig. 9) 0.14 mm. in length. Antennae conical in form, with 2 short, blunt sensoria at the tip.

Body broadest in the mid-abdominal region, the segments subequal in length, the last tapering to a sharp point. No dermal setae or spines.

Pupa. No distinctive characteristics except that the tip of the abdomen is sharply curved ventrally in the manner typical of the adults.

NEW TERMITES FROM THE ANTILLES AND MIDDLE AMERICA.

By THOS. E. SNYDER, *Senior Entomologist, Bureau of Entomology, United States Department of Agriculture.*

The following miscellaneous termites are herein described as new:

Family KALOTERMITIDAE.

Kalotermes (Kalotermes) bequaerti. Cuba.

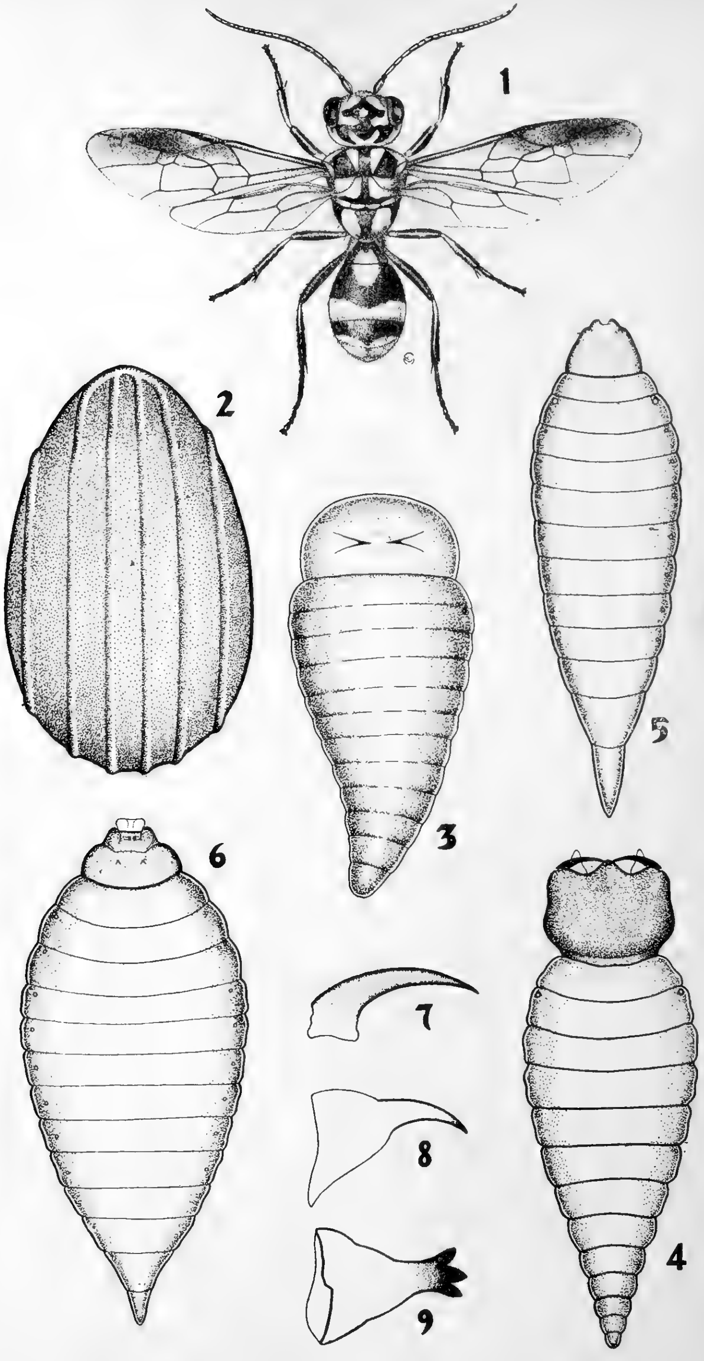
Kalotermes (Kalotermes) liberatus. Jamaica.

Family TERMITIDAE.

Cornitermes (Cornitermes) acignathus Silvestri, **subspecies walkeri.** Panama.

Cornitermes (Cornitermes) acignathus Silvestri, **subspecies costaricensis.** Costa Rica.

Cylindrotermes macrognathus. Panama



PECILOGONALOS HENICOSPILI ROHWER.

Figure 1, adult; 2, egg; 3, 4, 5, 6, second, third, fourth and fifth stage larvae respectively.

H. Hagen in 1858 (Linn. Ent., vol. 12, pp. 67–8) described *Calotermes posticus* from the dealated female adult from St. Thomas, stating it to be near "*Calotermes*" *brevis* Walker; the latter species is in the subgenus *Cryptotermes* Banks.

In 1910, N. Holmgren in Termitenstudien 2 (Kungl. Sv. Vet. Akad. Hd. 46, no. 6, p. 55, refers to *C. posticus* Hag. as doubtfully a species of *Cryptotermes*.

Nathan Banks, in Antillean Isoptera (Bull. Mus. Comp. Zool., vol. 62, no. 10, p. 477–479, Pl. I, figs. 8 and 12, 1919), described the soldier caste of a termite from Jamaica as *Kalotermes posticus* Hagen, stating that it might not be the soldier of *posticus*, if not, it was new. Winged forms (discussed in a key) are from St. Thomas, Cuba and Haiti.

Since the identity of *posticus* is in great doubt, and it is quite probably a *Cryptotermes*, possibly *cavifrons* Bks., which occurs in the Antilles, I am giving the specimens referred to by Banks the name *liberatus*. Unfortunately, I can not name them for Mr. Banks, having already described a termite as *Kalotermes banksi*.

Kalotermes (Kalotermes) liberatus, new species.

Soldier.—[1]"Head yellowish; mandibles red-brown, tips black, pronotum faintly brownish, body rather a dull yellowish, legs and antennae pale. Head about twice as long as broad; sides parallel, scarcely convex, broadly rounded behind, in front rather suddenly declivous, clypeus subquadrate; mandibles not as long as width of head, stout, toothed about as usual; antennae short, hardly longer than width of head, third joint not modified; eyes not noticeable; pronotum more than twice as broad as long, concave in front, slightly convex behind, sides rounded, hardly narrowed behind; head and body with scattered moderately long, erect hairs; legs short, hind femora much swollen. Length of head, 3 mm."

Type-locality.—Cinchona, Jamaica.
Type, soldier.—Amer. Museum Natur. Hist., New York City.

Kalotermes (Kalotermes) bequaerti, new species.

Winged adult.—Head light castaneous-brown, with numerous long hairs and fewer short hairs.

Antenna with 15 segments; third segment longer than second or fourth; last sub-elliptical, short and narrow.

Eye black, rather large, separated from lower margin of head by a distance less than half the diameter of the eye.

Ocellus elongate, narrow, in contact with and at oblique angle to eye.

Pronotum light castaneous-brown; with rows of long hairs on margins and a

[1]Description of *posticus* by Banks, 1919.

median row, fewer short hairs; broader than head; roundly emarginate at both anterior and posterior margins.

Wings hyaline, yellow near costal margin; radius nearer to subcosta than to cubitus; in forewing subcosta with 4 long branches to costa; cubitus nearer to upper than lower margin of wing.

Abdomen yellow-brown; tergites with a row of long hairs near posterior margins.

Pulvillus between tarsal claws prominent.

Measurements.—Length of entire winged adult[1]: 9.75—10.50 mm.
Length of entire dealated adult: 5.25–6.75 mm.
Length of head (to tip of labrum): 1.20–1.25 mm.
Length of pronotum (not at median): 0.65–0.70 mm.
Length of forewing: 7.80–8.00 mm.
Length of hind tibia: 0.70–0.80 mm.
Diameter of eye (long diameter): 0.26–0.27 mm.
Width of head (at eyes): 0.90–0.95 mm.
Width of pronotum: 1.00–1.05 mm.
Width of forewing: 2.15–2.20 mm.

Soldier.—Head yellow-brown with reddish tinge, darker at anterior margin; elongated normally; sides straight and parallel; front with slope at epicranial suture; with scattered short and long hairs. Gula slender.

Antenna with 11 segments, third segment greatly modified, chitinized, light castaneous brown, subclavate, longer and broader than second segment, or third and fourth together; last segment subelliptical, short and narrow.

Eye spot not colored, oval and at an angle to rim of antennal socket, separated from this rim by a distance about equal to the long diameter of the eye spot.

Mandibles black, short, stout, incurved at apex. Left mandible with a pointed marginal tooth near apex, two molars, and a large pointed tooth near base; right mandible with two large, pointed marginal teeth between middle of mandible and base.

Pronotum yellow, anterior margin broadly, angularly emarginate, finely serrate; posterior margin slightly emarginate; anterior corners high; sides narrow towards posterior margin; with scattered long and short hairs.

Abdomen with tergites light yellow; long hair near posterior margins.

Legs with hind femora markedly swollen.

Measurements.—Length of entire soldier: 5.00–7.00 mm.
Length of head with mandibles: 2.5–3.1 mm.
Length of head without mandibles (to anterior): 1.7–2.1 mm.
Length of left mandible: 1.00–1.10 mm.
Length of pronotum (from anterior to posterior margins at sides): 0.80–1.00 mm.
Length of hind tibia: 0.70–0.90 mm.
Width of head (where widest posteriorly): 1.00–1.40 mm.
Height of head at middle: 0.80–0.90 mm.
Width of pronotum: 1.10–1.55 mm.

[1]The females average slightly larger than the males.

Type locality.—Banos (Oriente), Cuba.

Described from a large series of male and female winged adults, soldiers and nymphs collected in dry, dead branch near edge of mangrove, March 21, 1925, by J. Bequaert. Named in honor of the distinguished collector, who is now entomologist in the Department of Tropical Medicine, Harvard Medical School, Boston, Mass.

Cotypes.—(Winged adults.) Cat. No. 41742 U. S. National Museum; morphotypes (soldiers), U. S. National Museum. Coparatypes at the Museum of Comparative Zoology, Cambridge, Mass.

Key to Antillean Species in the Subgenus Kalotermes.[1]

Winged.

1. Head and thorax red-brown, small species not 10 mm. long....*liberatus* Snyder.
   Head and thorax light castaneous-brown, usually at least 10 mm. long .... *bequaerti* Snyder.
   Head and thorax pale yellowish, larger species........2
2. Body with bristly hair........*schwarzi* Banks
   Body with only very short, fine hair........*jouteli* Banks.

Soldiers.

1. Third antennal segment scarcely if any longer than second........2
   Third antennal segment plainly longer than second........3
2. Eye spot black, mandibles not very broad........*mona* Banks
   Eye spot black, mandibles very broad........*cubanus* Snyder
   Eye spot hyaline........*schwarzi* Banks
3. Eye spot black, gula very broad........*jouteli* Banks
   Eye spot hyaline, gula very slender........*liberatus* Snyder
   Eye spot hyaline, gula slender, anterior margin of pronotum finely serrate .... *bequaerti* Snyder

After an examination of Silvestri's cotypes in 1927, Dr. A. E. Emerson, of the University of Pittsburgh, states that specimens of *Cornitermes* from Panama and Costa Rica determined by me as *acignathus* Silv. are close to type but need varietal or subspecific names. *C. pugnax* Emerson from British Guiana is closely related to, but distinct from, *acignathus*. I am naming the subspecies from Panama after a former Governor of the Canal Zone, Panama, Brigadier General Meriwether L. Walker; the subspecies from Costa Rica is named *costaricensis*.

The dealated male adult of *walkeri* has already been described by the writer under the name *Cornitermes* (*C.*) *acignathus* Silvestri, in the Journal Agricultural Research, U. S. Dept. Agric., Vol. XXIX, no. 4, p. 187, Aug. 15, 1924.

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[1]Adapted from Banks, 1919.

Cornitermes (C.) acignathus Silvestri, **walkeri,** new sub-species.

Soldier.—Head yellow-brown, broadest posteriorly, with a few scattered fairly long hairs.

Frontal tube elongate, slender, upturned, at oblique angle to head.

Mandibles piceous, curved, broad at base, slender, sharp pointed and incurved at apex; marginal teeth as in figure 1. On left mandible, the fine marginal serrations on the apical third are more prominent than in *costaricensis.*

Antenna with 15 segments. Pronotum yellow with long hairs on margins, anterior margin slightly emarginate. Abdominal tergites with numerous long hairs.

Type locality.—Rio Tapia, Republic of Panama.

Described from a series of soldiers collected with workers at the type locality in a decaying log on February 7, 1924, by the writer.

Type, soldier,—Cat. No. 41743, U. S. National Museum.

Cornitermes (Cornitermes) acignathus Silvestri, **costaricensis,** new subspecies.

Soldier.—Head with a distinctive reddish tinge, broadest posteriorly, with scattered fairly long hairs, more numerous than in *walkeri.*

Frontal tube not as elongate or as slender as in *walkeri,* upturned at oblique angle to head.

Mandibles piceous, curved, broad at base, slender, pointed and incurved at apex, marginal teeth as in figure 2.

Antenna with 15 segments, segments more slender than in *walkeri.*

Pronotum yellow, with long hairs on margins, anterior margin very slightly emarginate.

Abdominal tergites with numerous long hairs.

Type locality.—Hamburg Farm, near San Jose, Costa Rica.

Described from a series of soldiers collected with workers, November 26, 1925, by F. Nevermann, in decaying wood.

Type soldier.—Cat. No. 41744, U. S. National Museum.

Measurements	*Cornitermes (C.) acignathus* Silv., subspecies *walkeri* Snyder. Panama.	*Cornitermes (C.) acignathus* Silv., subspecies *costaricensis* Snyder. Costa Rica
Length of head with mandibles	4.70–4.80 mm.	4.50–4.60 mm.
Length of head to base mandibles	3.50–3.60 mm.	3.40 mm.
Length of left mandibles	1.50 mm.	1.40 mm.
Length of frontal tube (from beneath, taken from angle in profile)	0.50–0.55 mm.	0.40–0.50 mm.
Length of hind tibia	2.40 mm.	2.35 mm.
Width of head	3.00–3.01 mm.	2.90–3.00 mm.
Width of pronotum	1.50 mm.	1.40 mm.
Thickness of head not including frontal tube	2.20 mm.	2.10 mm.

Doctor Emerson's summary after examination of the cotypes of *acignathus* is substantially as follows:

The typical soldier of *Cornitermes acignathus* Silv. is somewhat larger than *C. pugnax* Emerson, has a proportionately wider head with a few scattered long hairs; the small serrations anterior to notch in left mandible and posterior to notch are not as distinct as in *pugnax*. Inner edge of right mandible curving convexly anteriorly to notch much more so than in *pugnax*, causing a sharper angle in the notch. Posterior to the notch there is a small concave curve not present in *pugnax*. The species are undoubtedly distinct, but closely related.

The soldier of *C. acignathus* is very close to but a little larger than forms from Rio Tapia, Republic of Panama; the mandibles from the notch out are proportionately a little longer; the frontal tube is proportionately a little shorter (quite perceptibly); the gular region is close. Both the Panama and Costa Rica forms are much closer to the typical form from Ecuador, in regard to the mandibles, than is *acignathus* to *pugnax*. The typical soldier of *acignathus* is very similar to specimens from Hamburg Farm, Costa Rica (near San Jose); the frontal tube is a little smaller, the mandibles from the notch outward are proportionately a little longer; in profile the frontal tube is not as much turned up; the segments of the antennae are conspicuously shorter and thicker proportionately (*pugnax* is intermediate between the two in this respect). The gular region is very similar. The size is about the same.

Cylindrotermes macrognathus, n. sp.

In 1926 (Proc. U. S. Nat. Mus., Vol. 68, art. 14, p. 58–9), the writer referred to a species of *Cylindrotermes* from Panama as possibly *nordenskiöldi* Holmgren described from Bolivia. Recently Dr. Alfred Emerson, of the University of Pittsburgh, has seen Holmgren's type and discovered that the Panama specimens represent a new species with longer mandibles than *nordenskiöldi*. I am naming this species *macrognathus* in contrast to an undescribed species collected by Emerson in British Guiana.

Soldier.—Head yellow, elongate, posterior margin rounded, faint trace of eye spot, with numerous fairly long hairs. Frontal gland opening small, located at apex of epicranial suture. Gula slender at middle.

Antenna with 11–12 segments, third segment showing a tendency to divide.

Mandibles reddish brown, elongate, wide, curved, incurved and sharp-pointed at apex, a single tooth near the base.

Pronotum light yellow, margins with long hairs, anterior lobe distinct, very weakly emarginate in middle.

Abdominal tergites with long hairs.

Measurements.—Length of entire soldier: 4.20–4.60 mm. Length of head with mandibles: 2.25–2.35 mm. Length of head to mandibles: 0.80 mm. Length of pronotum: 0.37–0.40 mm. Length of hind tibia: 0.62–0.70 mm. Width of head: 0.95–1.00 mm. Width of pronotum: 0.65 mm. Hairs on head longer than in *brevipilosus* Sny. from Bolivia; differs from *Nordenskiöldi* by wider head, shorter pronotum and darker, heavier mandibles, and from Emerson's undescribed species by the wider head and the longer mandibles.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from a series of soldiers, collected with workers and nymphs by the writer at the type locality on February 21, 1924; also collected at Rio Chinilla, R. P.

Type, soldier.—Cat. No. 41745 U. S. National Museum.

Specimens collected in 1926 by F. Nevermann at Hamburg Farm, near San Jose, Costa Rica, also appear to be this species.

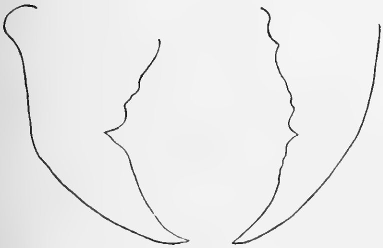

Fig. 1.

Fig. 2.

A HANDBOOK OF THE DRAGONFLIES OF NORTH AMERICA.[1]

By James G. Needham and Hortense Butler Heywood.

This book should be hailed with enthusiasm by students of the American Odonata. It is interestingly and lucidly written and contains keys and other information essential to the identification both of adults and known nymphs, from ordinal to specific rank. The matter is arranged in two parts. The first discusses in a delightful way the natural history of the various forms, and the second contains illustrated, easily assimilated information on the taxonomy of the American species. The descriptive matter is so fully annotated with respect to environment, phenology and behavior as to render it unusually valuable.

The illustrations, consisting chiefly of excellent line drawings, are of practical value throughout and an abridged but well selected bibliography is appended.

The letterpress and binding are all that could be desired and it is no exaggeration to say that this work will be found indispensable by students of the Odonata of North America.—W. R. Walton.

[1]Charles C. Thomas, Springfield, Ill., $7.00 net.

A NEW SCIARID FROM LURAY CAVERN, VIRGINIA (DIPTERA: MYCETOPHILIDAE).

By O. A. Johannsen, *Ithaca, N. Y.*

Sciara luravi, n. sp.

Male.—Head black, subshining; ocelli in a flattened triangle behind the eye-bridges and separated from them by a width greater than twice the diameter of the latter; eye-bridges contiguous, two facets in width which is laterally reduced to one. Face black, in width extending laterad of the middle of the antennal scape. Palpi dark, last segments nearly four times as long as wide. Antennae black, about .8 as long as the wing measured from the humeral cross-vein. Thorax subshining black; hairs blackish, acrostichal and dorso-central hairs short, the former in an irregular double row extending the length of the scutum, the latter more numerous; lateral mesonotal setae black, consisting of 3 or 4 larger and several smaller ones. Scutellum with two larger marginal and several smaller marginal and discal setae. Abdomen including hypopygium subopaque brownish black covered with brownish hairs. Hypopygium without a median setose ventral papilla; claspers resembling those of *S. varians* (Fig. 115, Bull. 200, Me. Agr. Exp. Station) but with the subapical setae on the inner side rather stronger. Legs brownish, fore tibia with one, middle and hind tibiae each with two spurs which are a little longer than the diameter of the tibiae at the tip; hind tibial comb distinct; claws small and simple; empodium well developed. Wings hyaline, veins brownish, posterior ones paler. Branches of M and Cu without setae; sc short; the base of the radial sector about equidistant from the humeral cross-vein and the tip of R_1; R_1 ends opposite or but very slightly proximad of the fork of M; costa produced about .7 of distance from tip of R_1 to M_{1+2}; M_{1+2} ends about mid-way between the tips of R_1 and M_3; branches of M rather straight and only very slightly divergent at tips; r-m longer, the petiole of cubitus over .6 as long as the basal section of M; petiole of M about 5/6 as long as M_{1+2}; anal veins evanescent. Halteres pale to sub-fuscous. Length 2.5 mm.

Female.—Resembles the male in coloring. It differs in having shorter antennae which are about 5/8 as long as the wing measured from the humeral cross-vein, and in being a little larger, measuring 3 mm. in length. The wing measures 3.5 mm. in length from the humeral cross-vein. Some specimens even exceed these dimensions.

Holotype and allotype in U. S. National Museum; paratypes in U. S. National Museum and in my collection.

This species will fall in with *Sciara varians* in my key (Bull. 200 Me. Agr. Exp. Station, 1912), but differs in being distinctly larger, in having proportionally longer antennae and in the longer R_1.

These insects were collected in traps set by Mr. H. S. Barber in Luray Cavern, Virginia. Two ♀ specimens were also collected in Madden's cave. The traps were set last October, deep in the cave, but the collections were not made until April, 1929.

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VOL. 31 MAY, 1929 No. 5

THREE NEW ACALYPTRATE DIPTERA.

By J. M. Aldrich, *U. S. National Museum.*

The following three species have all been reared and the records are of considerable interest. It is therefore thought advisable to publish the species at this time.

Agromyza schmidti, new species.

Resembles *Agromyza melampyga* Loew in having the thorax yellow with a large dorsal spot which does not reach the sides and is deeply excavated behind; also in having a large spot on sternopleura, the rim of the calypter, and the sides of the scutellum black. Differs chiefly in having the black portion of the thorax opaque, with glaucous pruinosity, the prescutellar yellow area not deeply concave in front, the dark mark reaching the scutellum on each side.

Head yellow, the arista, ocellar triangle, and occiput black; frontals four pairs; cheeks at narrowest one-sixth of eye height, wider behind. Dorsocentrals two large pairs behind, three smaller anterior to them; acrostichals coarse and rather irregular, none on yellow prescutellar area; two pairs of scutellars; a brown spot on humerus, another very small behind it, a small vertical brown stripe below wing; halteres yellow. Abdomen black above, not shining, indistinctly yellow at sides; hairs of tergites coarse and rather abundant; ovipositor of female black, very short. Legs yellow, hind knees and all tarsi brownish. Wings hyaline, costa reaching fourth vein; last section of fifth vein a little more than twice the preceding; anterior crossvein on the middle of the discal cell. Length, .8 to 1 mm.

Described from seven males and four females, reared at San Jose, Costa Rica, by H. Schmidt, from larvae making serpentine mines in leaves of *Gliricidia maculata.* Named in honor of Mr. Schmidt, a valued collaborator of the National Museum.

Type.—Male, Cat. No. 41413, U. S. N. M.

Phytomyza atripalpis, new species.

Female.—Black, including legs and antennae, the halteres and most of the head yellow. Front yellow, about half as wide as the head; the ocellar triangle subshining black; four pairs of frontal bristles (apparently only three pairs in the paratype); frontal orbits with minute proclinate hairs. Face yellow, the shallow antennal grooves reaching to the oral margin; cheek yellow, about half the eye height, scarcely higher behind than in front. The yellow color extends up behind the eye two-thirds of the way to the vertex. Proboscis yellow; palpi very distinctly enlarged at apex, shining black. Antennae entirely black, of moderate size; third joint round, not pilose; arista strongly thickened on basal third, microscopically a little pubescent.

Thorax cinerous, with a minute yellow line below the notopleural suture; acrostichal in two rows; dorsocentral 4, 3 being behind the suture; scutellum with 4 bristles. Pleurae black with one bristle above front coxa, one accompanied by two hairs on hind edge of mesopleura and one on upper hind part of sternopleura before which is a small hair; halteres lemon yellow.

Abdomen black with a trace of a yellow hind margin on the first three segments and a very distinct whitish posterior border on the fifth; sixth segment (base of ovipositor) shining black, cylindrical, nearly as long as the two preceding segments.

Legs entirely black, or with exceedingly narrow indication of yellow on the tips of the femora. Wing subhyaline, auxiliary vein ending in the costa close to the first. Costal section between first and second almost four times as long as that between second and third.

Length, 1.9 mm.

Described from two females from British Columbia "received as pupae amongst seeds of *Anemone multifida* in Nov. 1927," by G. Fox Wilson of the Royal Horticultural Society Gardens, Wisley, Surrey, England, who sent them to me for identification.

Type.—Female, Cat. No. 41708 U. S. N. M.

The paratype was returned to Mr. Wilson, who deposited it in the Canadian National Collection.

Oscinella dampfi, new species.

Female.—Of elongated form like *Oscinella longipes* Loew, but the posterior half of the mesonotum distinctly flattened, the eye narrower and more diagonal in position, etc. Shining black, the trochanters and base of middle and hind tarsi, and the knees very narrowly, yellow. Frontal triangle polished, very large, reaching the lunule. Antennae black, of ordinary size, third joint rounded, arista rather short and slightly pubescent under a power of 35 diameters; palpi black. Back of head bulging, from the neck forward as wide as the eye in profile. Cheek one-third eye height. Thorax with delicate dark hairs, which are pale only in certain angles of light, the flattened posterior part aciculate, the scutellum rounded, scabrous, with two pairs of minute bristles, the apical upright. Pleurae shining black, broadly concave from front coxa to just below the wing, where it is bulging; mesosternal region flat, with distinct whitish hair. Halteres whitish. Abdomen shining black, distinctly elongated, at base below a little pale. Wings hyaline, costal segment between first and second veins hardly double that between second and third, fourth vein ending in or barely behind exact apex, alula little developed.

Length, 1.8 to 2.2 mm.

Described from three females, reared by Dr. Alfons Dampf from rotten ears of maize at San Jacinto, D. F., Mexico. One of the paratypes is returned to him.

Type.—Female, Cat. No. 41885 U. S. N. M.

The generic position of the species is a little doubtful. The flattened thorax is much like *Melanochaeta longula* Loew, a common North American form; but in that genus the arista is densely pubescent, appearing thickened. On account of the similarity of *Oscinella longipes*, I place *dampfi* in the same genus.

The genus Oscinella was proposed by Becker (Arch. Zool., vol. 1, 1910, p. 150) in the sense of *Oscinis* of authors, since the latter contained when first proposed no species belonging to the present group. *Musca frit* Linnaeus 1758 is hereby designated the genotype.

A STUDY OF MARLATT'S GROUP I OF THE GENUS PONTANIA WITH DESCRIPTIONS OF FOUR NEW SPECIES (HYMENOPTERA: TENTHREDINIDAE).[1]

By H. H. Ross, *Illinois State Natural History Survey, Urbana, Illinois.*

In 1927–28 the author reared a species of *Pontania* O. Costa which proved to be new to science, whose larvae had caused a leaf-fold of poplar. This species infested a large number of *Populus balsamifera* in Vancouver, British Columbia, in 1927. Since biologically the species seemed identical with several other species, the adults of which differed only in minute structural characters, it was necessary to give the group to which it belonged a fairly thorough survey. This paper is the result of that study. The types of all the species considered have been studied, as well as those of some species belonging to other groups of the genus. It has been found necessary to recognize four new species in the group, the descriptions of which follow; and since several other species have been described since the group was keyed by Marlatt (1896), a key is given for the separation of all the nearctic species known to the author.

Pontania mariana new species.

Female.—Length 5.5 mm. Robust, head nearly as wide as thorax. Labrum wide and truncate, clypeus circularly emarginate, the cleft moderately deep, the lobes broad and rounded; supraclypeal area convex, shining and prominent; tentorial foveae large and pit-like, confluent with area about antennae. Vertex finely punctate, dull; antennal furrows represented by only a crease opposite

[1]Contribution No. 133 of the Entomological Laboratories of the University of Illinois, Urbana, Illinois.

posterior ocelli; vertical furrows and postocellar furrow each represented by a line; ridges of the head variable, but with the median fovea shallowly funnel-shaped, the frontal crest usually weak, almost obsolete, although sometimes well defined, cut by a narrow linear furrow extending from the median fovea to the median ocellus; walls of ocellar basin ridge-like, distinct laterally but either present or nearly obsolete posteriorly. Antennae relatively short, third and fourth segments subequal, distinctly longer than fifth. Dorsum of mesothorax finely punctate, dull, one and one-half times as long as wide. Wings hyaline, costa, subcosta and stigma yellowish hyaline, veins blackish-brown. Stigma three times as long as wide, widest near base, evenly rounded to an acute tip. Tarsal claws cleft for one-third their length, rays coarse, subequal, widely divergent. Sheath slightly convex above, evenly emarginate below, finely pointed at tip, and densely hairy with outward-, then up-curving setae (Fig. 1).

Color of head, pleurae, legs, and venter mostly yellowish red, with the following parts black: antennae, large spot on vertex from antennae to occiput, dorsum of meso- and metathorax, dorsal portion of meso-epimeron, and dorsum of abdomen, except lateral margins of segments 3–6, and segments 7 and 8 entirely, which are the color of the venter. Apex of sheath, extreme apex of posterior tibiae, apical segments of tarsi above, and posterior tarsi entirely, infuscated.

Male.—Similar in structure to the female. Hypopygium as long as three-fourths of the ventral length of the rest of the abdomen, the lateral margins of the apex slightly sinuate, converging relatively sharply, at slightly less than a right angle, the extreme tip round-pointed. The procidentia is broad and flat, very little produced, convex above, hardly carinate basally, the tip broadly rounded. Color as in the female, but with the pleural sutures washed a trifle more with black, and with the dorsum of the abdomen entirely black except a narrow yellowish red lateral portion.

Larva.—Typical for the genus. Since the larvae of closely related species could not be obtained, no comparative description can be drawn up.

Leaf-fold.—Similar to that described and figured by Cooley (1903). Produced by a folding-under of a lateral area near the base of the leaf. The fold is flat. A crescentic row of punctures is made on the upper part of the leaf, just within the edge of the turned-under portion. One or two folds may be made on one leaf; if two, then one on each side. Little feeding is done within the fold, but the adjacent apical portion of the leaf is badly eaten.

Holotype.— ♀, Vancouver, British Columbia, Canada, reared from *Populus balsamifera*. Cocoons spun October 10, 1927, adults emerged June 4, 1928. Deposited in the collection of the author.

Allotype. ♂, same data. Deposited with holotype.

Paratypes.—4 ♀ ♀, same data. Deposited in the collections of the Canadian National Museum, the Illinois State Natural History Survey, the U. S. National Museum, and the author.

The female of this species may be separated from *nevadensis* by the shape of the sheath and the obsolete frontal crest, the male by the latter character, and from the other members of the group by the characters given in the appended key.

Pontania marlatti, new species.

Female.—Length 5.5 mm. Body robust. Head above antennae opaque, finely shagreened; clypeus circularly emarginate, lobes wide and rounded; supraclypeal area wide and prominent, flattish; tentorial and antennal foveae confluent, deep and declevitous; antennal furrows obsolete, vertical furrows represented by a puncture behind posterior ocelli; walls of ocellar basin practically obsolete, ocellar basin obsolete, ocellar fovea a small, depressed, shining area anterior and adjacent to the median ocellus; third and fourth segments of antennae subequal, slightly longer than fifth. Anterior and lateral lobes of mesonotum minutely punctate, dull, scutum and postscutellum shining; tarsal claws deeply cleft, the inner ray slightly smaller and shorter than outer; stigma two and one-half times as long as wide, upper and lower margins parallel for basal half, evenly rounded at tip. Sheath (Fig. 3) thick and stocky, distinctly shouldered on ventral margin, emarginate near tip, dorsal margin convex; lateral surface shouldered slightly near dorsal margin; setae numerous and fine; cerci almost attaining length of sheath.

Color of body black, the inner and posterior orbits yellow-rufescent, the following parts luteus to yellow: mouthparts and genae, clypeus, inner lower orbits, latero-posterior margins of collar, tegulae, costal veins and stigma at base, legs except base of coxae, narrow upper and lower margins of femora, tip of hind tibiae and hind tarsi which are blackish or fuscous, and cerci. Apex of stigma reddish. Veins of wing blackish.

Holotype.— ♀, Oregon (Koebele). Deposited in the U. S. National Museum. Easily differentiated from *agama* Roh. by the shouldered sheath (Figs. 2 and 3).

I take great pleasure in naming this species after C. L. Marlatt, the first worker to put the nearctic Nematinae on an easily understood basis.

Pontania agama, Rohwer.

Pontania agama Rohwer, Proc. U. S. Nat. Mus., Vol. 43, p. 242, Sept. 30, 1912. ♀.

Pontania foveata Rohwer, *ibid*, p. 243. ♀. *New synonymy.*

A study of the types of these two forms, together with a large series of material from the typic locality, indicates that they are conspecific, and that *foveata* represents only an individual variation of *agama*.

Pontania populella, new species.

Female.—Length, 6 mm., body robust. Head shining; clypeus shallowly circularly emarginate, lobes very broadly angulate; supraclypeal area prominent, flattish; tentorial foveae large, pit-like, confluent with depression around base of antennae; antennal furrows obsolete, vertical furrows a line, postocellar furrow obsolete; walls of ocellar basin not raised, ocellar basin only a general shallow area; third and fifth segments of antennae subequal, fourth longer than either. Mesonotum smooth, postscutellum evenly and minutely punctate. Tarsal claws deeply and coarsely cleft, rays subequal in length, the inner one the stouter. Stigma two and one-half times as long as broad, widest at middle evenly rounded beneath; sheath shining, dorsal margin very slightly emarginate at tip, ventral margin distinctly emarginate, point subconical; setae fine, relatively short. Sheath varies a little in shape, the extremes represented by Figure 4 (the holotype) and Figure 7 (a paratype).

Color of body resinous-yellow, except mandibles, sheath, and tips of hind femora, which are reddish, and the following parts which are black: second segment of antennae, flagellum above, small spot on front directly above base of antennae, spot on vertex including ocelli and postocellar area except two transverse lateral pale areas, mesonotum except sides of anterior lobe, two lateral spots on postscutellum, and posterior margin of lateral lobes, metanotum, basal plates dorsally, and a triangular median area on dorsum of abdomen, widest at base and decreasing towards apex. Wings hyaline, veins below costal area blackish except at base. In some specimens the black on the dorsum is reduced in extent.

Male.—Similar to female, differing as follows: third antennal segment sometimes as long as fourth (varying on same specimen); clypeus narrow and therefore more deeply emarginate; black on head extending over walls of ocellar basin half-way to eye; entire dorsum of thorax and abdomen black. Hypopygium broadly rounded at apex.

Holotype.—♀, Aweme, Manitoba, Canada, May 8, 1910 (N. Criddle). Bred from cottonwood leaves. Deposited in the Canadian National Museum.

Allotype.—♂, Brookings, South Dakota, June 23, 1891. In the collection of the author.

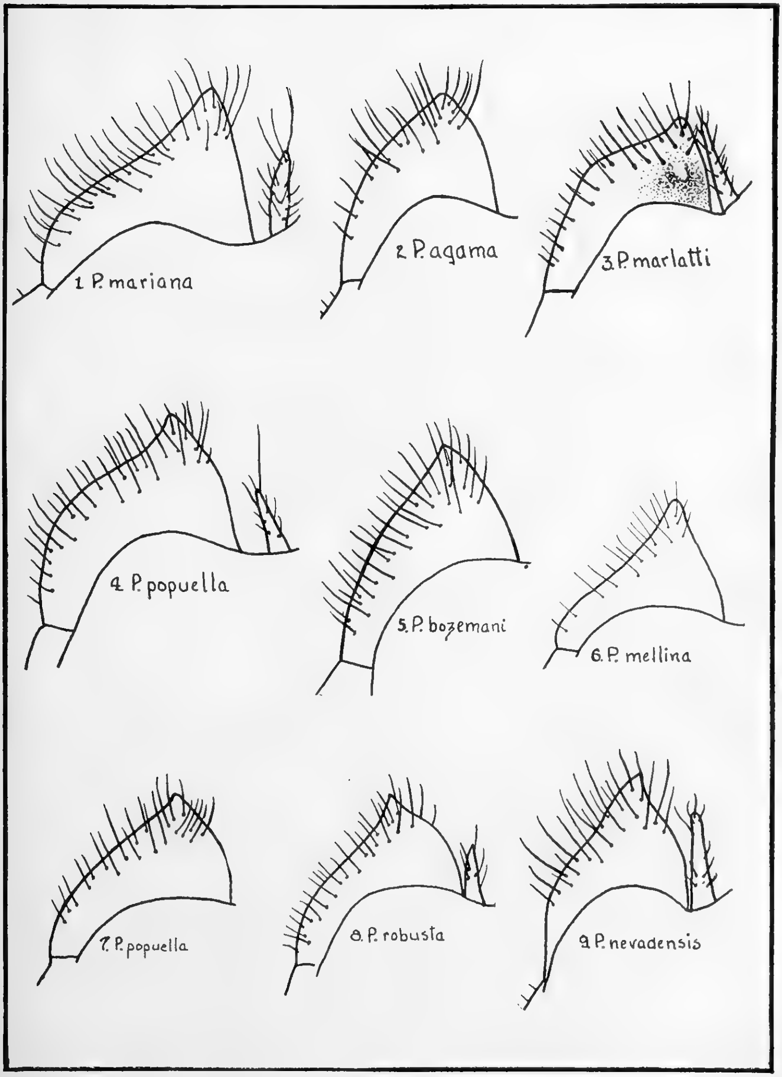
Paratypes.—2 ♀♀, June 20, 1913; 5 ♀♀, May 6–9, 1910; 1 ♀, June 13, 1911, all at Aweme, Manitoba, bred from cottonwood leaves (N. Criddle); 5 ♂♂, 1 ♀, Brookings, South Dakota. In the collections of the Canadian National Museum, U. S. National Museum, Illinois State Natural History Survey, South Dakota State College and the author

The female can be separated by characters given in the key.

Specimens which are considered as the males of this species agree closely with the type of *P. agilis* Cresson, but also agree with the males of species in other groups. It is therefore considered wiser to describe the females as distinct, although the name may later fall as a synonym of *agilis*. The female described as *P. agilis* by Marlatt (1896) seems to be *P. bozemani* Cooley.

Pontania pepii new species.

Female.—Length 6.5 mm. Robust, head nearly as wide as thorax. Clypeus arcuately emarginate, cleft one-half its length, the lobes broad and rounded; tentorial foveae deep and pit-like, confluent with area around base of antennae; head above antennae shining, slightly wider behind eyes than through them,



Sheathes of Pontania.

postocular area robust; antennal furrows interrupted above antennae, represented posteriorly by broad shallow depressions; vertical furrows deep and trenth-like for anterior two-thirds, line-like for posterior third; postocellar area nearly three times as broad as long; postocellar furrow faint and line-like; lateral walls of ocellar basin nearly obsolete, wide, shining and flat, ocellar basin only very slightly depressed; median fovea shallow and saucer-like, ocellar fovea likewise, but slightly larger. Third and fourth segments of antennae subequal, fifth slightly shorter, sixth only two-thirds as long as fifth, remainder subequal, and shorter than sixth. Thorax shining, finely setose, postscutellum punctate. Stigma narrow and acuminate, two and one-half times as long as wide, the lower margin straight. Tarsal claws not deeply cleft, the two rays subequal, very little separated. Sheath as in Figure 8; ventral margin undulate and emarginate near tip, dorsal margin nearly straight basally, but sharply convex at apex; point small but sharp.

Color mostly black. Antennae, dorsum of head except posterior-lateral area, pro-pleurae, mesal portion of collar, dorsum of thorax, pleurae except small yellowish spot, pectus, metapleurae, small mark at base of hind coxae, dorsum of abdomen except last tergite, and lateral and ventral portion at base, black; remainder of head and collar, tegulae, costa and basal two-thirds of stigma, luteous; spot on pleurae, legs, venter and sides of abdomen except at base, and sheath, fuscous.

Holotype.—♀, Florence, Montana, June 1, 1912. In the collection of the author.

This species is most closely related to *robusta* Marl., *bozemani* Cooley, *mellina* (Cress.), and *popuella* n. sp., from which it can be separated by the black pectus and pleurae; it also differs from *robusta* and *popuella* in having the antennae almost entirely black, and from *bozemani* and *mellina* in the shape of the sheath.

Marlatt's Group I of *Pontania* Costa, includes those species which have the sheath pointed at the tip, and emarginate on the ventral margin. The following species known to the author belong to this group: *tundra*, *leaviti*, *parva*, *nigrita*, *melanosoma*, *pallicornis*, *marlatti*, *agama*, *pepii*, *nevadensis*, *mariana*, *mellina*, *bozemani*, *robusta* and *popuella*. These may be separated by the following key:

1. Pleurae black, or with a small pale spot 2
   Pleurae pale 10
2. Femora black .... *tundra* Kincaid
   Femora in great part luteous 3
3. Lateral walls of ocellar basin distinct 4
   Lateral walls of ocellar basin wanting, or mound-like and indistinct 8
4. Ocellar basin deep, shining .... *leaviti* Rohwer
   Ocellar basin shallow, shagreened, dull 5
5. Femora linearly infuscate along edges .... *parva* Cresson
   Femora luteous, or infuscate at base 6

6. Lateral walls of ocellar basin low, basin scarcely excavated....*nigrita* Marlatt
   Lateral walls of ocellar basin distinct, basin well excavated....7
7. Lateral walls linear, sharp, frontal crest of same height, the ocellar basin bounded by perpendicular walls....*melanosoma* Rohwer
   Lateral walls wide and sloping, the frontal crest mound-like, higher than lateral walls, ocellar basin saucer-like, with sloping walls.... *pallicornis* (Norton)
8. Dorsum of head dull, shagreened; lateral walls of ocellar basin obsolete....9
   Dorsum of head shining, not shagreened; lateral walls of ocellar basin indistinct and mound-like....*pepii* n. sp.
9. Sheath shouldered laterally....*marlatti* n. sp.
   Sheath not shouldered laterally....*agama* Rohwer
10. Lateral walls of ocellar basin ridge-like, distinct and linear....11
    Lateral walls of ocellar basin rounded, not ridge-like, ocellar basin subobsolete....13
11. Frontal crest obsolete, represented by a flat area....*mariana* n. sp.
    Frontal crest raised, distinct....12
12. Pectus pale....*nevadensis* (Cresson)
    Pectus black or stained....*nevadensis* var. *nigripecta* Rohwer
13. Flagellum of antenna entirely black....14
    Flagellum of antenna pale beneath, for entire length or at apex....15
14. Abdomen entirely pale; sheath short and wide, as in Figure 6.... *mellina* (Cresson)
    Abdomen black at base of dorsum; sheath longer than wide, as in Figure 5 *bozemani* Cooley
15. Antennae short, terminal segment 2–3 times as long as broad.... *robusta* Marlatt
    Antennae long, terminal segment 4–5 times as long as broad.... *Popuella* n. sp.

To further aid in differentiating the species here described as new the sheaths are illustrated of these and the species to which they are most closely allied (see figure).

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1. C. L. Marlatt, 1896. Revision of the Nematinae of North America. Bull. U. S. Dept. Agric., Div. Ent., Tech. Ser., No. 3, 135 pp., 1 pl.
2. R. A. Cooley, 1903. A New Sawfly. Can. Ent., Vol. XXXV, No. 7, July, pp. 197–198, w. 1 fig.

THE USE OF CARBON DIOXIDE TO INCREASE THE INSECTICIDAL EFFICACY OF FUMIGANTS.

By R. T. Cotton, *Senior Entomologist, U. S. Bureau of Entomology,*
and
H. D. Young, *Assistant Chemist, U. S. Bureau of Chemistry and Soils.*

It is well known to those who work with fumigants that insects in an inactive state are relatively more resistant to the effect of fumigants than when they are active. Any agent therefore that will activate an insect or stimulate the respiratory processes—for it is by penetration into the tracheal system that a gas is most quickly effective—should render more effective the fumigant with which it is used.

An increase in temperature has, up to a certain point, a stimulating effect upon the respiratory processes, and greatly increases the susceptibility of an insect to a toxic gas. It should be noted, however, that the apparent increase in toxicity of a fumigant with an increase in temperature may be owing in part to a reduction of the absorption capacities of the media containing the insects. The use of heat to increase the toxicity of a fumigant is a common practice but its value is limited.

Many gases are believed to cause insects to close their tracheal valves, but a few are known that apparently have the property of stimulating the respiratory processes of insects and consequently are capable of rendering more effective the fumigants with which they may be used. Sanders and Pestell observed that the addition of ammonia increased the insecticidal effect of nicotine. In an application for a patent, filed September 1, 1922,[1] they make the statement, "The object of our invention is to provide a nicotine dust with which insects of the above character may be readily exterminated, in as much as our composition contains not only nicotine in a volatile form but also ammonia, which appears to increase the effect of the nicotine upon the insects, owing, probably, to the increase in the respiratory function of the insects." Owing to the corrosiveness of ammonia and the readiness with which it is absorbed it is doubtful whether it will ever be of practical value in admixture with other gases for general fumigation work.

Brinley and Baker[2] observed that "A small amount of methyl acetate added to liquid hydrocyanic acid gas seemed to increase the toxicity of the gas arising from the liquid, which may be due to the fact that a small amount of methyl acetate kept the spiracles open, while in pure hydrocyanic acid gas the spiracles were quickly closed."

The writers have found that the placing of a small quantity of methyl acetate in a fumigation chamber, prior to administering a fumigant, resulted in an apparent increase in toxicity of the fumigant. Roark and Cotton[3] found that methyl acetate alone was not highly toxic to the rice weevil, *Sitophilus oryza*. The minimum lethal dose as determined by them in half-liter glass

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[1]Sanders, G. E., and Pestell, R. H., U. S. Patent No. 1,577,369, Mar. 16, 1926.

[2]Brinley, F. J., and Baker, R. H., Biol. Bull., Vol. LIII, pp. 201–207, Sept., 1927.

[3]Roark, R. C., and Cotton, R. T. Tests of Certain Aliphatic Compounds as Fumigants. (In manuscript.)

flasks half-filled with wheat was 192 mg. per liter. The fact that the vapor of methyl acetate is highly flammable is a drawback to its use, since the addition of even small quantities to other fumigants would increase the fire hazard.

In 1928 Hazelhoff[1] published a short note in which he stated that in the course of his studies on the regulation of respiration in insects he had observed that carbon dioxide had a marked effect not only on the ordinary respiratory movements of insects but also on the tracheal valves. He found that "The cockroach, *Periplaneta americana* e. g., displays no respiratory movements when at rest (at room temperature), and its tracheal valves are nearly closed; when the animal is brought into an atmosphere containing 2 or 3% carbon dioxide, the spiracles open immediately, thus allowing a more rapid diffusion of the respiratory gases. When the carbon dioxide pressure is raised to about 7 or 10% or more, ordinary respiratory movements of the abdomen appear. The width of the spiracle opening turned out to be regulated normally by the amount of carbon dioxide pressure in the immediate neighborhood of the spiracles." He suggested that carbon dioxide might therefore have the same effect as methyl acetate when mixed with hydrocyanic-acid gas or other respiratory insecticides, i. e., to accelerate the penetration of such gases and to increase their insecticidal action.

In many ways carbon dioxide is admirably adapted for such a part. It is easily handled, relatively inexpensive, readily available, non-injurious to man, non-injurious to merchandise, is non-flammable, and in addition removes or reduces the fire hazard connected with the use of fumigants with which it is mixed. It is compatible with all the common fumigants.

Carbon dioxide has frequently been recommended as a fumigant, but when used alone has never proved very satisfactory. Of the many reports regarding its insecticidal properties, the most exhaustive known to the writers is that of Dendy and Elkington,[2] published in 1920. They found that specimens of the rice weevil, *Sitophilus oryza*, were readily killed with carbon dioxide in admixture with air and that up to a certain point the higher the initial concentration of carbon dioxide the more rapid was the lethal effect. With an initial carbon dioxide concentration of 14 per cent rice weevils survived for about 12 days, with a percentage of about 79 the weevils were all killed in 21 hours. On the other hand weevils confined in pure carbon dioxide for 20 hours all recovered and others confined in the pure

[1]Hazelhoff, E. H., Jour. Econ. Ent., v. 21, no. 5, p. 790, 1928.

[2]Dendy, A., and Elkington, D. Report on the Effect of Air-tight Storage upon Grain Insects. Part III, Royal Soc. Rpt. Grain Pests (War) Committee, no. 6, pp. 1–51, 1920.

gas at temperatures lower than normal recovered after 13 days' confinement. Apparently pure carbon dioxide acts as a narcotic, under the influence of which insects may remain inactive for a considerable period, without losing their power of recovery.

The writers recently conducted a series of experiments to determine the value of carbon dioxide in admixture with other fumigants, and to determine the possibility of its commercial application. In the first series of experiments, fumigation tests were conducted with specimens of the flour beetle, *Tribolium confusum* Duv., in 6-liter glass flasks. Ethylene dichloride at the rate of 63 mg. and 84 mg. respectively, per liter, and methyl chloroacetate at the rate of 4 mg. per liter were used alone and with varying concentrations of carbon dioxide. The results obtained are given in Table I.

In the preceding experiments the carbon dioxide was run into the flasks first and allowed to stand a few minutes before the fumigant was added. As may be seen from the data in Table I, ethylene dichloride used alone at the rate of 63 mg. per liter killed only 50 per cent of the flour beetles in 5 hours, whereas when the same dosage was used in combination with 330 mg. of carbon dioxide per liter 100 per cent kill was obtained in 3 hours. When used at the rate of 84 mg. per liter ethylene dichloride alone gave a 100 per cent kill in 4 hours, and in combination with 330 mg. of carbon dioxide per liter a 100 per cent kill was obtained in 1 hour. Similarly a dosage of 4 mg. per liter of methyl chloroacetate used alone gave a 100 per cent kill in 5 hours and in combination with 330 mg. of carbon dioxide per liter a 100 per cent was obtained in 1 hour.

Further experiments were conducted in the 6-liter flasks with carbon disulfide and chloropicrin. Carbon disulfide when used alone at the rate of 250 mg. per liter gave a 100% per cent kill in 2¾ hours, and the same dosage in combination with 330 mg. per liter of carbon dioxide gave a 100 per cent kill in 1½ hours. With chloropicrin the results were more striking. When used alone at the rate of 17 mg. per liter a 100 per cent kill was obtained in 90 minutes, whereas with the addition of 330 mg. per liter of carbon dioxide the necessary exposure to kill 100 per cent of the flour beetles was reduced to 20 minutes, or less than a fourth of the time.

From an examination of the data in Table I a dosage somewhere between 165 mg. and 330 mg. per liter (or 10 and 20 lbs. per 1,000 cu. ft.) of carbon dioxide would, from the standpoint of economy and efficiency, appear to be most satisfactory for general fumigation work. In subsequent experiments a dosage about midway between the two proved to be very efficient.

Since the use of carbon dioxide in combination with other fumigants is particularly adapted for vacuum work, experiments

TABLE I.

Lethal effect upon adults of *Tribolium confusum* of ethylene dichloride and methyl chloroacetate, alone and in combination with carbon dioxide in 6-liter flasks.

Length of exposure in hours.	*Per cent kill with ethylene dichloride 63 mg. per liter.*						*Per cent kill with ethylene dichloride 84 mg. per liter.*					*Per cent kill with methyl chloroacetate 4 mg. per liter.*				
		With carbon dioxide, per liter.						*With CO_2, per liter.*					*With CO_2, per liter.*			
	Alone.	*42 mg.*	*83 mg.*	*165 mg.*	*330 mg.*	*660 mg.*	*Alone.*	*42 mg.*	*83 mg.*	*165 mg.*	*330 mg.*	*Alone.*	*42 mg.*	*83 mg.*	*165 mg.*	*330 mg.*
1	0	5	80	10	50	50	25	80	35	85	100	5	15	15	65	100
2	0	75	90	80	95	100	35	50	95	100	100	10	60	40	65	100
3	40	65	100	95	100	100	50	100	100	100	100	60	90	75	100	100
4	20	85	100	100	100	100	100	100	100	100	100	70	100	100	100	100
5	50	80	100	100	100	100	100	100	100	100	100	100	100	100	100	100

were conducted in a small vacuum tank to determine its possibilities. Specimens of the rice weevil, *Sitophilus oryza*, and the flour beetle, *Tribolium confusum*, were buried in the middle of tightly sealed cartons of rice and the vacuum tank was filled with these packages. Ethylene oxide was used as the fumigant. When used alone at the rate of 3 pounds[1] to 1,000 cubic feet this fumigant gave a 100 per cent kill in 3 hours, when used in combination with carbon dioxide at the rate of about 14 pounds to 1,000 cubic feet, the same dose gave a 100 per cent kill in 45 minutes, or in one-fourth of the time. To obtain a perfect kill in 45 minutes without the use of carbon dioxide it required slightly more than 6 pounds to 1,000 cubic feet of the fumigant, or more than twice the dosage.

Carbon dioxide is at present being used to some extent in commercial vacuum fumigation in combination with carbon disulfide.[2] It is used in very heavy concentrations with the purpose of reducing the fire hazard connected with the use of carbon disulfide and not for the purpose of increasing the toxicity of the fumigant.

Conclusion.

Carbon dioxide in admixture with the vapors of ethylene dichloride, methyl chloroacetate, carbon disulfide, chloropicrin, and ethylene oxide appears to be of considerable value for fumigation purposes. It accelerates the toxic action upon insects of these vapors to such an extent that the dosage or length of exposure may be greatly reduced. It is non-injurious to man and to the merchandise fumigated and has the added advantage of removing or reducing the fire hazard of inflammable fumigants.

A NEW AGRONUS FROM CANADA (COLEOPTERA: OTIORHYNCHIDAE).

By L. L. Buchanan, *U. S. Biological Survey*.

The species described below is one of the many interesting discoveries of Mr. F. S. Carr of Medicine Hat, Alberta.

Agronus carri, n. sp.

20 specimens, apparently all females. Length, 3¼ to 4 mm.; width, 1.26 to 2.01 mm. Body stout; vestiture above consisting of short, stout, sub-erect setae, and pale, subcircular scales with a faint pearly luster; scales slightly

[1]Three pounds per 1,000 cubic feet are equivalent to 48 mg. per liter.

[2]U. S. Patent 1,668,068, May 1, 1928, states that 740 cu. ft. of carbon dioxide is used with 200 cubic feet of carbon disulfide.

separated or contiguous, at most not more than narrowly overlapping, and allowing numerous points of the shining black surface chitin to show through; abdomen sparsely hairy, sides of 1st and 2d segments with a few scales; rest of under surface rather sparsely scaly.

Rostrum a little shorter than in *cinerarius*, similarly concave above, upper margins of scrobes not quite so strongly convergent backward; rostrum and head longitudinally strigose; scape 2/3 as long as funicle, and with a few, narrow, not appressed scales on apical portion (in addition to the setae); funicle distinctly shorter than in *cinerarius*, though the relative lengths of the segments are about the same. Eyes small, nearly round, rather prominent. Pronotum unevenly, subrugosely punctured, the scaly covering incomplete and leaving exposed many of the larger, seta-bearing punctures; sides of prothorax feebly rounded, slightly constricted at base and apex, the latter narrower. Elytral intervals broad and flat, the setae numerous and confused; scales, as a rule, a little more condensed and just visibly paler for a short distance behind scutellum; serial punctures rounded, close-set (separated by their own diameter or less), the rows more or less interrupted or obscured by the encroachment of scales. Legs scaly and setose, 1st tarsal segment shorter than in *cinerarius*. Abdominal punctures on 1st to 4th segments very fine and sparse or obsolete, on 5th segment small and rather sparse, but distinct; middle half of 1st and 2d segments transversely strigose on most specimens; apical half of 1st, and basal half of 2d, with a common flattened or concave area. Inter-coxal piece narrower than in *cinerarius*, and with a slightly arcuate suture between it and metasternum (suture is straight in *cinerarius*).

Type locality.—Medicine Hat, Alberta (F. S. Carr) (on sage brush).

Other locality.—Chilestin, British Columbia (E. R. Buckell).

Type and 13 paratypes returned to Mr. Carr. Type to be deposited in Canadian National Collection; 2 paratypes, Cat. No. 41754, in U. S. National Museum Collection; 1 paratype in Biological Survey collection; 1 paratype in collection of Ralph Hopping; 2 paratypes in collection of writer.

In *cinerarius*, the elytral intervals are narrower, with the scales more crowded and almost completely covering the surface chitin. The scales are largely confined to the intervals, —i. e., they do not noticeably encroach on the strial rows, the latter, in most specimens, being rather sharply defined throughout their length. The male of *cinerarius* has a concavity or transverse depression near apex of last ventral segment.

The three species of *Agronus* are separable as follows:

1. Scape, when laid across middle of eye, reaching distinctly past its hind margin 2

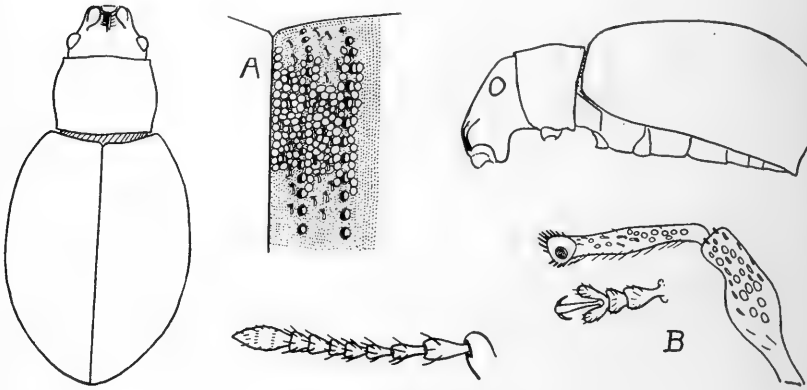
1a. Scape not or barely attaining hind margin of eye; last ventral segment flat or feebly convex, not transversely depressed apically (probably a female character) 3

2. Elytral setae short, blunt, in a confused single or double row along each interval; scales above denser, those on sutural, third, and fifth intervals often paler, the latter two intervals sometimes a little wider than the others; strial rows generally sharply defined; form more elongate; Calif. (Placer and Siskiyou Cos.).. *cinerarius* Horn.

2a. Elytral setae long, fine, acute at tip, in a double row along each interval; strial rows feebly defined, interrupted in numerous places by the encroachment of scales; body stouter; Calif. (San Francisco), (Horn).... *deciduus* Horn

3. Elytral setae short, stout, blunt at tip and in a confused double or triple series along each interval; intervals broad and flat; strial rows as in *deciduus;* body still stouter; Alberta and B. C.................................. *carri* n. sp.

Mr. E. T. Cresson, Jr., kindly furnished data regarding the type of *deciduus* Horn.



Agronus carri, n. sp.

A, base of elytra showing strial punctures and arrangement of vestiture.
B, fore leg.

CORRECTION OF LEGEND FOR PLATE 5 OF THE PREVIOUS ISSUE.

Through an unfortunate editorial error the name "Pecilogonalos henicospilus Rohwer" appears under plate 5, page 80, in the issue of May 4, 1929. The following name should be substituted for this: Poecilogonalos thwaitesii (Westwood).

—*Editor.*

Actual date of publication, June 21, 1929.

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VOL. 31 JUNE, 1929 No. 6

FURTHER NOTES ON INSECT INHABITANTS OF BIRD HOUSES.

By W. L. McAtee.

In these Proceedings for April, 1927 (Vol. 29, No. 4, pp. 87–90), the writer reported on insects and certain other small organisms found in or bred from bird houses at Bell, Md., during the season of 1926. The present paper is a similar report for the season of 1927.

Assistance by identification of organisms upon which they specialize is gratefully acknowledged from J. R. Malloch and L. L. Buchanan of the Biological Survey, Aug. Busck, Adam Böving, E. A. Chapin, H. G. Dyar, H. E. Ewing, and A. B. Gahan of the Bureau of Entomology, and Paul Bartsch and C. R. Shoemaker of the National Museum.

Corrections and additions to the previous report may be noted as follows: the puparia there listed as sarcophagid were chiefly those of *Protocalliphora;* the *Tinea* sp. doubtless is the same as that positively identified in 1927 as *T. fuscipunctella* Haworth; and the *Atheta* sp. is now provisionally identified as *Microglotta nidicola* Fairmaire.

Points in the 1927 findings of special interest are: the fact that rather heavy infestations of the parasitic flies (*Protocalliphora splendida*) are not especially destructive to nestling birds; we found no entire broods killed, in fact only an occasional individual nestling the death of which may have resulted from attacks of these parasites; from 50 to 65 per cent mortality of the *Protocalliphora* due to parasites and predators shows that balancing factors are operating in favor of the birds; the finding of living adults of the beetles (*Gnathoncus communis* and *Ptinus brunneus*) in closely fitting cavities inside bird droppings, and of those of the first named species and of *Attagenus piceus* inside of puparia of *Protocalliphora* into which they must have gained entrance as very small larvae, cases practically bridging the gap between scavenger and parasite; the common occurrence in the nests of the tachinid fly *Plectops pruinosa* with no evidence as yet as to its rôle; and finally the astonishing abundance of scavengers, predators, and parasites in some of the nests.

Records of occurrence are analyzed in the sequel, first, under species of birds and secondly, under entries for each kind of inquiline identified.

STARLING (*Sturnus vulgaris*).

The contents of 7 nest boxes in which broods of starlings had been reared were analyzed. The starling is very untidy in its housekeeping with the result that the nest becomes a paradise for scavengers.

Isopoda.

Porcellionides pruinosus Brandt. A single specimen from one house, July 8.

Corrodentia.

Troctes divinatorius Muller. In 5 nests, numerous in 2, July 8.

Lepidoptera.

Epizeuxis americalis Guenee. An adult present in one box, July 8.

Tinea fuscipunctella Haworth. In 5 houses (both dates), from one of which 39 adults were bred, and later a count made of no fewer than 92 cocoons.

Coleoptera.

Silpha noveboracensis Forster. One adult, July 8.

Philonthus sp. One larva, July 8.

Microglotta nidicola Fairmaire. One adult identified as probably this species, July 8.

Dermestes sp. Associated with the dried-up body of a young bird in one nest were 26 shed skins of about equal size, and remains of smaller ones of earlier instars, July 8.

Attagenus piceus Olivier. Living larvae and exuviae in 5 boxes, both dates.

Hister biplagiatus Leconte. One adult from each of three boxes, both dates.

Hister abbreviatus Fabricius.

Hister memnonius Say. One adult of each of these species from a nest collected July 8.

Hister sp. A single larva, July 8.

Carcinops 14-striata Stephens. Nine adults, from a single box, July 8.

Dendrophilus punctulatus Say. A single adult with the last.

Saprinus conformis Casey. One adult, July 8.

Saprinus n. sp. A single adult from one house, and four from another, July 8.

Gnathoncus communis Marseul. One adult from each of two boxes, and four from each of two others, July 8. In one of these latter houses the state of occurrence of two of the specimens were of interest; one was inside a dropping and the other inside a puparium of *Protocalliphora splendida*, which had some exit holes of parasitic hymenoptera but none large enough to admit the adult histerid; it must therefore have matured in the puparium after crawling in as a larva.

Gnathoncus idiopygus Casey. One adult in each of two nests, July 8.

Glistrochilus fasciatus Olivier. One adult, July 8.

Trox scaber Linnaeus. In 4 houses, July 8, to the number of 1, 6, 7 and 7 adults; all in the lot of 6 were covered with mites.

Hypera punctata Fabricius. One adult, July 8.

Diptera.

Scatopse notata Linnaeus. Two puparia from one nest, July 8.

Reichertella femoralis Meigen. Two adults from one nest and one from another, July 8.

Scenopinus fenestralis Linnaeus. Represented in 5 nests by small numbers of various stages, both dates.

Aphiochaeta sp. One adult, July 8.

Tachinidae. Puparia probably of this family, but not further identified, were found in 2 houses, fifteen in one and one in another, July 8.

Plectops pruinosa Malloch. In small numbers in 3 boxes, July 8.

Sarcophaga sp. One puparium, August 16.

Lucilia australis Townsend. One adult, July 8; in the same nest were 4 puparia, one containing a dead fly, that may represent the same species.

Protocalliphora splendida Macquart. Represented in 4 nests, from one of which 24 and from another 33 adults were bred; both dates.

Orthellia caesarion Meigen. One puparium, August 16.

Muscina stabulans Fallen. Six adults and 8 puparia from one nest, July 8.

Hydrotaea nidicola Malloch. Five adults and 8 puparia, 4 of them parasitized, from one box, July 8.

Fannia canicularis Linnaeus. A single adult from one box and one adult and 5 puparia from another, July 8.

Fannia femoralis Stein. Three puparia from one nest, July 8.

Fannia trimaculata Stein. Seventeen adults from one house, July 8.

Fannia sp. Represented by a few larvae or puparia in 4 nests; both dates.

Dendrophaonia querceti Bouché. Represented by 18 to 20 puparia in each of 3 houses, July 8.

Anthomyia pluvialis Linnaeus. Three adults and 4 puparia from one nest, July 8.

Hylemyia sp. One puparium, July 8.

Neossos marylandica Malloch. Represented in 6 houses, usually numerously; both dates.

Hypaspistomyia latipes Meigen. Three adults from one nest and 8 from another, July 8.

Leptocera limosa Meigen.

Leptocera ferrugata Stenhammer. One adult of each of these in one nest, July 8.

Hymenoptera.

Apanteles carpatus Say. Five adults from one nest, July 8.

Acoloides sp. One, July 8.

Eucoila sp. In 2 houses, 22 from one, July 8.

Eurytoma sp. Two in one box, July 8.

Spalangia drosophilae Ashmead. Two from one house and one from another, July 8.

Spalangia muscidarum. Two, July 8.

Mormoniella abnormis. One, July 8.

Tetrastichus sp. In 3 nests to the number of 9 in one, July 8.

Crematogaster lineolata Say. A numerous colony in one nest, July 8.

Acarina.

Liponyssus sylviarum Canestrini and Fanzago.

Lælaps sp.

Analgesidae. Two of the nests collected July 8 were heavily infested with mites, one having the first and second groups in this list represented, and the other the second and third.

Araneida.

One spider further unidentified, July 8.

Gastropoda.

Zonitoides arborea Say. One specimen in each of 3 nests; both dates.

Gastrodonta ligera Say. One, July 8.

Pupoides marginatus Say. In 2 houses, July 8. There may be some question as to whether the snails are food items or intruders; if the former we should expect them to have been eaten or at least damaged; as they were in perfect condition the intruder hypothesis is favored.

ENGLISH SPARROW (*Passer domesticus*).

Three bird houses were occupied by this species from two of which two nests each were collected; another nest was tucked into a cavity in the lower aspect of the martin house, and this circumstance appears to have resulted in some transfer of parasites.

Isopoda.

Porcellionides pruinosus Brandt. In one nest, August 16.

Corrodentia.

Troctes divinatorius Muller. Numerous in two nests, July 8.

Lepidoptera.

Tinea fuscipunctella Haworth. Twenty-seven adults bred from one nest (August 16), and smaller numbers from each of two others.

Coleoptera.

Attagenus piceus Olivier. Numerous in 3 nests, both dates.

Trogoderma ornata Say. Three adults bred from one nest, July 8, and one from another, August 16.

Trogoderma inclusa Leconte. Four adults bred from a nest collected July 8, and one from another collected August 16.

Ptinus brunneus Duftschmid. Seven adults from one box, July 8, one of them from inside a dropping composed of insect fragments; in addition there were living larvae of *Ptinus* in this nest, and in another collected August 16.

Diptera.

Scenopinus fenestralis Linnaeus. One larva, 2 puparia, and 2 adults in one nest, August 16.

Phoridae. Two puparia in one house, July 8.

Plectops pruinosa Malloch. In three boxes, both dates, the largest number from one nest, 14.

Lucilia sp. Seven larvae in one nest, July 8.

Protocalliphora splendida Macquart. Represented in every nest, the largest number of adults bred from a single nest being 20.

Hylemyia sp. Remains of 4 adults in one nest, July 8, and one puparium in another, August 16.

Neossos marylandica Malloch. Bred from 2 nests collected August 16, 5 and 6 adults being reared.

Hymenoptera.

Crematogaster lineolata Say. Numerous in 2 nests, August 16.

Suctoria.

Ceratophyllus idius Jordan and Rothschild. Two in the nest under martin house, no doubt by intrusion from the latter.

Acarina.

Liponyssus sylviarum Canestrini and Fanzago.

Dermanyssus sp.

Laelaps sp.

Analgesidae. All of these were represented in a nest swarming with mites; many of the last-named group were in a second house; July 8.

PURPLE MARTIN (*Progne subis*).

Apparently only 4 rooms of a 16-compartment martin house were occupied. The contents of these were collected August 16 and yielded the following insects:

Corrodentia.

Troctes divinatorius Muller. Thousands.

Lepidoptera.

Tinea fuscipunctella Haworth. Fragments of several chrysalides.

Coleoptera.

Attagenus piceus Olivier. Numerous living larvae and cast skins.

Trogoderma sp. One from puparium of *Protocalliphora splendida.*

Carcinops 14-striata Stephens. Two adults.

Diptera.

Scenopinus fenestralis Linnaeus. Nineteen larvae, 10 puparia (2 unhatched), and 5 adults.

Plectops pruinosa Malloch. One adult.

Protocalliphora splendida Macquart. Fragments of 2 adults, 3 dead larvae, and 355 puparia were found in the martin house, an average infestation of nearly 90 to a brood of nestlings. An analysis of the puparia is of interest. Flies had emerged from 123; 173 otherwise emptied puparia had been parasitized by small hymenoptera (chiefly if not entirely *Mormoniella abnormis*); 6 had larger exit holes in them, and 6 were irregularly broken (probably by some scavenger); 45 were entire containing dead larvae or flies, of which 12 appeared to have been killed by mold and 12 by parasites. The numbers of parasite larvae in single puparia were counted in several cases and totals of no fewer than 36 reached in two instances.

Hylemyia sp. One puparium and fragments of 4 adults.

Neossos marylandica Malloch. Hundreds of puparia and adults.

Hymenoptera.

Mormoniella abnormis Boheman. Hundreds of adults emerged and many larvae were in puparia of *Protocalliphora* as noted.

Suctoria.

Ceratophyllus idius Jordan and Rothschild. Many.

Acarina.

Dermanyssus gallinae Linnaeus. A few, perhaps stragglers from the English sparrow nest tucked in a cavity under the martin house proper.

HOUSE WREN (*Troglodytes aedon*).

Fifteen boxes occupied by house wrens were studied, in 13 of which one or more broods were produced. The insect and other inhabitants other than those brought in to feed the young included:

Isopoda.

Porcellionides pruinosus Brandt. Two in one nest, July 8, six in another, August 16; elevated retreats for these characteristically terrestrial creatures.

Corrodentia.

Troctes divinatorius Muller. A few in one nest and many in another, July 8.

Lepidoptera.

Epizeuxis americalis Guenee. A chrysalis in one nest, August 16.

Tinea fuscipunctella Haworth. In four nests; numerous, with all stages represented in one, August 16.

Coleoptera.

Staphylinidae, remains of 2 in one nest, August 16.

Hippodamia convergens Guerin. In one box, July 8.

Attagenus piceus Olivier. Represented in 8 nests, numerous in one, August 16.

Trogoderma ornatum Say. Adults in 4 nests.

Trogoderma inclusa Le Conte. One adult in a single nest, August 16.

Ptinus fur Linnaeus. Three adults in one nest, August 16.

Anomala undulata Melsheimer. Two adults in one nest, July 8. Do these beetles (too large for the wren to bring in) creep into cavities to die?

Mordellistena infima Le Conte. One adult in each of 2 boxes, July 8.

Diptera.

Scenopinus fenestralis Linnaeus. One larva found in each of 3 nests, August 16.

Plectops pruinosa Malloch. Four adults from one box, August 16.

Sarcophaga sp. One puparium in a single nest, August 16.

Protocalliphora splendida Macquart. Represented in 6 nests, both dates. Two lots collected August 16 are worth further comment. In one case a well grown larva of *Attagenus piceus* with several cast skins was found inside an apparently intact puparium. Probably some small opening existed through which the first stage larva crawled but the case is one of those illustrating the convergence of predation and parasitism. In the second noteworthy instance the *Protocalliphora* found consisted of 48 puparia from which adults had emerged, 50 that had been destroyed by parasites, and a single dried-up larva. This case besides showing a rather heavy infestation for so small a bird as the house wren (one of the 4 young died in the nest) proves that the *Protocalliphora* do not have things all their own way, the mortality cited being more than 50 per cent.

Protocalliphora sp. Two adult females bred from a nest collected July 8, probably represent an undescribed species, but males are needed for satisfactory diagnosis.

Fannia sp. One puparium in a single nest, August 16.

Neossos marylandica Malloch. One adult bred August 16.

Hymenoptera.

Apanteles carpatus Say. Four adults from one nest, August 16.

Acoloides sp. Two adults from one house, July 8.

Mormoniella abnormis Boheman. Two puparia of *Protocalliphora splendida* from a nest collected August 16, were packed with the small fat larvae of this parasite.

Tetrastichus sp. Six specimens from one nest box, August 16.

Crematogaster lineolata Say. Numerous in one box, July 8.

Araneida.

Spiders not further identified were represented in the contents of 3 houses.

Gastropoda.

Zonitoides arboreus. A single specimen found in each of 3 bird boxes; not likely to have been brought in by wrens; these probably crawled in for shelter.

BLUEBIRD (*Sialia sialis*).

Four nests, occupied part or all season by bluebirds, in two of which broods were reared, yelded the following intruders, mostly scavengers:

Corrodentia.

Troctes divinatorius Muller, abundant in one nest, July 8.

Lepidoptera.

Tinea fuscipunctella Haworth, in one nest, August 16.

Coleoptera.

Attagenus piceus Olivier, a few larvae in one nest, July 8.

Anthrenus sp., one adult, August 16.

Ptinus fur Linnaeus, two adults, one live larva, and some shed skins in one nest, August 16.

Diptera.

Neossos marylandica Malloch, 2 adults in one nest, August 16.

Hymenoptera.

Acoloides sp., 7 adults in one nest, July 8.

Crematogaster lineolata Say, numerous in two nests, July 8, August 16.

As a supplement to the 1927 report may be added the following statement of the inquilines found in a nest collected August 18, 1928, the only one analyzed this year.

CRESTED FLYCATCHER (*Myiarchus crinitus*).

Lepidotera.

Tinea fuscipunctella Haworth. Numerous.

Diptera.

Plectops pruinosa Malloch. Ten adults.

Frontina sp. Two puparia in a cell with a shrunken caterpillar, Sarcophagidae. Fragments of an adult.

Protocalliphora splendida Macquart. Five puparia.

Hymenoptera.

Cynipidae. One adult.

DESCRIPTION OF A BRUCHID IMMIGRANT INTO HAWAII BREEDING IN THE SEEDS OF CONVOLVULACEAE (COLEOPTERA).

By John Colburn Bridwell, Glencarlyn, Virginia.

Under the manuscript name *Megacerus pescaprae* Faldermann, Director of the Botanic Gardens at St. Petersburg, sent a Bruchid obtained from seeds of *Ipomoea pescaprae* from Brazil to Schoenherr for use in his work on the Curculionidae. Schoenherr considered it a *Bruchus* of his Stirps 2, Maniplus 2, and referred it to Fåhraeus, who described it as *Bruchus pescaprae* in Schoenherr 1839, Gen. Curc. 5:34, no. 48, citing Faldermann's manuscript name in synonymy. Under the International Code of Zoological Nomenclature (see Opinion no. 4) this action validates the monobasic genus *Megacerus* with the genotype *Bruchus pescaprae*. This instance seems to be the oldest use of the genonym *Megacerus*. Jekel in 1855 (Insecta Saundersiana Col. Curc. 1:1) considered the group containing *Bruchus pescaprae* and *B. coryphae* Olivier as of generic rank and described it without using a generic name but placed the specimens in his collection under the name *Pachybruchus* which was published by Pic 1912 (Échange 28:109) as a subgenus. I fully agree with Jekel's opinion and with the suggestion made by Sharp 1885 (Biol. Centr.-Am. Col. 5:484) that the group seems entitled to generic recognition and it is here so treated as the genus *Megacerus*.

The breeding habits of several species of *Megacerus* are known and with one possible exception all are attached to the family Convolvulaceae, the larvae living in their seeds. Among these are our species *discoideus* (Say), *impiger* (Horn), *coryphae* (Olivier), and *schaefferianus* new name (*Bruchus crenatus* Schaeffer 1909 not *Bruchus crenatus* (Fabricius) Thunberg 1791). Material of an undescribed species from Panama in the National Museum bears a label indicating the "silk cotton" as host plant. So far the genus is exclusively American, extending throughout the range of Convolvulaceae on the Continent and in the West Indies, and represented by many species in the American tropics. The species here described is the first of the genus to show migratory tendencies.

The species of *Megacerus* may be separated into four groups of which the species here described falls into one having these characters: Mucro of hind tibia long and slender, as long as the tibial width at apex or longer, sculpture very strong, at least some of the elytral intervals bearing a row of punctures; body beneath, pygidium, and in part dorsum of pronotum and elytra bearing dense appressed pubescence concealing the surface sculpture and with certain characteristic denudate areas;

apex of front tibia of males bearing a deflected slender acute tooth or spine behind the base of the tarsus; inner carina of hind femur beneath simple, not crenate nor emarginate or toothed at apex. Should further study indicate the need of a name for this group *Pachybruchus* Pic is available since *Bruchus coryphae* (originally included and hereby designated as genotype of *Pachybruchus*) belongs in this group together with *Megacerus melaleucus* (Fåhraeus) and *treticulatus*, *leucorpilus* and *excellans* (Sharp) all distinct and well distinguished species.

Megacerus alternatus, new species.

Rufous, head and antennae entirely black; clothed with dense appressed pubescence concealing the surface sculpture, whitish-ochraceous on prothorax and mesothorax shading to snowy white on metapleuron, metasternum, sternites and pygidium; pronotum with a longitudinal denudate area on either side of the median line with an outer acute backward directed spur arising near the middle and a sublateral denudate dot on either side near the middle; elytra with the intervals alternately pubescent and denudate, suture basally passing over on the first interval near the middle, the suture thence denudate, 2, 4, 6, 8 except on humeral callus, 9 and 10 on humeral lobe, and the apex of elytra pubescent, elsewhere denudate; pygidium with a slight longitudinal denudate excision on either side, these parallel, slightly divergent from the margin anteriorly; legs with sparse cinereous pubescence not concealing the surface; punctures of pronotum revealed on the denudate areas moderate, dense, confluent, well impressed; striae of elytra well impressed, the punctures moderate, not much encroaching on the intervals, subconfluent, a little larger than the more shallow punctures of the intervals; sculpture of pygidium concealed by pubescence; eyes of female separated by nearly the width of the upper lobe of the eye, subcontiguous in the male. Length (from anterior margin of pronotum to apex of elytra), 4 mm.

Described from material furnished by O. H. Swezey of Honolulu and collected by him. Holotype male, Barber's Point, Oahu, Dec. 23, 1923; allotype female, Honolulu, September 22, 1926, from seeds of *Ipomoeae pescaprae* and four female and six male paratypes with the same data as the allotype.

Holotype, allotype and six paratypes deposited in the collection of the United States National Museum; male and female paratypes in the collection of the Hawaiian Entomological Society; male and female paratypes in the collection of the British Museum (Natural History).

The alternate pubescence of the elytra distinguishes this species from any other, no other species of this group having so much pubescence on the elytra. It resembles, among the described species, *leucospilus* more closely than any other, but in that species the sculpture of the elytra is somewhat coarser. In *coryphae* the profound perforate punctures of the intervals encroach upon the intervals very strongly.

Mr. Swezey first took *alternatus* on Oahu on Dec. 23, 1923, as recorded (1925, Proc. Haw. Ent. Soc. 6:3 *Bruchus* near *coryphae* Olivier). It was subsequently bred by E. L. Caum and Mr. Swezey from *Ipomoea pescaprae* and by Mr. Swezey from *I. tuberculata*. In the collection of the National Museum is a series of three broken and much abraded individuals apparently belonging to this species intercepted at San Francisco by L. A. Whitney in baggage from Nicaragua together with the seeds from which they had bred numbered H. 3870. The seeds appear to be those of *Ipomoea crassicaulis* (Bentham), better known as *I. fistulosa* Martius, an erect shrub much cultivated in southern Texas and in tropical America generally.

A NEW GRASSHOPPER (ORTHOPTERA: ACRIDIDAE) FROM TEXAS.

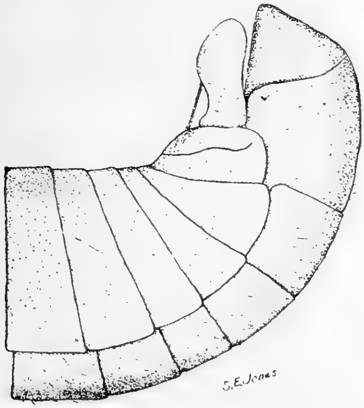
By V. A. Little, *Texas A. and M. College, College Station, Texas.*

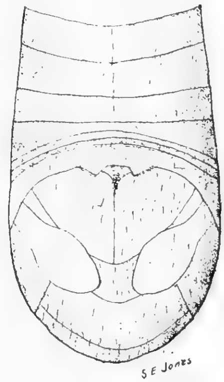
Melanoplus warneri, new species.

This form belongs to the Texanus series and is most closely related to *texanus*. The writer formerly confused it with this species (Entomological News, Vol. 37, p. 319), but a study of a large series of both shows it to be an entirely separate and distinct species. It can be easily separated from *texanus* by the differences in the male cerci, size, fastigium of the vertex, and distribution.

Type male: Brazos County, Texas, May 20, 1928.

Size medium; form robust. Color grayish brown with a ferrugineous tinge on head and pronotum, lighter beneath. Antennae reddish brown, apically infuscated; equal to the combined length of the head and pronotum. Eyes oval, the width equaling two-thirds the length; mottled in color. Fastigium of the vertex moderately declivent, enlarging and rounded apically; shallowly sulcate. Frontal costa equal, plane above, shallowly sulcate around and below the median ocellus. Pronotum enlarging a little posteriorly with the hind margin roundly angulate; the metazona three-fourths the length of the prozona. Median carina very distinct; lateral carina faint. Post-ocular band reaching metazona, broadening posteriorly. Prosternal spine large, sub-conical, blunt, and retrose. Epimera of the meso- and meta-thorax black. Interspace between the mesosternal lobes twice as long as wide; the lobes of the metasternum attingent. Tegmina short, overlapping, ovate with the apices roundly pointed; faintly maculate; scarcely as long as head and pronotum combined. Extremity of abdomen upturned, supra-anal plate triangular, as broad as long, mesially sulcate, sides nearly straight. Furcula very short, depressed broader than long. Cerci broad and straight, spatulate; two and one-half times as long as the narrowest breadth; apically roundedly angulate and slightly incurved.





Tip of abdomen of the male, lateral and dorsal views.

Sub-genital plate sub-conical, almost as broad as long, apically entire. Hind femora exceeding tip of abdomen and crossed on the outer and upper surfaces by two ill-defined fuscous bands; lower surface reddish. Hind tibiae red with eleven black tipped spines in the outer series.

Measurements in Millimeters.

	Length of Antenna	Length of Pronotum	Length of Body	Length of Tegmen	Length of Hind femur
Type	8	5.5	20	7	12.8
Paratypes (76)	7–9.6	5.4–6.3	17.8–23.8	5–7.2	11.6–14.4

Allotype female: Brazos County, Texas, May 10, 1928.

Considerably larger than the male; very robust in form. General color rusty brown with fuscous; lighter beneath. Antennae rusty brown apically infuscated; not quite as long as the combined length of head and pronotum. Eyes moderately prominent, width equaling three-fourths the length. Fastigium of vertex as in male but more shallowly sulcate, Frontal costa equal, plane, shallowly sulcate around and immediately below the median ocellus; punctate. Pronotum considerably enlarging posteriorly, but evenly; slightly arched; posterior margin rounded. Metazona four-fifths the length of the prozona; median carina distinct; lateral carinae sub-obsolete. Post-ocular band reaching metazona, not as distinct as in male. Prosternal spine sub-conical, retrose. Epimera black. Interspace between the mesosternal lobes sub-quadrate; that of the metasternal lobes wedge-shaped. Tegmina short, oval, slightly overlapping with their apices rounded; length less than that of the head and pronotum combined; faintly maculate. Ovipositor moderately exserted. Hind femora reaching tip of abdomen, more or less infuscated; two fuscous bands across the upper and outer surfaces faintly indicated; color beneath, reddish. Hind tibiae red with eleven black tipped spines in the outer series.

Measurements in Millimeters.

	Length of Antenna	Length of Pronotum	Length of Body	Length of Tegmen	Length of Hind femur
Allotype	9.5	7.65	26.4	8	16.4
Paratypes (48)	8.8–10.4	7.65–8.55	23.2–28.8	7.2–9.2	14.4–17.6

This species is found in open post oak woods. Over a five-year period that the writer has taken it, April 12 is the earliest date that adults have been found. It disappears in early June. No specimens have ever been taken after June 15. The type, allotype and all the paratype material was taken in the immediate vicinity of College Station, Texas.

It is named in honor of Dr. S. R. Warner, Huntsville, Texas. The type, allotype and several paratypes have been deposited in the U. S. National Museum.

A NEW MYELOIS FROM BRAZIL (LEPIDOPTERA: PYRALIDAE: PHYCITINAE).

By Harrison G. Dyar and Carl Heinrich.

The following new species was received from Señor Doctor Gregorio Bondar, Chief of the Laboratory of Vegetable Pathology of the State of Bahia, Brazil, with request for a name.

Myelois expunctrix, new species.

Fore wing unicolorous slate gray, under magnification showing a few black scales along the veins and a general faint whitish dusting; cross lines obsolete; along termen at vein ends a row of faint black dots; cilia gray, faintly sprinkled with sordid white; veins 4–5 long stalked. Hind wing semitranslucent white with a smoky shade at apex and on veins and with a rather broad dark band along costa; along termen a thin dark line; cilia shining white; veins 4 and 5 long stalked.

Expanse, 22–30 mm. Females considerably larger than the males.

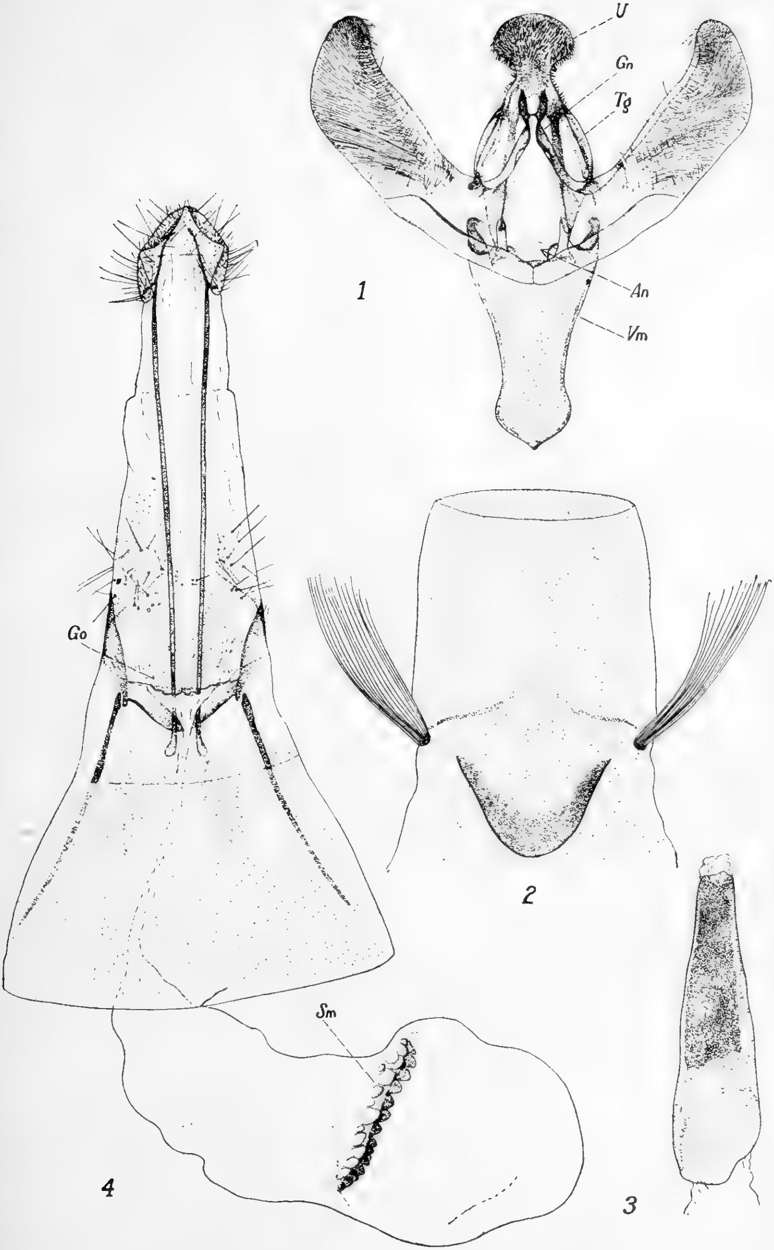
Genitalia figured from type (male) and paratype (female).

Type and paratypes.—Cat. No. 41636 U. S. N. M. (Gregorio Bondar).

Type locality.—Bahia, Brazil.

Food plant.—"Stems of leguminous tree."

Described from male type and 2 male and 11 female paratypes, all reared and from the type locality. Apparently close



DYAR AND HEINRICH, MYELOIS.

to *perrensiella* Ragonot from which it is distinguished by the absence of the outer cross line on the fore wing. The genitalia resemble those of *euzopherella* Dyar and *pombra* Dyar, differing in the uncus which is much stouter and broader stemmed in *expunctrix* than in either of the other two species.

EXPLANATION OF PLATE.

Myelois expunctrix, new species.

Fig 1. Male genitalia; ventral view of organs spread, with aedoeagus omitted; An = anellus; Gn = gnathos; Tg = tegumen; U = uncus; Vm = vinculum.

Fig. 2. Eighth abdominal segment showing ventro-lateral hair tufts.

Fig. 3. Aedoeagus and penis of male.

Fig. 4. Genitalia of female; Go—genital opening; Sm—signum.

Drawings made under the author's supervision by Mary Foley Benson of the Bureau of Entomology.

TWO NEW SPECIES OF APANTELES (HYMENOPTERA: BRACONIDAE).

BY C. F. W. MUESEBECK,
U. S. Bureau of Entomology, Melrose Highlands, Mass.

The following descriptions are presented at this time in order to make the names available for use in economic papers that are in the course of preparation.

Apanteles phlyctaeniae, new species.

Runs to couplet 140 in my key to the North American species of Apanteles,[1] and is very similar to *pyraustae* Viereck and *phobetri* Rohwer. From both it differs, however, in the very weakly punctate mesoscutum, in the relatively less strongly sculptured propodeum, and in having the plate of the first tergite more strongly rounded off apically and that of the second much narrower at extreme base. It differs further from *pyraustae* in the much longer female antennae.

Female.—Length 2.3 mm. Face a little broader than long to clypeus, weakly but distinctly punctate, subopaque; antennae as long as the body, all flagellar segments elongate; ocell-ocular line about twice the diameter of an ocellus; temples moderately broad, evenly rounded; mesoscutum very minutely punctate, smooth posteriorly; disc of scutellum convex, with weak scattered punctures; propodeum rather gradually declivous, mostly smooth basally and laterally, finely rugulose medially, without a median carina; mesopleura mostly

[1]Proc. U. S. Nat. Mus., Vol. 58, 1920, p. 500.

polished; metapleura polished anteriorly, opaque posteriorly; abdomen narrower than thorax; plate of first tergite broadening only slightly behind, strongly rounded off at apex, punctate or very weakly rugulose laterally and apically, polished medially toward base; plate of second tergite transverse, narrow on the first suture but broadening strongly directly behind this, finely rugulose, narrowly polished down middle; third tergite a little longer than the second; third and following tergites polished; hypopygium not surpassing apex of last tergite; ovipositor only slightly exserted; posterior coxae smooth; inner spur of posterior tibia longer than the outer and distinctly a little more than half the length of metatarsus; radius of fore wing longer than greatest width of stigma and longer than intercubitus, joining the latter in a rather strong angle. Head and thorax entirely black; palpi pale; abdomen black, yellowish basally on sides and venter, the broad membranous lateral margins at apex of first tergite and base of second yellow; legs testaceous, with all coxae black, and extreme apices of hind femora above, the apical third of posterior tibiae, and the posterior tarsi except at base of metatarsus, blackish or fuscous; tegulae black; wing bases fuscous or blackish; wings hyaline; stigma brown.

Male.—Essentially as in the female.

Cocoon.—Solitary; very pale yellowish in color.

Type locality.—Oak Harbor, Ohio.

Type.—Cat. No. 41849, U. S. N. M.

Host.—? *Phlyctaenia tertialis* Guen.

Described from one female (type) and one male (allotype) reared by W. V. Balduf, July 28 and August 2, 1928, respectively, and labeled "Probably on *Phlyctaenia tertialis*."

Apanteles oidematophori, new species.

Very similar to *A. cacoeciae* Riley, differing principally in being considerably larger, in the relatively slightly shorter ovipositor sheaths, and in the more strongly sculptured propodeum and second abdominal tergite. It is apparently a solitary parasite, while *A. cacoeciae* is gregarious.

Female.—Length 3.2 mm. Head strongly transverse, a little narrower than thorax; face broader than long from antennae to clypeus, very slightly convex, nearly smooth, the punctation very weak; antennae a little shorter than the body; ocell-ocular line not more than twice the diameter of an ocellus; temples narrow but not receding directly behind the eyes; thorax stout; mesoscutum, viewed from above, broader than long, closely finely punctate, opaque or subopaque; disc of scutellum a little longer than broad, impunctate, polished, only very slightly convex; lateral faces of scutellum mostly rugulose, the posterior polished area transverse and not extending half way to the base; propodeum strongly convex at base, rather sharply declivous posteriorly, mostly finely punctato-rugulose, and with a poorly-limited, though distinct, areola medially; mesopleura mostly smooth and shining; metapleura polished anteriorly, punctate and opaque posteriorly; abdomen as long as thorax, somewhat narrower, depressed; plate of first abdominal tergite large, practically parallel-sided from spiracles to apex, finely longitudinally rugulose, and with a weak suggestion of a median impression posteriorly; plate of second tergite strongly transverse, its greatest breadth three times its greatest length, broader at apex than at base, the lateral margins oblique; posterior margin somewhat arcuate so that the plate is longest down the middle; surface of second plate mostly finely longitudinally sculptured, most strongly so posteriorly; rather broad membranous margins laterally on apex of first plate and along second; third and following tergites polished; ovipositor sheaths slightly more than half the length of the abdomen; posterior coxae large, somewhat compressed; inner spur of posterior tibia but little longer than outer and slightly less than half the length of the metatarsus; radius longer than intercubitus; metacarpus much longer than stigma. Body entirely black, including sides and venter of abdomen; tegulae and wing bases black; wings hyaline; stigma brown with a distinct pale spot at base; all coxae black; anterior trochanters yellowish, except on the apical segment below; remainder of anterior legs testaceous except for blackish markings on extreme base of their femora; middle legs blackish, with the apices of their femora within, the basal half of their tibiae, and the four basal segments of their tarsi testaceous; posterior legs black, except for the pale basal third or more of their tibiae.

Type locality.—Dane County, Wisconsin.
Type.—Cat No. 41848, U. S. N. M.
Host.—*Oidaematophorus kellicottii* Fish.
Described from two female specimens (type and paratype) reared by E. P. Breakey, May 28, 1928.

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PROCEEDINGS OF THE
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RETICULITERMES TIBIALIS BANKS IN THE CHICAGO AREA.

By ORLANDO PARK, *Whitman Laboratory, University of Chicago.*[1]

Reticulitermes tibialis Banks is a western species. Banks and Snyder (1920, p. 50) give its distribution west of the Mississippi River as "Iowa City (Johnson County), Iowa, and Cass (Franklin County), Arkansas. The State records are Nebraska, Kansas, Oklahoma, Texas, New Mexico, Arizona, Colorado, Nevada, Utah, Idaho, Montana and California." Another species of Reticulitermes (*R. flavipes* Kollar) of similar subterranean habit is distributed generally over the eastern United States and has been assumed in the past to be the only species of termite inhabiting the region defined ecologically as the Chicago area.

R. tibialis was recorded by Dietz (1923) in the extreme southwest section of Indiana (Gibson County), "The one and only record of *R. tibialis* was winged adults obtained November 3, 1922, from crowns of strawberry plants, previously tunnelled by the workers" (p. 299). Since Chicago occupies a portion of the transition zone between these two species of Rhinotermitidae, an investigation was undertaken to obtain a better idea of the distribution of these forms in the Chicago area. So far *tibialis* is known from the Indiana dune region, but future search should discover its colonies in the ecologically equivalent area near Waukegan, Illinois, since the species apparently thrives in sandy communities and Dietz (loc. cit, p. 301) mentions the Gibson County habitat as being "a sandy, level, almost treeless area."

First form reproductive adults have been taken on four different occasions in the sand dunes of Indiana, some thirty miles east of Chicago. A single deälated adult was taken beneath a small, moist log on the upper beach of Lake Michigan (Miller's, Indiana) on March 28, 1925, at 10:00 A. M., and two more were taken under the same conditions of habitat at 3:40 P. M. (Ogden Dunes, Indiana) on May 22, 1928. These deälated adults were all active and were taken from niches similar to

[1] I am indebted to Mr. W. J. Gerhard of the Field Museum, and Dr. Alfred Emerson of the University of Pittsburgh for the determination of material, and especially to Dr. T. E. Snyder, U. S. Bureau of Entomology, for timely aid and criticism.

those from which colonies were found at other times. The single deälated adult was a female which had apparently reached the sheltered, favorable conditions of the upper beach drift following the spring colonizing flight. The other deälated individuals, both females, were taken, one under each end of an upper beach drift log. These latter were probably part of an incipient colony of *tibialis*.

The "colonizing flight" (Snyder, 1926) or colonizing aggregation (after the terminology of Allee, 1927) has been observed on March 16, 1927, and on March 24, 1928. On the former date *tibialis* was abundant on the bare sand of the upper beach of Lake Michigan (Long Lake, Indiana) between 11:55 A. M. and 2:00 P. M. It will be seen from the following table that the intensity of daylight was from 7791.03 foot-candles at 11:55 A. M. and then a general clouding of the sky with a reduction of daylight intensity to 4269.06 foot-candles at 2:00 P. M.

On March 24, 1928, another colonizing aggregation was noticed at 11:00 A. M., that is, approximately one year later. The termites were present in great numbers crawling over the bare sand (only occasionally were individuals noted flying) of the Ogden Dunes blow-out. The swarm was composed of first form males and females in the approximate ratio of 90 ♀♀ to 100 ♂♂. More extensive counts probably would have given the expected one to one sexual ratio. At this time the air six inches above the sand was 26.5° C., the sand surface 33° C., and one inch below the surface 19° C., and the intensity of the unobstructed daylight measured 7684.3 foot-candles.

In the following table of climatological data the daylight intensities were measured by the author with a Macbeth Illuminometer at the localities mentioned. The temperatures and relative humidities are taken from records of the University Observatory, Chicago, Illinois, through the courtesy of Mr. P. E. Johnson, and are given for the general conditions only since the condition of the sky, and the various environmental factors, would vary considerably between the dune area and at Chicago.

On March 24, 1928, this scattered distribution of termites prevailed over at least 5000 square feet. On the sheltered sides of Ammophila ridges *tibialis* was found in a concentration of four per square foot and often groups of from 50 to 75 individuals were noticed, their bodies in contact, and the outer fringe of individuals moving actively about. It is quite possible that such crowding was accidental, and due to the usually strong lake wind, rather than a more significant grouping together. No holes from which these adults may have just emerged were found. Since the gullies between Ammophila ridges cast little if any shade, daylight intensity or temperature apparently were not acting selectively. Similar groups were taken under *Popu-*

Time.	*Temperature (°F).*	*Relative Humidity (%).*	*Daylight Intensity (Foot-candles).*
March 28, 1925			
10:00 A. M.	44	56	....
March 16, 1927			
11:00 A. M.	63	50	....
12:00	66	45	7791.03 (11:55 A. M.)
1:00 P. M.	69	45	....
2:00 P. M.	70	44	4269.06
March 24, 1928			
11:00 A. M.	69	56	7684.30
12:00	73	54	8111.21
1:00 P. M.	73	52	....
2:00 P. M.	74	50	4269.06
May 22, 1928			
4:00 P. M.	69	50	4593.37

lus deltoides where branch interference cut down the daylight intensity to 5500 or 6000 foot-candles at 11:10 A. M., and a proportionate drop in temperature of air and sand surface was apparent.

On the dry, open sand many pairs of *tibialis* were observed, one (usually the male) following another (usually the female). Occasionally three would be in a row following the apparently aimless wanderings of the leader over the sand. The latter was normally engaged in moving forward, twisting the head and thorax from side to side and tapping the sand with the antennae. The termite following kept the abdomen of the leading individual between its antennae, one antenna in contect with the latter's abdomen on each side. If separated from the leader, these individuals experienced difficulty in finding her again. Under such conditions the behavior of the female was apparently not changed, while the male, when separated by as much as half an inch, ran haphazardly about, as if "distracted," jerking the head and antennae in all directions. When replaced in contact with the female, they immediately resumed the passive behavior noted before, apparently in response to an odor of the female, according to Snyder (1926, p. 536). Both or either member of the pair was found with the wings still intact, although the general rule was the presence of deälated adults, the wings being detached and scattered over the sand. As far as I could determine, the behavior of the solitary individuals was that of the leading female of a pair, although both members of a pair may have been affected since the average rate of locomotion of such pairs was .38 inches per second as against .77 inches per second for solitary individuals. These latter were largely engaged in actively running about over the sand or standing in an attitude singularly like that of many Staphylinidae. This staphylinoid pose was characterized by holding the abdomen sharply elevated in the air, with the head more or less lowered.

In the afternoon the sky had become overcast and the wind had increased, accompanied by a driving rain at 4:00 P. M. Observations on the swarm were made at 2:30 P. M., with the sky overcast, averaging 4000 foot-candles daylight intensity (4269.06 at 2:30), and an air temperature of 25° C. At this time *tibialis* was far less abundant; many apparently had been blown away, had burrowed, or had reached favorable conditions under upper beach drift logs, or in the adjacent communities of the jack pine (*Pinus banksiana*) or black oak (*Quercus velutina*). Of those remaining, although isolated termites were present, groups of from 7 to 12 were more common and few pairs of male and female were to be found. Of the groups, some were composed of dead and dying individuals, with others crawling slowly about on the sand.

These data are largely in accord with the general swarming of winged, sexual termites as previously recorded by many investigators (cf. Snyder, 1926, pp. 535–541), and represent the spring colonizing aggregation of *R. tibialis* in the Chicago area.

This behavior has been noticed, then, twice on different years toward the end of March, from 11:00 A. M. to 2:00 P. M., approximately. In both cases the daylight intensity was more or less at a maximum for the day involved, and normal for the time of year. In both cases by early afternoon the sky had become overcast with a lowering of the daylight intensity to approximately the same average, accompanied by a diminution in numbers and activity of *tibialis*. Such behavior may, of course, only refer to the conditions obtaining in the Chicago area, or to *tibialis*, or both, but the facts are interesting. This is not to say that daylight intensity necessarily is involved any more than another factor, as temperature or humidity. Rather, from the general picture of the weather as indicated in the preceding table, there is a fairly constant complex of temperature, relative humidity and daylight intensity, and any or all of the environmental factors, together with more obscure biological factors, may be operating. The colonizing rhythm may even possibly parallel a rhythm in weather and climate, without the two impinging upon each other, although such an assumption is improbable. Swarming termites are markedly photopositive, later becoming thigmopositive according to Snyder (loc. cit.). Such behavior is quite the reverse of the strongly photonegative response of the established colony to strong, or directive light, and suggests a reversal in phototropism having as its origin some periodic influence, either internal or derived from the environment. It is possible that the relative length of day and night may play some part. This latter view is strengthened by the demonstration of photoperiodicity in growth and reproduction of plants (Garner and Allard, 1920; Kellerman, 1926), and in the migration of certain birds (Rowan, 1926), while Marcovitch, 1923, thinks that the relative length of day and night may stimulate the production of sexual forms in plant lice. Of the three factors mentioned in the preceding table, the seasonal periodicity of daylight intensity is more constant probably for the given dates.

It is fully recognized that what part light may play in such behavior, whether intensity or the relative length of day and night, may only be determined by controlled experimentation. That light has a direct or an initial effect is improbable since the winged caste receives the swarming stimulus in the darkness of the nest. However, it is possible that in those species in which apertures are made in the walls of the nest for purposes of emerging, the suddenly penetrating ray of light may act as a stimulus and subsequent reversal of phototropism may explain, together with odor and contact, the emergence of the colonizing aggregation. The fact that some species of Isoptera swarm at night, however, indicates that the process is too complicated to be explained simply. Once the *tibialis* swarm is outside of the nest, such a factor as daylight intensity may be important in conditioning the subsequent behavior.

Apparently both *R. tibialis* and *flavipes* are well established in the Chicago area. Colonies of *flavipes* have been taken from the Indiana dune region just east of Chicago, viz., a colony of *flavipes* including soldiers, workers and first form nymphs has been located at Dune Park, Indiana, beneath a log in the cottonwood community (*Populus deltoides*) on September 23, 1924, to mention but one of a number of records. In another colony of *flavipes* (Long Lake, Ind., May 6, 1926) four specimens of the small staphylinid, *Atheta polita* Melsh., were found in the galleries of the nest. The presence of this species of beetle may or may not be accidental since species of the tribe Myrmedoniini, to which *polita* belongs, often occur in the nests of ants, and its presence with termites is certainly interesting.

Colonies of *tibialis* (soldiers and workers) are also abundant in the same area, being located chiefly beneath drift logs on the upper beach of Lake Michigan, viz., abundant at Clark and Pine, Indiana (May 19, 1929), and at Ogden Dunes, Indiana (May 25, 1929). Since *R. tibialis* and *flavipes* appear to occupy much the same habitat in the Chicago area, it is possible that the species are ecologically equivalent, and consequently a more precise survey of the distribution of these species in this area should be valuable, especially since we have an eastern and a western species near the limits of their respective ranges occupying closely similar habitat niches.

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NOTES ON THE LUNG MITES OF PRIMATES (ACARINA: DERMANYSSIDAE), INCLUDING THE DESCRIPTION OF A NEW SPECIES.

BY H. E. EWING, *U. S. Bureau of Entomology.*

Lung mites of primates occur, so far as known, exclusively in Old World hosts. They infest the bronchial tubes and tracheae and cause tubercular growths that have been mistaken for tuberculosis nodules. The injury produced by these mites has been well summarized by Helwig (1925), who reported upon six cases of infestation of the lungs. He states that the acarids produced pulmonary lesions that were at first mistaken for those of tuberculosis. According to this writer three of the infested monkeys were subject "to very frequent attacks of paroxysmal coughing and sneezing which we attributed to the arachnid infection."

Our first knowledge of these mites dates from the publication of a paper by Haan and Grijns in 1901 in which they include Banks's description of the first reported species, which species was placed in a new genus. These authors state: "Dr. N. Banks determiniert und als *Pneumonyssus simicola* n. g., n. sp. beschrieben worden sind. Wir entnehmen seiner Veröffentlichung folgendes * * *." Then the description follows in quotation marks. It is evident that the genus *Pneumonyssus* and also its one included species, *simicola*, should be attributed to Banks rather than to Haan and Grijns. Since this first description was published a number of papers have appeared dealing with the biology, taxonomy, or economy of lung mites of monkeys. Included in these papers are the descriptions of four forms that were considered as new species.

Recently the writer has received two lots of lung mites for study, one of them coming from a Rhesus monkey in this country and one from the dog-faced baboon in the Belgian Congo. A study of these two lots showed some striking differences between them, and when the characters of other described species were taken into consideration it appeared that most of these differences existed between those species occurring in hosts from the Ethiopian Region and those occurring in hosts belonging to the Oriental Region. Also it seems that some of the species described as new should be regarded as synonyms.

In order to give a summary of the known species in the briefest possible manner a table is here presented that is self explanatory:

TABLE OF SPECIES OF LUNG MITES OF PRIMATES.

NAME OF MITE.	TYPE HOST.	TYPES COLLECTED IN.	REMARKS.
Pneumonyssus simicola Banks (1901)	*Cynocephalus* sp.	Java	Described in paper by Haan & Grijns.
Pneumonyssus duttoni Newstead & Todd (1906)	A guenon, *Cercopithecus schmidtii*	Congo	No male mites found.
Pneumonyssus griffithi Newstead (1906)	*Macacus rhesus*	England	Six host individuals infested.
Pneumotuber macaci Hoepke (1914)	*Macacus rhesus*	Breslau, Germany	Probably a synonym of *griffithi*.
Pneumonyssus foxi Weidman (1915)	*Macacus rhesus*	Philadelphia, Pennsylvania	Specimen from adult male monkey. Probably a synonym of *griffithi*.
Pneumonyssus congoensis, new species	Dog-faced baboon, *Papio* sp.	Belgian Congo, Africa	The host was said to be a species of *Cynocephalus*. The generic name should be *Papio*.

It is noted that three of these six species came from the same type host, the common laboratory monkey, *Macacus rhesus*. Weidman (1915), when he described the last of these three, pointed out in a very clear manner the supposed differences between his *foxi* and the other species.

The chief trouble in our work with these mites has been the lack of adequate material and the lack of proper technique in studying specimens. The present writer has had no difficulty in determining his material from *Macacus rhesus* as representing Weidman's species from the same host, and when a comparison is made with the descriptions of the other two species that have also been described as new from the same host there appears to be an argeement in regard to most of the characters. It is noted also that the drawings of the entire specimens are so similar to the species in hand that one is inclined to consider all species described from *Macacus rhesus* as the same. In studying these mites it is very hard to determine whether the dorsal shield is present or absent in certain specimens. The mouth-parts are so small that it is almost impossible to tell definitely whether the chelicerae are chelate or not. It is believed, also, that here we have a case where resemblances should be emphasized as much or even more than supposed differences in characters that are variable or very hard to make out. The very close agreement in a number of characters that can easily be seen and described in species from the same type host should go a long way in indicating their probable synonymy.

The genus *Pneumotuber* Hoepke, based on *Pneumotuber macaci* Hoepke, from the Rhesus monkey, must be very near to Banks's *Pneumonyssus*. If in fact the posterior tarsi are without claws in *P. macaci* the genus should be considered as good. However, specimens examined by the writer, taken from the Rhesus monkey and considered by him as being, very probably, identical with Hoepke's *P. macaci*, show the posterior tarsi with claws.

There are four species of lung mites from primates that come from different type host species, and these give every evidence of being good species. They are separated by the following key:

Key to Species of Pneumonyssus.

A. Tarsal claws of second and third pairs of legs large, angulate, projecting laterally and more conspicuous than the pulvillus; abdomen of gravid females elongate and swollen and in some specimens separated from cephalothorax by transverse folds. Occurring in Ethiopian primates.

B. With two pairs of stigmata, abdomen in gravid females very long. Found in a guenon, *Cercopithecus schmidtii*........ *P. duttoni* Newstead & Todd.

BB. With but a single pair of stigmata; abdomen not so long in gravid females. Found in a baboon, *Papio* sp. ...*P. congoensis*, new species.

AA. Tarsal claws of second and third pairs of legs much reduced, not angulate, not projecting laterally and less conspicuous than the pulvillus; abdomen of gravid females swollen but not elongate and never separated from cephalothorax by a transverse fold. Occurring in Oriental primates.

B. Dorsal plate present; pulvilli constant on legs I, II and III. Occurring in *Macacus rhesus*..*P. griffithi* Newstead.

BB. Dorsal plate wanting; pulvilli poorly developed in some specimens. Occurring in a Javan monkey, *Cynocephalus*........*P. simicola* Banks.

The new species from the baboon is here described, especial attention being given to those characters believed to have specific importance.

Pneumonyssus congoensis, new species.

(*Adult female.*)

Capitulum quadrangular, about one and a half times as long as broad, with retracted chelicerae occupying most of internal space.

Palpi greatly reduced, in length not equal to width of capitulum; first segment very short, disclike, about three times as broad as long; second segment about half as broad as the first but slightly longer; third segment about two-thirds as broad as second segment and slightly longer than broad. This third segment is indistinctly divided about its middle and bears distally two prominent tactile setae, the outer of which is longer than the palpus itself.

Chelicera with two chelae, each being modified into a sharp, tapering piercer; outer chela with a prominent elbow near its base and a long, curving, lancelike distal part; inner chela smaller than outer and without the elbow.

Dorsal plate long, eggshape in outline and completely covering the cephalothorax above. It is well scleritized, extends backward past the fourth pair of coxae and bears about a dozen, short, subequal setae.

Ventral plate irregularly diamondshape, with three pairs of setae; first pair subapical; second pair situated just in front of lateral angles of plate near margin of same; third pair near posterior end, tips of setae themselves extending beyond tip of plate.

Anal plate eggshape in outline, somewhat angulate behind; anal opening a little more than a third as wide as anal plate is broad; the two paired anal setae slightly longer than the single posterior seta, and situated slightly in front of anterior rim of anal opening.

Spiracles surrounded with irregularly scleritized, bulblike walls. They are situated dorsally above the posterior coxae just under the lateral margins of dorsal plate.

Tarsal claws well developed, particularly those of legs II and III; first pair of tarsal claws appressed; second and third pairs large, angulate, strongly divergent; fourth pair similar to second and third pairs but smaller and less angulate.

Length of nongravid female, 0.61 mm.; width, 0.18 mm. Length of gravid female, 0.87 mm.; width, 0.36 mm.

Type host.—Dog-faced baboon, *Papio* sp.
Type locality.—Belgian Congo, Africa.
Type slide.—Cat. No. 994, U. S. N. M.
Described from four females (one having a larva almost com-

pletely formed in the abdomen) taken from a dog-faced baboon, *Papio* sp., March 4, 1927, by Professor J. Bequaert at Lutenga, Belgian Congo, Africa.

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OBSERVATIONS ON THE INJURY CAUSED BY TOXOPTERA GRAMINUM ROND (HOMOPTERA: APHIDIDAE).

By F. M. Wadley, *U. S. Bureau of Entomology*.[1]

Toxoptera graminum Rondani is much more injurious in proportion to numbers than other grain aphids. This seems to be due largely to a peculiar effect of its feeding on the leaf tissues, which has not been seen with the other species. *Rhopalosiphum prunifoliae* Fitch and *Macrosiphum granarium* Kirby have been reared and compared with Toxoptera. They show no such effect; plants infested by them in chimney cages have supported colonies of aphids in considerable numbers and for weeks at a time without dying. With *Toxoptera graminum* similar numbers quickly killed the plant.

Horvath (1884) described the injuriousness of Toxoptera and reddening of its food-plants in Hungary; Webster (1892) in

[1]This work was done while the writer was employed by the Minnesota Experiment Station, and is published with the approval of the Director as Paper No. 892 of the Journal Series of the Experiment Station of the University of Minnesota.

America, noted the great damage caused in proportion to numbers, and indicated a belief in a pathological condition in association with the aphid. Numerous references are found in the extensive literature to unusual injury and reddening or yellowing of the food-plant. Webster and Phillips (1912) refer to the injury as specific. Moore (1914), working in Africa, describes it and points out its superficial resemblance to injury caused by some plant bugs, except that the spots are not sunken. In the present study, helpful suggestions have been given by Dr. R. A. Gortner, biochemist of the Minnesota Experiment Station.

The injury on oats is in the form of pale or yellowish spots, which become confluent if numerous. They are slightly lengthened in the direction of the leaf veins, and may reach 2 mm. in length, though usually smaller. Their boundaries are not sharp. A reddish dot is usually formed in the center around the feeding puncture, and is about 0.1 mm. in diameter. A microscopic examination shows that at the feeding puncture the leaf cell contents appear brownish; in adjacent cells bright red bodies are seen, becoming less numerous farther from the puncture. Not more than one of these red bodies has been seen in a cell; they appear identical with nuclei, as revealed in normal cells by staining with Delafield's hematoxylin and eosin. This condition produces the red dot, and may give a yellowish tinge to the pale area. In the pale area away from the feeding punctures, cells appear normal at first except for loss of color and sharper definition of the chloroplasts; later the cells appear nearly empty.

At ordinary temperatures a faint paleness appeared 18 to 24 hours after the first feeding, and the spot became fully defined in about 48 hours, the red dot appearing last. In one case on oats, a spot was not produced by 2 or 6 hours feeding by an adult; a faint spot was produced by 8 hours' feeding; and a fully defined spot by 14 hours' feeding. It is obvious that injury may not appear until after the aphid has left. The appearance of injury after feeding has ceased is delayed by coolness; in one case the development in 10 hours at 26° C. approximately equaled that in 58 hours at 14° C.

All plants fed on long have been affected in about the same way. They include oats, wheat, rye, barley, corn, sorghum and a number of grasses. On a few grasses no effect was seen, but these were species on which Toxoptera could not be induced to remain long, and feeding was probably not continued long enough in any location to form a spot. Size of spots, shade of red or of paleness, and rate of development varied somewhat on different plants. On barley, spots developed very slowly, and the pale area around the red spot was small and poorly developed. Injury was not pronounced, but Toxoptera remained on barley only reluctantly. On Dawson's Golden Chaff wheat, a variety of the common white type, spots were numerous and white, with no red dots, and injury was severe.

The spots were not observed to spread after feeding had ceased and they had reached their full development, which was only a day or two later. No recovery was observed. Single spots remained about the same in appearance for some days; shrivelling was not observed, though the tissue appeared dead. Where an entire leaf or a large part of it became pale, it shrivelled and dried after holding its turgor for a day or two. Damage has been roughly proportional to amount of feeding, considering both number and size of aphids. It invariably developed following prolonged feeding of any form or stage of Toxoptera.

Injury has developed fully and typically in darkness, on plants green before they were put in the dark and infested. On oat sprouts germinated and kept in the dark, hence devoid of chlorophyll, no pale spots have appeared as a result of 24 or 48 hours' feeding in the dark. The red dots developed in darkness after 48 hours. When such plants were brought to the light and aphids removed, green color developed in a few hours, and the pale spots appeared in typical form around the feeding punctures.

In efforts to study the development of paleness in the laboratory, it was found that juice from oat leaves standing on macerated Toxoptera usually became paler than untreated juice, or juice with other grain aphids, but results were not consistent. Juice from oat leaves showing effects of Toxoptera feeding, became markedly paler than juice from normal oat leaves within two days. Chlorophyll prepared from alfalfa and spinach by the method described by Morrow (1927) was obtained from the biochemistry division, and dissolved to saturation in absolute ethyl alcohol. This solution was diluted with four times its volume of distilled water, the dilution resulting in a clear bluish-green solution. This was treated with an extract of Toxoptera, made by freezing 100 to 300 aphids at —18° C. or lower, macerating them and extracting them for an hour or more with ½ cc. of distilled water.[1] The clear extract was drawn off with a pipette, and added to 2 cc. of the chlorophyll solution in a small vial, which was allowed to stand in the laboratory. Decolorization was noticeable in 2 days, and was practically complete in 5 to 7 days. A precipitate formed on first adding the extract; this was not chlorophyll, since the

[1]At first a water solution of sodium chloride, 0.6%, was used as an extractant; decolorization took place with it, but a hazy condition in the chlorophyll solution hampered observation. Distilled water was then tried with better results, and used thereafter.

color remained unchanged. It was finely divided and settled slowly. This precipitate must be of material derived from the aphids, as the only other substance present were water, alcohol and chlorophyll. This experiment was repeated five times with similar results. When the precipitate was removed from contact with the solution decolorization took place without it just as in its presence. The extract of Toxoptera failed to decolorize the chlorophyll, in one case, after being raised to 100° C.; in another case it decolorized after being heated just enough to coagulate protein-like material present.

In the above experiments checks were run by adding only distilled water to the chlorophyll solution; these remained unchanged. Rhopalosiphum and Macrosiphum, the less harmful grain aphids mentioned, were also tested. Extracts made from them as described above failed to decolorize chlorophyll solution noticeably in a week, in several trials. A precipitate formed on adding their extracts to the solution, as it did in the case of Toxoptera extract.

It is believed that this injury is a direct effect of feeding, not a case of transmission of a disease organism or virus; since injury always followed prolonged feeding, was proportional to amount of feeding, and did not spread long after feeding ceased. The paleness must be due to destruction of chlorophyll, since it did not develop in the absence of chlorophyll, and decolorization was produced in solutions of refined chlorophyll by aphid extract. It appears that the destruction is due to some substance injected, because it went on for a short time after the aphid had left, and if chlorophyll was absent during feeding and developed later the affected areas remained pale and chlorophyll-free. A substance which destroyed refined chlorophyll slowly was extracted from frozen Toxoptera, and its activity was destroyed by heat. It seems likely from these facts that this is an enzyme. Davidson (1923) demonstrated a starch-splitting enzyme in the salivary glands of *Aphis rumicis*. The reddening effect is independent of the action on chlorophyll, as noted, and has not been the subject of experiments. It seems to be largely a reaction of the leaf cell nuclei with some substance injected or formed in the breaking down of the tissue. According to Mirande (1907) red coloring in leaf cells, attacked by some insects, is due to formation of anthocyanins, and these are formed when several conditions occur together, including the presence of oxidase. This suggests that reddening also may be connected with enzyme action.

Judging from the cases of barley in which red dots occurred with little paleness, and of Dawson's Golden Chaff wheat in which paleness without reddening occurred, the paleness or destruction of chlorophyll was much more injurious than reddening. This combination of feeding effects, characteristic of Toxoptera, causes much greater injury than extraction of sap. It usually develops before sap extraction has had a chance to cause injury; though by confining large numbers of Toxoptera on small plants, injury by extraction has been produced before the specific injury developed. It seems unlikely that juice extraction by Toxoptera is greater than that by Macrosiphum and Rhopalosiphum, which cause comparatively little injury. The secretion of a chlorophyll-destroying enzyme may thus contribute largely to the economic importance of *Toxoptera graminum*.

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A NEW AEGERIID ON COWPEA FROM BRAZIL (LEPIDOPTERA: AEGERIIDAE).

By August Busck, *U. S. Bureau of Entomology*.

The Chief of the Laboratory of Vegetable Pathology of the State of Bahia, Brazil, Señor Doctor Gregorio Bondar, has requested a name for the following species to be used in his forthcoming paper, "Les Ennemies de Legumineuses cultivées."

Aegerina vignae, new species.

Second joint of labial palpi with well developed triangular tuft of black scales, slightly tipped with yellow; terminal joint erect, black with acute apex reddish. Antennae gradually thickened towards the tip, with minute hair pencil at apex; in the female simple with basal half bluish black and apical half dark maroon brown; in the male biciliate on underside and light reddish brown throughout. Face smooth, iridescent, bluish black; head with semi-erect dull black scales and a thin transverse line of yellowish white scales. Thorax dark reddish brown, nearly black, with shoulder tufts edged with yellow and with posterior edge yellow. Abdomen wasp-like towards base, bluish black with each joint narrowly edged with yellow posteriorly. Anal lateral tufts bluish black. Fore wing with costal area above the cell bluish black, dorsal edge and cross vein dusted with reddish brown; otherwise nearly clear, transparent; 11 veins; vein 10 absent; 7 and 8 stalked to costa; 2 to 6 separate and straight. Hind wing transparent with veins thinly scaled; 7 veins; vein 4 absent; 3 and 5 shortstalked (Plate 7, Fig. 1). Legs metallic bluish black with the spurs and posterior edge of each joint yellow.

Male genitalia (Plate 7, Figs. 3–4) typical Aegeriid with gracefully backwardly curved socii (Si) clothed with forked hairs; winged tegumen; gnathos (Gn) with narrow, strongly chitinized, curved, wire-like ventral plate (Vp) supporting the anal tube; harpes with forked scales on costal half, dorsal half nearly unscaled except for a rectangular patch of scales on the middle of the sacculus and two strong spines of unequal length on the base of the sacculus; this latter character is probably generic, and is not found in any North American species of the family; vinculum produced, stout, half as long as the harpe; anellus rounded, with two elongate, weak lobes surrounding the aedoeagus; the latter long, thin, straight, dilated at base; penis with about ten pairs of small seed-like cornuti.

Female genitalia (Plate 7, Fig. 2) telescopic, with lobes of the ovipositor elongate, narrow, and opposed to each other; ostium strongly chitinized, deep funnel- or cup-shaped with inverted edges; adjoining posterior half of ductus bursae a strongly chitinized, curved and narrow tube; anterior half wider, soft and ending in a rather small, soft, oval bursa, with a mere trace of signum.

Type and Cotypes.—Cat. No. 42161, U. S. N. M.

Type locality.—Bahia, Brazil.

Foodplant.—Stems of *Vigna sinensis* Endl. (cowpea) and other cultivated leguminous plants (Gregorio Bondar).

The genus *Aegerina* Le Cerf has hitherto been restricted to its type, *A. ovinia* Druce, from Mexico and Guatemala, from which the present species differs in coloration; some of the other South and Central American species, however, described by Druce as *Aegeria* and placed at present in the genus *Synanthedon* Hübner (Dalla Torre, Strand, Hampson and Le Cerf), will probably be found to belong to *Aegerina;* the genus is characterized by the tufted antennae, the straight dorsal veins in the fore wings, the stalked veins 7 and 8, and the absence of vein 10 in the fore wing, the stalked veins 3 and 5 in the hind wing, and the anteriorly narrowed abdomen, as well as by the male genitalia, which are at once recognized by the strong single spines on the base of the sacculus.

EXPLANATION OF PLATE 7.

Aegerina vignae Busck.

Fig. 1. Wing-venation.
Fig. 2. Genitalia of female.
Fig. 3. Genitalia of male.
Fig. 4. Side view of tegumen; Si—socii; Vp—ventral plate; Gn—gnathos.

Drawings made under the author's supervision by Eleanor Templeman Armstrong of the Bureau of Entomology.

PAPER WASPS (POLISTES) AS PESTS IN BIRD HOUSES.

By W. L. McATEE.

A cooperative project between the Biological Survey and Bureau of Plant Industry for increasing the number of birds in the experimental chestnut orchard at Bell, Md., has been under way since 1926.

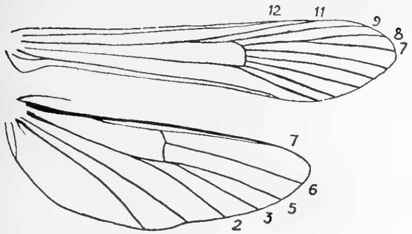
In the season of 1928 ninety-nine bird boxes were available and of these forty had one or more nests of *Polistes* in them. These wasps showed a decided preference for houses in the sun, those selected having an average degree of insolation of 78.5%. Some of the lowest (4 ft.) houses were inhabited by the wasps, but none of the highest ones (10 to 15 ft.), the average height of those occupied being 5.5 feet.

Of the forty nests with *Polistes* in them eleven were occupied at the same time or later by birds. In four of these cases the wasps were driven out by our aggressive operations, in six cases the wasp nests were unsuccessful perhaps by reason of destructive activities of the birds themselves, and in one instance the bird house was occupied simultaneously by wasps and birds.

The opportunity was taken for experimenting on methods of driving out wasps, and two sprays were used, namely, gasoline and Flit. Either would in most cases kill a *Polistes* thoroughly drenched with it, but neither was effective as a vapor, and merely spraying these fluids through the entrances of otherwise closed bird boxes had no permanent ill effects upon the wasps.

Tearing the nests down and removing them from the houses was the only remedy we found of any account and this operation had to be repeated two, three, or even four times to achieve lasting success. Nests can be torn out on cool days or in the morning or evening with little to fear from these well-armed but comparatively mild-tempered and sluggish wasps.

It may be of interest to add that two of the boxes were occupied by swarms of honey bees.



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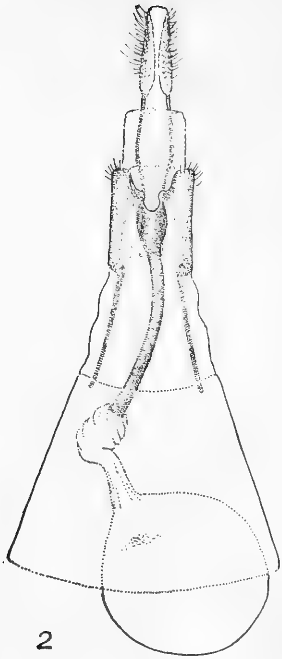

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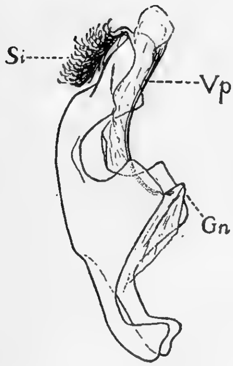

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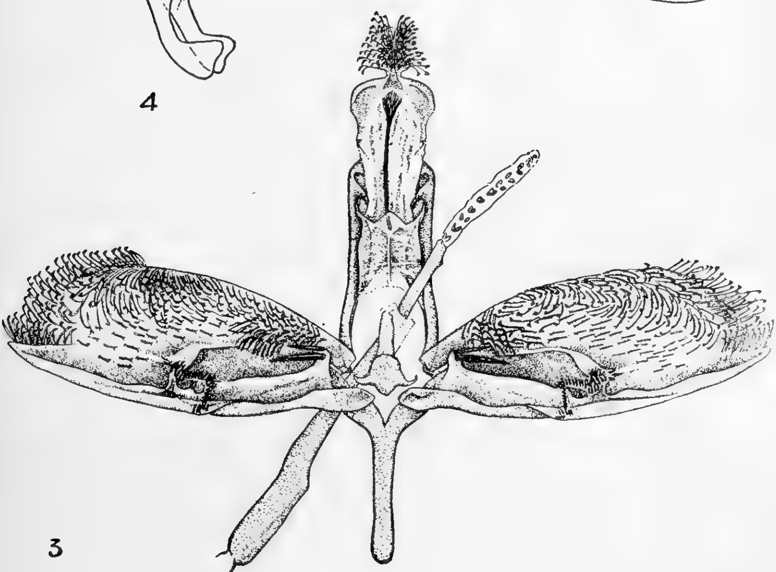

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E.T.A.

BUSCK NEW AEGERIID ON COWPEA.

THE PLACE OF AUTHORITY IN TAXONOMY.

By W. L. McAtee.

Taxonomists while they have constantly to deal with authorities, should ever be on guard against placing too much reliance on authority. Science rests upon data subject indefinitely to verification, and in no branch of science is the necessity for this process greater than in taxonomy. The infinitude of detail resulting from the vast number of organisms dealt with, their multiplicity of characters, the complexity of descriptions and of bibliographic references renders going back to fundamentals a constant necessity.

A reviser can not accept identifications merely upon authority, a bibliographer can not safely copy references perhaps already second or third hand and therefore almost certainly erroneous, and the definer of ranges must be ever conscious of the ease with which errors creep into citations of geographic names often from more or less abbreviated or illegible labels. The systematist who occupies all of these rôles is reminded at every turn that he can not safely rely upon authority.

If a large work, one for which the author can not possibly verify all details, must be undertaken, it can only be with trepidation and a foreboding that it will be charged with errors. The ideal is a small work perfected and polished with infinite patience. Most of us usually are too impatient for this type of performance, or prompt results are demanded, and we rush through another largely compiled paper; in other words we trust once more to authority and as a rule have ample cause for regret. It may encourage us to adopt a more careful policy to reflect that errors copied would go on forever, except for inquiring minds that so far as possible verify every detail for themselves. Without this type of mind, self-reliant, and spurning authority, there would be no progress, no science. We conclude, therefore, that only through force of unavoidable circumstances has authority any place in taxonomy.

A MANUAL OF EXTERNAL PARASITES.

By Henry Ellsworth Ewing.

Although dealing principally with the external parasites of the vertebrates this work also includes a discussion of the mites affecting some insects such as the locusts. The larger part of the work is devoted to the mites, which discussion consumes some 65 pages. The remaining allotments are as follows: Mallophaga 37 pages, Siphonaptera 31, Anoplura 26, Ixodoidea 25, and descriptive matter proposing some 32 new genera in

4 of the orders, 20 pages, respectively. In most cases family and generic tables are given and a list of synonyms with a brief bibliography are appended. A convenient index occupies some 20 pages.

An important feature of this manual is the digest of control or remedial measures furnished for each principal group. In view of its content this work should prove of great value to the student and of more than ordinary interest to the advanced taxonomists in the orders treated.

The letter press, illustrations, paper and binding are excellent.

The publisher is Charles C. Thomas, Springfield, Ill. Price, $4.50. —*W. R. Walton.*

PERIPATUS FROM THE ISLAND OF MONTSERRAT.[1]

By Austin H. Clark.

The National Museum has just received from Mr. T. Savage English three specimens of an onychophore from the island of Montserrat, British West Indies, where, according to Mr. English, this creature is "now nearly exterminated."

The species represented is *Peripatus* (*Peripatus*) *antiguensis* Bouvier which was originally described from the neighboring island of Antigua. This form is very closely related to *P.* (*P.*) *dominicæ* Pollard from the island of Dominica.

All three specimens are females; one is 42 mm. long with 29 pairs of legs; another is 38 mm. long with 29 pairs of legs; and the third is 35 mm. long with 31 pairs of legs.

NOTE ON THE RESPIRATION OF ENTOMOLOGISTS.

The desirability becomes more and more apparent that refutation be made of certain opprobrious allegations directed from time to time against conditions alleged to prevail during the two-hour sessions of our society: (1) Vigorous denial should be made of the systematically disseminated slander to the effect that the entomologists composing our personnel have a chronic aversion to ordinary systems of ventilation. On the face of it this is false and preposterous, as it can easily be proved that our assembly hall is thoroughly aired out at least once and sometimes twice each decade—and, verily, what more could possibly be expected or desired in exuberant abundance of fresh air. Traducers with turned-up noses have more than hinted that there also frequently prevails therein a distinct

[1]Published with the permission of the Secretary of the Smithsonian Institution.

odor of mustiness. Of course, it is to be expected that this would be misinterpreted by an uninitiated proletaire, because in reality that which is noticed is the atmosphere of scholarship and learning which prevails at our sessions, and it is this which is—as it should be—the pride and glory of our membership. In reply to the offensive remarks regarding the high degree of heat likewise claimed to prevail at other times to an excessive degree in our meeting place, it should be emphatically asserted that the temperature never at any time has been permitted to go higher than 212 degrees F. Furthermore, adequate warmth is highly commendatory and desirable in this particular circumstance as it must be attributed solely to radiations from the passionate beating of the warm hearts of our members during these periods of fraternal devotion and good fellowship. (2) Indignant repudiation also should be made of the gross exaggerations that repeatedly have reached our ears concerning an alleged over-abundance of tobacco smoke in the room during our deliberations. It even has been stated that garments worn on such occasions have become so thoroughly permeated with smoke that they were never afterwards in need of subsequent fumigation. The real fact is that tobacco smoke is never allowed to become thicker in the room than can be chopped with a meat ax. Then in this phenomenon, too, there is an altruistic impulse, for members of our society who indulge during sessions in the fragrant weed are actuated in part by a benevolent consideration for their companions—few in number—whose early education has been neglected to the unfortunate extent of not having learned to smoke. No doubt these smokers are actuated by a deep desire to pass a good thing along so that its satisfaction may be shared by their comrades. It is urged that our membership take every opportunity to repudiate all calumnies and extravagant statements of the character here indicated, for they are not only highly reprehensible but are unworthy the dignity and gravity of our gatherings.

J. S. WADE.

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PROCEEDINGS OF THE
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VOL. 31 NOVEMBER, 1929 No. 8

A PRELIMINARY GENERIC ARRANGEMENT OF THE PALM BRUCHIDS AND ALLIES (COLEOPTERA) WITH DESCRIPTIONS OF NEW SPECIES.

By JOHN COLBURN BRIDWELL, *Washington, D. C.*

In January, 1829, Dr. E. A. Back, in charge of Stored Product Insect Investigations in the United States Department of Agriculture, showed me two palm bruchids from Brazilian babassu nuts under investigation in his office. Having already given considerable attention to this group, I asked permission to study them. On comparing them with the material in the United States National Museum, both species were found to be already represented there and in addition to these there were representatives of five other species so closely allied to one of them as to make it necessary to treat them together. Unfortunately the condition of the literature of the group does not enable the described species to be determined with certainty and types or other authentically named material are not to be found in this country. Dr. Back and Dr. Cotton have prepared a paper upon these two bruchids and needed names for them. The present paper has been prepared to supply this need, to describe characters not previously used to distinguish species in the group, and to establish in the literature the genera into which the palm bruchids have differentiated.

Opportunity for type study being not yet afforded, I have ventured to describe the species as new believing it will be easy to sink any species found synonymous after the study of types. It is more difficult to clear up confusion caused by misidentifications.[1]

The types of the species here described are to be found in the United States National Museum, Washington, D. C.

GENONYMS AND GENERA OF PALM BRUCHIDS AND ALLIES.

The species of Bruchidae breeding in the seeds of many American palms have been considered as belonging in a single

[1]I have appreciated the opportunity to work on these interesting Bruchidae, particularly as it associates my work with the economic aspects and illustrations discussed in the paper previously referred to.

genus, in which have been included several Old World species, none of which are known to attack palm seed. The first genonym applicable to this group is *Pachymerus* Thunberg 1805, a monobasic genus based upon *Dermestes bactris* Johansohn 1763 (usually cited as of Linnaeus). The second was *Caryedon* Schoenherr 1823, with the originally designated genotype *Bruchus serratus* Olivier 1790, which has largely been lost sight of. In 1833 Schoenherr suppressed *Caryedon*, erected the "Grex" *Caryoborus* in *Bruchus* with the designated genotype *Bruchus serripes* Sturm 1826, including in it *bactris* and *serratus* and applied the genonym *Pachymerus* to another "Grex" with the designated genotype *Bruchus brasiliensis* Thunberg, which is not congeneric with any of the species referred to. This arrangement of the palm bruchids and the Old World "*Caryoborus*" was universally followed until 1913, when Pic restored *Pachymerus* for the group, listing *Caryedon* as a subgenus without indicating its application to species. Careful study of the Bruchidae of the National Museum has convinced me that the Old World species are not congeneric with the palm bruchids and must form a separate tribe. The palm bruchids separate naturally into three genera and form a compact tribe. These tribes with a third composed of *Caryopemon* Jekel 1855 and *Diegobruchus* Pic 1913 form a natural subfamily of the Bruchidae.

PACHYMERINAE (new subfamily).

Mesepimeron free, not fused with the mesepisternum, broadly attaining the trochantin extension of the mesocoxal cavity, but little or not at all narrowed beneath; pronotum flattened, flanks separated from dorsum by a marginal carina subtended on the dorsum by an impressed line, completely surrounding the dorsum or both obsolete anteriorly on the sides in *Caryedon;* anterior angles but little deflected toward the front coxae; front and middle tibiae with small equal paired calcaria concealed in the dense lustrous fulvous appressed hairs covering the tibiae toward the apex; front and middle tarsi with first and second joints triangularly widened toward apex and with the expanded lobes of third joint bearing dense fulvous plantar brushes, hind tarsi similar, basitarsus longer, hind tarsus about half as long as tibia; hind coxae narrow, about half as wide as the femora, and narrower than first sternite behind coxa (this elongate often forming in the middle more than half the length of the abdomen); hind femora strongly incrassate, unicarinate beneath, with a strong tooth and a denticulate crista extending from it toward the apex, or with several strong teeth near apex, hind tibiae arcuate dorsoventrally, with a median longitudinal ventral channel bounded by strong ridges, obliquely truncate at apex, ventral apex produced into a strong trowelshaped spine; elytra elongate, convex, narrowed and deflected at apex, covering base of pygidium, or in *Caryopemon* and *Diegobruchus* less convex, little deflected and narrowed at apex, not covering base of pygidium.

None of the species referred to *Pachymerus* Latreille by Schoenherr and his associates or other authors before 1913, except *Pachymerus pandani* Blanchard 1845, are members of the Pachymerinae as thus described. They are, in general, Bruchinae and some but not many fall into *Andromisus* Gozis 1881 (*Pseudopachymerus* Pic 1913).

TRIBES OF PACHYMERINAE.

The tribes of the Pachymerinae may be distinguished by the following table in which the order is from the specialized to the generalized forms:

1. Head elongate, malar space longer than broad, temples strongly produced behind the eyes; eyes finely facetted, emarginate for half their length; pronotum less flattened, lateral margins depressed, its hind margin semicircularly produced between the elytra; front coxae contiguous at apex or narrowly separated; scutellum minute; elytra flattened with humeral calli prominent, not much narrowed apically nor bent down, not covering the base of pygidium.....*Caryopemini*, new tribe (*Caryopemon*, *Diegobruchus*).

   Head short, malar space not longer than broad, temples not produced; eyes coarsely facetted, emarginate for one-fourth or less of their length, strongly projecting; pronotum flatter, not produced semicircularly between the elytra; scutellum larger; elytra convex, elongate, narrowed and deflected apically, covering base of pygidium........2.

2. Carinae and impressed lines of pronotum obsolete on the sides in front; front coxae contiguous at apex, prosternum separating them for not more than one-third their length; eyes barely perceptibly emarginate; joints one and two of tarsi but little expanded at apex .... *Caryedini*, new tribe (*Caryedon*).

   Carinae and impressed lines of pronotum complete, the lines surrounding dorsum; front coxae separated at apex by the sternum; eyes distinctly emarginate but not for more than one-fourth their length, joints one and two of tarsi strongly triangularly expanded........ *Pachymerini*, new tribe (*Pachymerus*, *Caryobruchus*, new genus, *Caryoborus*).

Caryopemon and Diegobruchus.

Jekel 1855 Ins. Saundersiana Curcul. 25–26, gave the most carefully elaborated description of a Bruchid genus which has been published, describing *Caryopemon* and an equally excellent description of the genotype *hieroglyphicus* l. c. 27–29, with the locality "India orientalis." During June, 1925, I collected a large series of the species feeding upon the glands of the young leaves of the scandent *Acacia intsia* at Mormugao, Goa, Portuguese India. This is not the host plant and I could not find the plant in which it breeds. There is before me also an individual of this species from Bandra (a suburb of Bombay), India, collected by Dr. Jayakar, 1905, 152, which reached the National Museum through the British Museum by way of the Carl F. Baker collection. Another belonging in the collection of the Imperial Entomologist of India, kindly lent to me for study with other bruchid material by T. Bainbrigge Fletcher, Imperial Entomologist, was collected at Chicacole Road, Madras Presidency, by P. V. Isaac, 8, vii, 24. These are the only locality records known to me for the species.

Stephens 1839 Man. British Col. 265, described *Caryoborus cruciger* "from red West India seeds: evidently imported." It was figured by Spry and Shuckard 1840 British Col. Delin. Suppl. Pl. 6, f. 2, and referred to *Caryopemon* by Pic 1913 Col. Cat. 55:9, with the locality indication "England (eingeschleppt), Indien, Afrika." I have elsewhere (Journ. Washington Acad. Sci. 15:80, 1925) recorded it as bred from seeds of *Abrus precatorius* by Le Doux, Cape Province, Union of South Africa. Since then two additional lots have come to the National Museum secured from the same plant from Africa by inspectors of the Federal Horticultural Board. I know no other records of the habits of any of the species, all of them Indo-Maylayan, Mascarene, or Ethiopian.

While many important characters force us to place *Caryopemon* in the Pachymerinae, it shows many resemblances to *Andromisus* Gozis 1881 as represented by the genotype *Bruchus brasiliensis* Thunberg 1816. Whether these resemblances indicate affinity or convergence requires further study to determine. The species show much divergence and may not belong together. Pic 1912 Échange 28:110, has laconically established the "new genus *Diegobruchus* (for the old *B. suarezicus* Pic 1904 Échange 20:35), near *Caryopemon* and very distinct by the prothorax strongly inclined in front, concealing the head from above, hind femora strongly incrassate, pluridentate, the tibiae strongly arcuate." When the characters of *Diegobruchus* are further elaborated some species of *Caryopemon* may, perhaps, be placed there. There are no records of the habits of any species of *Diegobruchus* which are all Mascarene or East African.

Caryedon and its Genotype.

The first species of the Pachymerinae was described by Geoffroy 1762 as *Mylabris* 2, without a specific name. Goeze 1777 Ent. Beytr. 1:332, based *Bruchus fuscus* upon this description. Subsequently this species has received many names because the descriptions are inadequate; it utilizes a large number of leguminous host plants over an extraordinary range of distribution and is much more than ordinarily variable. Olivier 1790 Encycl. Meth. Ins. 5:199, described it under two names, *Bruchus pallidus* and *Bruchus serratus*, as collected by the younger Geoffroy in Senegal. Schoenherr in Isis von Oken 1823: 1134, cited *serratus* as the genotype of his undescribed genus *Caryedon*, a valid and available genonym under the International Code of Zoological Nomenclature, and a proper genotype fixation. Bedel 1901 Faune Col. Bas. Seine 5:341, after comparing the types made *serratus* a synonym of *fuscus*, indicating that both types had been collected by the younger Geoffroy in Senegal. The name of the genotype therefore is *Caryedon fuscus* (Goeze) new combination. If my present interpretation of the species and its synonymy is correct some 19 or more specific names have been applied to *Caryedon fuscus*, of which we need to mention here only *Bruchus gonagra* Fabricius 1798 Ent. Syst. Suppl. 159, and *Bruchus* (*Caryoborus*) *languidus* Gyllenhal 1839 in Schoenherr Gen. Curc. 5:129, names much used for the species. It is found throughout the Old World tropics and subtropics and has become established in Hawaii (recorded 1908), Jamaica (1916), Fiji (1921), and now Haiti (1928). The other species are found in the Old World and the only records of habits, besides those of *fuscus* under one name or another, are by Skaife 1926 South African Journ. Sci. 23:579, recording the attacks of *interstinctus* Fahraeus upon the seeds of *Acacia giraffae* in South Africa and Blanchard's account of his problematical *Pachymerus pandani*.

Caryedon? pandani (Blanchard).

Blanchard 1845 Hist. Ins. 2:114, pl. 10, f. 5–8, described from Madagascar *Pachymerus pandani* as "from five to six mm. long, and entirely grayish." To this brief description may be added his diagnosis of *Pachymerus:* "Hind femora much inflated, multidentate. Tibiae arcuate. Antennae long, a little serrate." The figures show that the insect was reared from *Pandanus* and is a bruchid of the subfamily Pachymerinae, possibly a *Caryedon* or an undistinguished genus near it. He refers to it 1845 Ann. Soc. Ent. Faunce (2) 3: iv, as *Bruchus pandani* and indicates that it may have originated in Bourbon. Pic 1913 Col. Cat. 55:11, places it in *Pseudopachymerus*.

The Genera of Palm Bruchids (Pachymerini).

The genotypes of *Pachymerus* and *Caryoborus* are not congeneric, these genonyms are therefore available for two genera. The genera are arranged from the more generalized, to the more specialized forms. That part of the armature of the lower margin of the hind femora occurring before the great tooth, is referred to, if present, as made up of serrations; that beyond it as denticles; they are not much unlike in some species.

1. Hind tibiae with two small unequal calcaria at apex beneath; antennae serrate from fourth joint or from third in one male, basal joints not impressed at base; hind femora with the great tooth before the middle, margin before it not serrate; crista beyond it with from ten to sixteen denticles; hind tibia evenly arcuate, without a tubercle beneath near base, received against the femur between the great tooth and crista within toward apex and a not very prominent subbasal angular process without.... *Caryoborus*.

   Hind tibiae without calcaria........2.

2. Antennae serrate from fourth joint (except in *veseyi* in which they are subfiliform), basal joints not impressed; hind femora with the great tooth beyond the middle, margin before it serrate, crista with six to ten denticles, hind tibia receiving the serrations of hind femur in its ventral channel and lying outside the great tooth and crista as in *Caryoborus*, but lacking the subbasal process of femur........*Caryobruchus* new genus.

   Antennae serrate from the fifth joint, joints 2, 3, 4, and sometimes others impressed at base; hind femora with the great tooth near base, margin before it not serrate, margin beyond hardly cristate, with ten or more denticles more or less hidden in pubescence, lower margin apically emarginate, the apical denticles, one at the beginning of the emargination and one or two in the emargination more tuberculate than the others; hind tibia abruptly bent near base, with a tubercle beneath at the bend, shallowly channeled above within and without, these longitudinal channels bounded by weak ridges (in addition to the ventral channel), received against the femur within and alongside the denticles and great tooth........ *Pachymerus*.

Caryoborus Schoenherr (Restricted).

As restricted by the description here given, *Caryoborus* includes *Bruchus serripes* Sturm 1826, *Caryoborus priocerus* Chevrolat 1877, *Caryoborus chiriquensis* Sharp 1885, and perhaps other species. The material of the genus in the National Museum seems to fall into but two species, all of it from the continent of South America. *Chiriquensis* was described from Panama and probably occurs there naturally, though all the material we have from Panama was secured in quarantine, in commercial ivory palm nuts from Equador, in which there is a considerable export through Panama. It may be that what I have considered as *serripes* consists of more than one species but I have been unable to find any certainly significant differences between the darker material from Bolivia and from French Guiana and the more rufescent material from Brazil. Probably *priocerus* is synonymous with *serripes*. The species may be separated thus:

1. Denticles of hind femur about 16; humeri strongly asperate; antennae unlike in the sexes, joint three widened in male and not in female, joint 11 in

male thrice as long as broad, twice as long as broad in female, mesosternum abruptly bent toward the plane of metasternum........................*serripes*.

Denticles about 12; humeri feebly asperate; antennae alike in the sexes, joint three narrow, joint 11 about twice as long as broad; mesosternum gradually curved back toward the plane of the metasternum....*chiriquensis*.

Caryoborus serripes (Sturm).

Sturm 1826 Cat. Ins.—Samml. 74, tab. III, fig. 28, described and figured this species "aus Para in Brasilien" without indication of host plant as *Bruchus serripes* and Boheman 1829 Nouvelle Mem. Soc. Nat. Moscou 1:117–118, independently described it under the same name attributed to Hoffmannsegg on the authority of Schneider in Litt., from the Schoenherr Collection, saying doubtfully "habitat in America meridionali." Schoenherr 1833, designated it as "typus" of his Grex *Caryoborus* in *Bruchus*, a proper genotype designation, according to the International Code. Pic 1913 Col. Cat. 55, referred it to *Pachymerus*.

In the National Museum is a series of a *Caryoborus* with the palm seeds from which they issued which have remained unidentified since 1878. The infested seeds were brought to Theodore Pergande by Mr. Smith of the Botanic Garden and reared out by him, several larvae working in a single seed. Careful study of Sturm's descriptions and figures and Boheman's description convince me that they are *Caryoborus serripes*. The seeds were referred to O. F. Cook and C. B. Doyle of the Bureau of Plant Industry and determined as those of a species of *Astrocaryum* and in all probability from Brazil as originally indicated by Mr. Smith. The indication of *Elephantusia* [*Phytelephas*] *macrocarpa* as host plant for this species by Letzner 1878 Jahresb. Schles. Ges. 55:195–198, is doubtless due to confusion with the similar, still undescribed *Caryoborus chiriquensis* Sharp 1885. Other material in the National Museum determined as this species, is a series collected by William Schaus on the Maroni River, French Guiana, in 1904; one individual intercepted in quarantine at Washington, D. C., by E. H. Dusham, then of the Federal Horticultural Board, in palm nuts from Para, Brazil, accompanied by a fragmentary beetle and fragment of palm nut from which it issued, considered by Mr. Doyle as probably that of a *Maximiliana;* and one individual collected by M. R. Lopez in February at Ivon, Beni, Bolivia, while with the Mulford Biological Expedition of 1921 and 1922.

Caryoborus chiriquensis Sharp.

Caryoborus chiriquensis Sharp 1885 Biologia Centr. Amer. Col. 5:504, pl. 26, f. 13, was described from the Volcano Chiriqui, Panama. A series in the National Museum derived from the Chittenden collection, bears a locality label Ecuador 5990, and another indicating they had been determined as this species by Dr. Sharp; two individuals are labelled Ivory nuts, Pier 7, Cristobal, C. Z., Oct. 26, 1918, H. F. Dietz Coll.; a series bear the label Zetek 1436, in Ivory nuts, Baranguatal, Ecuador. Under this number in the files of the Bureau of Entomology is the following note by Mr. Zetek: "Given me by Mr. H. K. Plank who collected it in April, 1921, and thought it was a good nut. Was going to send it to his people in the United States, I believe. The entire inside was reduced to powder, pupal cells and weevils. There were thirty-one adult weevils present, each in a cell by itself, filling the entire nut cavity." J. W. Douglas, 1876, Trans. Ent. Soc. London, 1876: xiv, xvi, reported a *Caryoborus*, presumably the present species, as seriously affecting the weight of a shipment of the Corozo nut (*Phytelephas macrocarpa*) on the London docks, imported from Guayaquil. "As there were several larvae in each nut the interior was completely destroyed." As before indicated, Letzner's record of the Ivory nut being attacked by *Caryoborus serripes* refers to this species. Schilsky's notes and description under *Caryoborus serripes* 1905, Käfer Europa's 41: G and 1906 op. cit. 43: no. 28, as imported into Hamburg from Central America also seem to refer to this species.

CARYOBRUCHUS, new genus (Genotype *Dermestes gleditsiae* Linnaeus).

The material of this genus to the National Museum is separable into fifteen species, of which only *veseyi* (Horn), *gleditsiae* (Linnaeus), and *curvipes* (Latreille) may be recognized with reasonable certainty as described.

This is the most widely distributed palm bruchid genus, with numerous species on the continent from the Carolinas to Argentina and in the West Indies, being the only genus definitely known to be represented in the United States and the West Indies. It is also more divergent than the other genera with two rather well defined groups besides the somewhat isolated *Caryobruchus veseyi*. The group of smaller species, so far as they have been associated with host plants, breed in the seeds of the palmettos and palms having similar drupaceous fruits with hard seeds lacking a differentiated soft kernel, mainly Sabalaceae Cook. The group of larger species breed in the oily kernels of palms in which the soft kernel is differentiated from the hard shell inclosing it, the shell covered with a pericarp and epicarp, sometimes soft and fleshy, often fibrous (Cocoaceae Cook). The former group includes the smallest species of the palm bruchids and the latter the largest, indeed the largest of all Bruchidae. *Caryobruchus giganteus* is described as reaching 29 mm. in length, while some individuals of *C. gleditsiae* of the smaller group collected by H. S. Barber on Big Pine Key, Florida, do not exceed 5 mm. in length.

The two groups may be distinguished by the form of the gula, *veseyi* agreeing with the smaller species in this character. The larger species have the eyes somewhat approximate beneath and the gula is abruptly narrowed between the eyes with its sides there parallel; in the others the eyes are less approximate beneath and the sides of the gula converge posteriorly. The larger species, so far as the fourteen individuals at hand represent the group, are all fifteen mm. or more in length. The carina of the hind femur beneath is incised before the great tooth with about six incisions forming flattened serrations; in the smaller species, the serrations are less flattened, more distinct, even and more numerous. In the larger species the antennal joints are longer and more slender, the apical joint being three times as long as broad; the apical joint in the smaller species is about twice as long as broad; in *veseyi* it is similar to those of the larger group but the other joints are still more slender than in those species and hardly serrate. Except in *veseyi* and two undescribed smaller species the elytral humeri are smooth or at most microscopically asperate; in these they are asperate as in *Pachymerus*. In the larger species the pronotum is angulate on the sides near the apical third, much more so than in any of the smaller species. The coarse punctures on the dorsum of pronotum are fewer than in the smaller species and grouped into a mediolateral and posterodiscal group on either side, those of the former group usually not extending forward beyond the lateral angulations. Most of the species have the antennae, more or less of the front and middle legs and the tibiae and tarsi of the hind legs reddish testaceous or yellow, contrasting with the darker reddish coloration of the body. In the males the first joint of the front and middle legs are very evenly inflated and expanded from base to apex with the lateral margins evenly rounded out and about twice as long as broad. Some of the smaller species have this joint similarly inflated but in them the joint is shorter and broader.

The large *Caryobruchi* are represented in the National Museum by six forms, presumably species, but their status and relationship to four species names in this group can not be determined until ampler material is available and comparison with the types of *ruficornis*, *giganteus*, *donckieri* and *revoili* can be made. No authentic material of any of these species is found in this country. Since but two of these forms are present in both sexes and the material of two of them show distortion from unnatural conditions during transformation, more satisfactory material for type series of new species might well be desired. Nevertheless, characters to distinguish species in this group seem to be present and have not been brought forward before. I have therefore ventured to describe and give names to these six forms, recognizing that some of them may be synonymous with species previously described.

Table of the Species of Caryobruchus with the sides of the gula between the eyes parallel, not converging posteriorly.

1. Sides of pronotum strongly angulate, somewhat concave between this angulation and the posterior angles............2.
   Sides of pronotum less strongly angulate, nearly straight from the angulation to the posterior angles............4.
2. Apex of mesosternum abruptly bent, the bent apex as long as broad, lateral sulcus of pronotum punctate............3.
   Apex of mesosternum gradually bent back toward the plane of the metasternum, lateral sulcus of pronotum not visibly punctate, mediolateral punctures about 15, extending forward beyond the angulation, posterodiscals about 14 (11–16); Colombia from seeds of *Scheelea excelsa;* length from anterior margin of pronotum to apex of elytra, 17–18 mm............ *scheeleae*, new species.
3. Basal portion of mesosternum subvertical, surface subgibbous at the bend; pygidium about as broad as long, broadly rounded at apex (slightly produced in ♀), a little convex (more convex in ♂); punctures of lateral sulcus few, not extending forward beyond the angulation, mediolaterals about four, posterodiscals about seven; Brazil from babassu nuts; 15 mm............*lipasmatus*, new species.
   Basal portion of mesosternum more oblique, surface not gibbous at the bend; pygidium longer than broad, but little convex, broadly truncate in both sexes (narrowly produced in ♀); punctures of lateral sulcus more numerous, extending forward beyond the angulation; mediolaterals about 16 (9–21); posterodiscals about 20 (10–40); Panama, Venezuela; 13–18 mm............*buscki*, new species.
4. Punctures of lateral sulcus coarse, in more than one series, encroaching on the surface above the sulcus, fine punctures of pronotum in front well impressed and numerous, extending across near the front margin from one group of mediolaterals to the other; denticles about seven, not flattened, four basal well separated, three toward apex more or less confused and indefinite; Uruguay, from the seeds of *Acrocomia* sp.; 12–13 mm............ *acrocomiae*, new species.
   Punctures of lateral sulcus finer, in a single series, not encroaching on the surface above, fine punctures in front few and feebly impressed, not noticeable in the middle near the front margin............5.
5. Pronotum with an anterodiscal group of a few well impressed punctures within the mediolaterals, finer than these and coarser than the fine puncture; denticles as in *acrocomiae;* Para, Brazil, from seeds of *Attalea* sp.; 14 mm............*pararius*, new species.

Pronotum without anterodiscal moderate punctures; denticles about 12, flattened, crista much elevated; from palm nut, probably *Astrocaryum* sp. from Brazil; 15 mm. .... *pergandei*, new species.

Caryobruchus scheeleae, new species.

Brownish red, antennae, front margin of clypeus, labrum, palpi and tars yellowish testaceous, everywhere covered with fine appressed brownish cinerous pubescence somewhat obscuring the surface sculpture, everywhere micropunctulate; eyes separated by about one-fourth the width of clypeus; front narrow anteriorly, arcuately wider behind, carinate, carina continued behind as an impunctate line to the contraction of the head above, supraorbital furrows subreticulately punctured; temples broadly and shallowly sulcate parallel to the contraction; pronotum strongly angulate, posterior angles produced and subacute, sides between this angle and the anterior angulation parallel and slightly concave, dorsum with scattered shallow scarcely perceptible fine punctures and mediolateral and posterodiscal groups of coarse well impressed punctures of varying size and number, mediolaterals in the type 9 on the right, 14 on the left, in the paratype 16 on the right, 13 on the left, posterodiscals in the type, 10 on the right, 11 on the left, in the paratype, 14 on the right, 15 on the left, flanks not perceptibly punctured; scutellum about as broad as long, strongly emarginate at apex; humeri micro-asperate, striae slightly but distinctly impressed except the marginal (10th) stria which is strongly impressed basally, punctures of striae irregularly disposed, intervals flat, not perceptibly punctured; femoral serrations 6–8, basal two acute and distinct, apical serrations obtuse and ill-defined, denticles 8–9 a little confused toward apex, inner carina of hind tibia beneath more elevated than outer; pygidium of male (female unknown) about as broad as long, broadly truncate with rounded angles, convex longitudinally, not very coarsely nor closely punctured, nearly impunctate broadly on the median longitudinal line, with coarser well impressed punctures toward the middle on either side; hypopygium about as long as the preceding sternite, its margin sinuate, somewhat produced in the middle; length 17–18 mm.

Described from two males, one (type) labelled as bred in Feb., 1917, from seeds of *Attalea* sp. from El Banco, Bolivar, Colombia (F. H. B. no. 18575), received July 29, 1916, and heavily fumigated; the other (paratype) was received from R. S. Beagles, then in charge of the Plant Introduction Gardens of the Bureau of Plant Industry at Chico, California, and labelled as "ex *Attalea* nut probably from El Banco, Colombia, 24–6–16, Curran.

The seeds of this palm were collected as indicated by Mr. H. M. Curran at El Banco, Colombia, and have been determined as those of *Scheelea excelsa* by Mr. Doyle as recorded in Inventory of Seeds and Plants Imported 48:14, no. 43055, 1921, from which this note is quoted. "Fruit drupaceous, edible, ovoid, apiculate, about the size of a duck's egg; pericarp mucilaginous, oily, intermixed with fibers; epicarp leathery, yellow; seeds bony, one to three celled. Grows in hot valleys of the Magdalena and Canea." The seed from which the paratype emerged is preserved in the National Museum. It is two chambered and the larva had eaten one of the kernels. Each of the chambers is about 1.5 in. in length by .5 in. in diameter; the enclosed kernel is very oily, nearly cylindrical, and covered with a fragile brown membranous coat. The exit hole of the bruchid is 9 mm. in diameter and leads to a pupal chamber about 20 mm. long. This is closed at base by a layer about 5 mm. thick composed of a substance like rotted sawdust and is lined with a brownish cement which is not very noticeable. The rest of the chamber is filled with a substance like that compacted to form the basal wall of the pupal cell. This is the débris resulting from devouring the kernel.

Caryobruchus lipasmatus, new species.

Closely resembling *C. scheeleae* with these differences besides those indicated in the table: Front and middle tibiae also reddish testaceous as well as the parts described as yellowish testaceous in *scheelei*, exact color probably not significant but dependent on maturity and state and manner of preservation; denticles of hind femur 11–12, confused toward apex; inner carina of hind tibia not more elevated than outer; scutellum less strongly emarginate; pygidium rather evenly, finely and sparsely punctured except upon a subtriangular nearly impunctate area on either side toward base; 15 mm. long.

Described from two individuals reared in Dr. Back's office and labelled "bred from babassu nuts shipped to New York from Para, Brazil, Stored Product Insect Investigations, Washington, D. C., December, 1928." One of these is a female type, the other the male allotype; there is another female paratype which was reared by H. L. Sanford from "coco" palm nut brought to this country from Estado do Maranhao, Brazil, in October, 1915, by Dr. E. C. Green, then in the Brazilian agricultural service. The adult beetle emerged in May, 1916. F. H. B. no. 5488. I have been unable to secure a determination of the species of palm from which this individual was reared. This paratype is imperfect, lacking the hind legs and is somewhat distorted from unnatural conditions during transformation.

Caryobruchus buscki, new species.

Closely resembling *C. scheeleae* with these differences in addition to those indicated in the table: Most of the head above in front of the neck, front and middle legs and hind legs except indefinite infuscate markings on femora reddish testaceous, less contrasting with the color of the body; scutellum less strongly emarginate; femora serrations more definite apically; inner carina of hind tibia not more elevated than outer; 13–18 mm. long.

Described from four female and one male individuals, with one exception from Panama, one paratype from Venezuela; type female, Tabernilla, Canal Zone, July 31, 1907, August Busck; allotype male, La Chorrera, May 17, 1912, Busck; paratype female, same data except May 10; paratype female Barro Colorado Island, 1929, Phil Rau 7565; paratype female, Caracas, Venezuela, H. Pittier, June, 1923, no. 495.

Named in honor of August Busck, the eminent microlepidopterist, whose name must be linked with the entomological exploration of Panama. This is one of many interesting Bruchidae collected by him in this work.

Caryobruchus acrocomiae, new species.

Much less closely resembling *C. scheeleae* with these differences besides those indicated in the table: Form more compact; clypeus palpi and all the legs except darker markings on the hind femora reddish; scutellum less strongly emarginate; pygidium more coarsely and irregularly punctate, with lateral subbasal subimpunctate areas; denticles of hind femora seven; 12–13 mm.

Described from two males, a type and paratype intercepted in quarantine at Washington, D. C., in seeds of *Acrocomia* sp. from Uruguay, Nov. 9, 1921, by W. T. Owens, F. H. B. no. 40378.

Caryobruchus pararius, new species.

Closely resembling *C. scheeleae* with these differences in addition to those indicated in the table: Color of antennae, labrum and legs not contrasting with body color; sternites 1–4 with apical margin infuscate contrasting with the basal portion; scutellum very slightly emarginate; inner carina of hind tibia not more elevated than outer; 14 mm. long.

Described from one female type intercepted in quarantine at Washington, D. C., April 19, 1918 (F. H. B. no. 24247), in a palm nut from Para, Brazil, D. A. Tower, identified for me by Mr. C. B. Doyle as that of an *Attalea*, one of the oil palms, with a very hard shell and two rather small oily kernels.

Caryobruchus pergandei, new species.

Closely resembling *C. scheeleae*, with these differences besides those indicated in the table: Coloration darker, perhaps due to age or condition of preservation, labrum partly yellowish, partly reddish, margin of clypeus paler red, antennae reddish, with no other marked color contrast with body color; some peculiarity of disposition of the pubescence along the elytral striae gives an effect of alternating color to the naked eye which disappears under the lens; 15 mm. long.

Described from one female type with the old Department of Agriculture no. 1036 P. In 1878 this insect was brought as a larva to Theodore Pergande in a palm seed, apparently the same as the Brazilian *Astrocaryum* from which *Caryoborus serripes* was bred, by Mr. Smith of the Botanic Garden. In 1880 Mr. Pergande noted finding the emerged beetle and preserved the present type which has remained undescribed until now. It is named in honor of Pergande to help keep alive the memory of a pioneer in the Bureau of Entomology. Apparently a single larva emerged from a single kernel of the nut, as appears to be the case with all these species of *Caryobruchus*.

Caryobruchus ruficornis (Germar 1818), new combination.

Germar 1818 Mag. Ent. 3:1—7, tab. 1, f. 1–4 described and figured *Bruchus ruficornis*, its larva and pupa and the seed from which it had been secured by Zincken in Brunswick from palm nuts, which Germar supposed to be those of *Bactris minor* Jacquin from the West Indies. The figure, however, shows the seed of one of the oil palms very much larger than those of *Bactris*. In the same volume, p. 463, he refers his species to *Bruchus curvipes* Latreille 1811, in which he was certainly in error. His species was the first of the large *Caryobruchi* to be described and his description of the larva was the first detailed[1] description of a bruchid larva. His error of determination has been universally followed and all subsequent literature of *Bruchus curvipes*, and particularly its larva, has been based on this or one of the related large species of *Caryobruchus*.

OTHER CARYOBRUCHI OF THE GROUP OF LARGE SPECIES.

The following species from the descriptions seem to belong in the group of large species of *Caryobruchus* with the sides of the gula between the eyes parallel, not converging. As has been said, I have not been able from the descriptions to make out whether any of these specific names or *Caryobruchus ruficornis*, represent species distinct from those here described or from each other. Pic's two species do not seem to be synonymous.

[1]Herbst 1784 [Borowsky] Gemein. Naturgesch. Thicerr. 6:102–3, and Kurze Einleit. z. Kenntn. Insekt. 102–103, described briefly the larva of *Pachymerus nucleorum* as that of *Bruchus bactris* and Boddaert 1770 Dierkundig Mengelwerk Stuk 5:12–23, f. 9–13 describes in the Dutch language and figures a palm bruchid and its larva obtained for him by Heer L. Juliaans, able apothecary, presumably in Flushing, from a South American palm nut used by the button makers. Everything suggests *Caryoborus chiriquensis* in the ivory palm nut but we can not be quite sure.

Caryobruchus giganteus (Chevrolat) new combination.

Caryoborus giganteus Chevrolat 1877 Ann. Soc. Ent. France (5) 7: xcviii Bahia.
Pachymerus giganteus (Chevrolat) Pic 1913 Col. Cat. 55: 7 Brasilien.

Caryobruchus donckieri (Pic) new combination.

Caryoborus donckieri Pic 1899 Le Naturaliste 21:21 Brazil.
Pachymerus donckieri (Pic) Pic 1913 Col. Cat. 55:7 Brasilien.

Caryobruchus revoili (Pic) new combination.

Caryoborus revoili Pic 1902 Le Naturaliste 24:172 Paraguay.
Pachymerus revoili (Pic) Pic 1913 Col. Cat. 55:8 Paraguay.

Species of Caryobruchus With the Sides of the Gula Converging Between the Eyes.

The species of this group with one exception, develop in the seeds of Sabalaceae which are without differentiated kernel and hard outer shell; an undescribed species in the National Museum is said to have been reared from a Mexican *Chamaedorea* of another family but with somewhat similar seeds. Nine species are represented in the collection, of which I am reasonably certain of the identity of three species. These four following names appear to apply to species of this group but I can not definitely associate any of them with the remaining six species of the collection:

Caryobruchus testaceus (Motschulsky) new combination.

Caryaborus testaceus Motschulsky 1874 Bull. Soc. Nat. Moscou 46^2:246–247.
Pachymerus testaceus (Motschulsky) Pic 1913 Col. Cat. 55:8 Nicaragua.

Caryobruchus rubidus (Chevrolat) new combination.

Caryoborus rubidus Chevrolat 1877 Bull. Soc. Ent. France (2) 7: cxiv Mexico, Tutla [Tuxtla, Chiapas] (Boucard).
Pachymerus rubidus (Chevrolat) Pic 1913 Col. Cat. 55:8 Mexico.

Caryobruchus recticollis (Chevrolat) new combination.

Caryoborus recticollis Chevrolat 1877 Ann. Soc. Ent. France (2) 7: cxv Venezuela, Caracas (Langsberg).
Pachymerus recticollis (Chevrolat) Pic. 1913 Col. Cat. 55:8 Venezuela.

Caryobruchus sparsepunctatus (Pic) new combination.

Caryoborus sparsepunctatus Pic 1913 Le Naturaliste 24:172 Brazil.
Pachymerus sparsepunctatus (Pic) Pic 1913 Col. Cat. 55:8 Brasilien.

Caryobruchus gleditsiae (Linnaeus), new combination.

Johanssohn 1763 Amoen. Acad. 6:392 described the first and second species of Bruchidae affecting palm seeds as *Dermestes* *gleditsiae* and *bactris*, usually cited as of Linnaeus, who referred them to *Bruchus*, 1767 Systema Naturae ed. 12:605. The former species was supposed to breed in the seeds of the honey locust (*Gleditsia triacanthos*) and so received its misleading specific name. It was later described as *Bruchus arthriticus* by Fabricius 1801 Syst. Eleuth. 2:398. Under this specific name it was placed in *Caryoborus* by Schoenherr 1833 Gen. Curc. 1:93 and has since been generally known as *Caryoborus arthriticus*. Pic 1913 Col. Cat. 55:6 called it *Pachymerus gleditsiae*, restoring the first specific name for it in accordance with the rules of nomenclature. It is a common species breeding in the seeds of palmettos in the United States from North Carolina to Brownsville, Texas. I do not know if it occurs elsewhere for some of the records of it occurring in the West Indies are probably based on undescribed species known to occur there. I do not believe that it occurs in Argentina as reported doubtfully by Bruch 1915 Rev. Mus. La Plata 19:432.

Caryobruchus curvipes (Latreille), new combination.

Bruchus curvipes Latreille 1811 in Humboldt et Bonpland Voy. aux Rég. Aequin du Nouv. Cont. 1:234–236, pl. 16, f. 5, 6, was described from Serrullo,[1] Nouvelle Espagne [Mexico] from the seeds of an unknown species of palm brought back to France for planting. Every one of these seeds was found to contain one of these Bruchids. The seeds are from the figure certainly those of *Inodes* or *Sabal*. The figures and description make it certain that this species is very closely allied to *gleditsiae*. Latreille gives the size as 14 mm. but says figure 5 is somewhat enlarged, yet it measures only 15 mm. Probably then the actual measurement is less than 14 mm. I have considered as representing this species a series bred from the seeds of an undetermined *Inodes* collected by G. N. Collins Dec. 26, 1907, at San Bartolome, Chiapas, Mexico, and another series received in Washington, June 2, 1919, from S. Calderon, who bred them from an undetermined native palm in San Salvador. The largest individual of both these series measures about 12 mm. in length and they resemble closely large individuals of *gleditsiae* bred from *Inodes texana* Cook from near Brownsville, Texas. They may be distinguished by the more nearly vertical mesosternum which is not noticeably bent back toward the plane of the metasternum. I do not think that Latreille's species has been interpreted correctly since its description, owing to the confusion between it and *ruficornis*.

[1]Serrullo is a missprint probably for Jorullo, the great volcano of Michoacan, Mexico, where Humboldt and Bonpland travelled.

Caryobruchus veseyi (Horn), new combination.

Caryoborus veseyi Horn 1873 Trans. American Ent. Soc. 4:313 was described from the Cape Region of Lower California. There is a series of this species in the National Museum bred from the seeds of a palm collected in January, 1906, by the late Dr. J. N. Rose on the Sierra de la Laguna and with it a single seed of the palm. This was determined for me by Dr. O. F. Cook as that of an *Erythea*, probably *Brandegeei* Purpus. Since *Erythea Brandegeei* is the only species of the genus known from the Sierra de la Laguna or indeed from the whole Cape region of Baja California, doubtless it is the host plant. Neither host plant nor insect is known except from that region.

PACHYMERUS Thunberg.

The genus *Pachymerus* is less widely distributed than *Caryobruchus*, all the material in the National Museum being from the mainland of the American continent except that from the island of Trinidad and a single specimen from Jamaica (perhaps only intercepted there). The most northerly material is from the state of Jalisco in Mexico and the southernmost from Paraguay. The species form a very compact group with most of the characters common to all. The differences by which the species may be separated are found in the structure of the hind femora, in differences in details of puncturation and in the impressions of the antennae. Since these characters have not been described for the named species I can not recognize with certainty any of those "described." The details described here and those given in the table are general to the material in this genus. It is hardly to be expected that some exceptions will not be found.

Form elliptical, strongly bent down in front and behind; piceous black, clypeus, labrum, and sometimes legs and elytra in part rufescent, integument in general micropunctulate and with not very coarse punctures on clypeus except at apex, front, neck, dorsum and flanks of pronotum, striae of elytra, pygidium, hind femur especially above at base and apex, metepisternum, and the sternites; in general covered with cinereous, olivaceous, or brownish appressed pubescence, denser beneath, but little concealing the surface sculpture, except toward apex of front and middle tibiae, on the denticulate edge of the hind femur and on the plantar surface of tarsal joints one to three.

Head short, strongly contracted above and on the sides behind the eyes, malar space not longer than broad, temples gradually declivous to the contraction, not produced, not sulcate; eyes coarsely facetted, emarginate about one-fourth, strongly projecting; pronotum about as long as broad or shorter, arcuately narrowed in front near the apical third, lateral margins somewhat depressed, sulcus punctate, coarser punctures of dorsum not assembled in distinct groups, denser and coarser toward the sides, flanks strongly and rather coarsely punctured, pronotum not much produced between the elytra, posterior margin nearly straight except for the median lobe, prosternum transversely carinate behind the coxae at the summit of the posterior face; mesosternum gradually bent back toward the plane of the metasternum; scutellum quadrate, more or less emarginate behind; elytral humeri asperate, punctures of striae coarser and more rounded basally, finer, more elongate, and less impressed toward apex, striae not strongly impressed, intervals flat; hind femur without serrations, denticles 10–12; hind tibia punctate dorsally; pygidium subvertical, covered at base by the decurved apices of elytra, about as broad as long, rounded at apex or subtruncate, nearly plane in female, plane or longitudinally convex and inflexed at apex in male, sternites transversely sulcate at base with a depressed translucent apical margin, hypopygium not longer than sternite four, narrowed in the middle in male.

The species of this genus which have been reared use seeds of the size of a filbert or larger, usually the seeds of Cocoaceae, but do not seem to correspond in size with the seed in which they develop. None of the species are as small as the smallest *Caryobruchi* and only one species approaches the size of the larger ones. The species are not so numerous as in that genus.

The genus *Pachymerus* is represented in the National Museum by 170 individuals which I have been unable to separate into species to my own satisfaction. My tentative arrangement separates them into six species, of which I have assigned old names to two. Reference of any of the remaining four (or more) species to any of the extant species names would be mere guess work for the descriptions to not even permit them to be assigned to the genus *Pachymerus* with certainty. Latreille's complaint of the difficulties he encountered in determining palm bruchids is as just to-day as when he published it, a hundred and eighteen years ago, in 1811. "The embarrassment one encounters in the determination of species comes from the greater part of the descriptions being very incomplete and from the authors being more attached to speaking of colors than of characters of form." I have separated the material by the characters exhibited in the following partial table, which should serve to distinguish the one species to which I wish to apply a new name.

1. Marginal and sutural intervals of elytra with more condensed and paler pubescence contrasting with the surface between, upper margin of hind femur in female in an even curve from base to apex, hind femur in male more elongate, with a sinuate basal crista nearly at right angles to the remainder of the upper surface and continued dorsally beyond the base of the longitudinal portion so that this is emarginate basally, apical denticles two, pygidium plane in both sexes.................*luteomarginatus*.

   Pubescence of elytra not differentiated on the sutural and marginal intervals.................2.

2. Basal portion of upper margin of hind femur abruptly bent, more strongly so in the males......*bactris* and another species.
   Upper margin of hind femur in an even curve from base to apex, nowhere abruptly bent, pygidium in males inflexed at apex......3.
3. Apical denticles of hind femur three—one or more species said to have been bred from *Maximiliana*, *Attalea*, *Scheelea*, *Orbignyia*, *Eleis guineensis* and *melanocarpa* and *Areca triandra* from Brazil, Bolivia, Demerrara, Trinidad, Panama, and Jalisco, Mexico.
   Apical denticles two......4.
4. Labrum and anterior margin of clypeus yellowish, pygidium coarsely, shallowly and irregularly confluently punctured, the median longitudinal line nearly free from coarse punctures especially in the female, Brazil 10 mm......*Pachymerus* sp.
   Labrum reddish, pygidium more finely deeply and discretely punctured with coarse punctures throughout......*Pachymerus olearius* new species.

Pachymerus bactris (Linnaeus).

Dermestes bactris Johanssohn 1763 Amoen. Acad. 6:392 was the second palm bruchid described and the first recorded as breeding in the seeds of a palm. Johanssohn in the original description cites Jacquin 1763 Hist. 170 where Jacquin records breeding it from the seeds of his *Bactris minor* brought back to Europe from Cathagena, Colombia, for planting and found infested with this beetle. Linnaeus 1767 referred it to *Bruchus;* Thunberg 1805 Goettinger Gelehrte Anzeiger 29:281 cited it under his monobasic genus *Pachymerus*, establishing it under the International Code with *bactris* as genotype; Gyllenhal 1833 in Schoenherr Gen. Curc. 1:93 referred it to *Caryoborus* Schoenherr, where it remained until Pic 1913 Col. Cat. 55:7 properly restored it to *Pachymerus*. Whether any of the insects referred to in the literature are really Linnaeus' species is doubtful, but material in the National Museum may represent it, since two lots bear labels indicating species of *Bactris* as host plant. It is a *Pachymerus* with the characters indicated in the table.

Pachymerus nucleorum (Fabricius).

Herbst 1783 Fuessly Archiv den Insectenk. (4) 4–5:28 described and figured what he supposed to be *Bruchus bactris* from "East Indian" palm nuts used by the turners in making knobs for canes. He describes the antennae as having three narrow joints which would indicate *Caryoborus* or *Caryobruchus* while his figure resembles the species here described as *olearius*. Fabricius 1792 Ent. Syst. 12:369 named Herbst's species *Bruchus nucleorum* describing the elytra as striate but not punctate, while Herbst had said they were striate with punctures. Schoenherr 1833 referred it to *Caryoborus*, and Pic 1913 to *Pachymerus* where it probably belongs. The identity of this species is uncertain and more than one species has been referred to under this name.

Pachymerus luteomarginatus (Chevrolat).

Chevrolat 1877 Ann. Soc. Ent. France (2) 7: cvi described *Caryoborus luteomarginatus* from Venezuela, Caracas. It is clearly a *Pachymerus*. Material collected the same day in Panama seems to represent this species and exhibits the peculiar sexual dimorphism indicated in the table.

Other Species of Palm Bruchids in Pachymerus.

The following species of palm bruchids may all be species of *Pachymerus*, where they have been placed by Pic 1913, but the study of types will be necessary before we can be sure:

Caryoborus cardo Fahraeus 1839 in Schoenherr Gen. Curc. 127 Brasilia.
abruptestriatus Gyllenhal 1839 l. c. 128 Brasilia.
lacerdae Chevrolat 1877 l. cvi. Bahia.
rubrofemoralis Pic 1899 Le Naturaliste 21:21 Brazil.

Pachymerus olearius, new species.

Labrum piceous red, shining, transverse, a little produced medially, clypeus black; hind femora with two apical denticles; pygidium of female about as broad as long, plane margined, sides straight, narrowly rounded at apex, coarsely densely and toward base somewhat confluently irregularly punctured with strongly impressed punctures; in the male similar, broader, convex longitudinally, more broadly rounded apically and inflexed. 13–16 mm.

Described from 48 individuals from Brazil: 1 ♀ type, 1 ♂ allotype, 1 ♀ paratype, 7 ♂ paratypes labelled reared from babassu nuts shipped to New York from Para, Brazil, Stored Product Insect Investigations, December, 1928 (from Dr. Back); 1 ♀ paratype and 3 ♂ paratypes from Maranhao, Brazil, F. H. B. No. 5488 with the same history as indicated under that no. for a paratype of *Caryobruchus lipasmatus;* 31 paratypes Para, Brazil, B. Koukoff coll., nuts of *Attalea speciosa;* 1 ♂ paratype ex nuts babassu intercepted in quarantine at New York by H. B. Shaw no. 145; 1 ♀ and 1 ♂ paratype intercepted in quarantine at Washington, D. C., in nuts of *Acrocomia sclerocarpa* from Porto Murtinho, Matto Grosso, Brazil, November 6, 1917, D. G. Tower, F. H. B. 22789.

This is the largest species of *Pachymerus* known to me and is one of the species referred to in literature as *nucleorum*. The babassu nut is the seed of *Orbignyia speciosa* of which *Attalea speciosa* is a synonym as I have been informed by Mr. Doyle.

NOTES ON CUBAN ANTS OF THE GENUS MACROMISCHA (HYMENOPTERA: FORMICIDAE).

By W. M. MANN, *U. S. National Museum.*

Mr. William S. Creighton, a student of the Bussey Institution, Harvard University, has recently very kindly turned over to me for study the ants of the genus *Macromischa* which he collected in Cuba. In addition to finding a distinct new species, *M. creightoni*, from the Isle of Pines, the collector rediscovered *M. porphyrites* and *M. versicolor*, and found also *M. pastinifera* Emery, the last making an interesting addition to the list of Cuban species.

The carton-making habit apparently varies a great deal in the different species in this group. Some make none at all, while others, such as *M. sallei* and its subspecies *haytiana* of the mountains of Haiti, construct large and beautiful nests entirely of this material.

Mr. Creighton's notes on the habits of certain species are included with the descriptions.

The accompanying drawings were made by Miss Eleanor Armstrong.

Macromischa (Macromischa) pastinifera Emery.

Female.—Length 4 mm. Resembling the worker in color and sculpture except for a black occellar spot and broad black borders to the sides of pronotum and on the posterior portion of scutellum. Head is much shorter and broader than in the worker and the occipital border nearly straight. The antennae slightly surpass the occipital corners. The striae on the pro- and mesonotum are irregular and very distinct. Hairs erect and stiff, moderately abundant on head, thorax and abdomen; finer and semi-recumbent on appendages. The wings are hyaline.

Male.—Length 2 mm. Head a little longer than broad, rounded behind; eyes large and prominent; mandibles well developed, stout; scapes distinctly less than one-half as long as funiculi, with well-developed 4-jointed club; joints 1, 2 and 3 elongate very slightly increasing in size toward apex, apical joint three times as long as broad and about as long as the two preceding joints together. Mesonotum with distinct Mayrian furrows; epinotum unarmed; petiole in profile two times as long as high; the node sub-globose; postpetiole sub-campanulate and two and one-half times as broad as petiole; legs long and slender, the femora feebly incrassate.

Sub-opaque. Head and thorax densely punctate. Petiole, post-petiole and gaster very finely punctate and moderately shining. Hair whitish, rather sparse, sub-erect.

Color dark brown to black. Legs and antennal scapes yellowish white, wings hyaline.

Soledad, Cuba.

I am unable to distinguish any characters in the specimen before me that would distinguish the Cuban form from Emery's description of the typical *pastinifera*. The workers of the Cuban species agree closely with those which I took some years ago on Andros Island in the Bahamas.

Macromischa (Macromischa) porphyritis Roger.

Female (*deälated*).—Length 7 mm. Head slightly longer than broad, rounded at sides; occipital border nearly straight; mandibles with 5 distinct teeth; clypeus longitudinally carinate at middle; antennal scapes surpassing the occipital corners by about one-fourth their length; mesonotum rather feebly margined at posterior half of sides; scutellum twice as broad as long; petiolar spines slightly longer than the distance apart at base, feebly curved; middle of peduncular node with strong triangular projections at sides.

Moderately shining. Head rugosely striate longitudinally, finely and densely punctate; mesothorax and scutellum and base of epinotum irregularly longitudinally striate. Hairs whitish and moderately abundant throughout. Apical half of petiole with sparse longitudinal rugae.

Scutellum, petiolar node, post-petiole, gaster and legs excluding tips of trochanters black with violaceous reflections; the remainder red brown with faint violaceous reflections.

Soledad, Cuba.

Numerous workers were taken (Fig. 1); the specimens agree closely with Roger's description except that he describes the

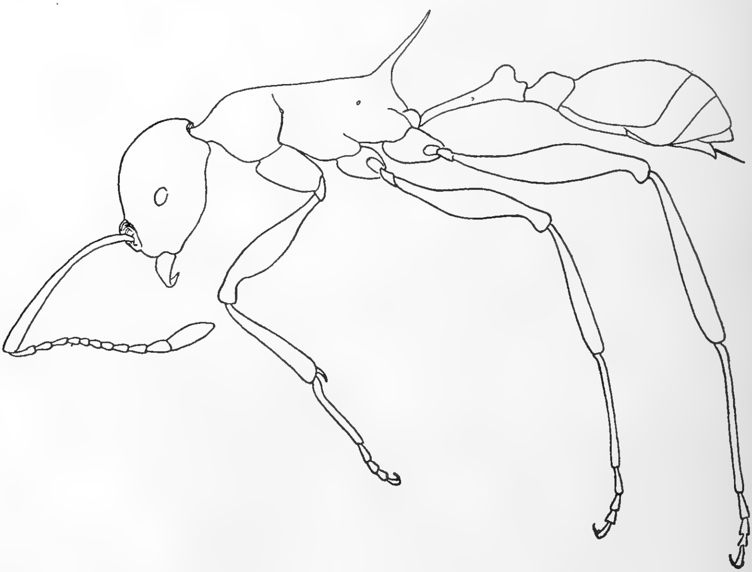

Fig. 1.

petiole and legs shining yellowish brown, whereas all of the workers taken by Creighton have the legs as well as the antennae postpetiole and gaster black with rather faint violaceous reflections. Possibly the single worker that Roger had before him was a callow. In the workers before me the femora appear finely tuberculate, a character common to several species in the genus.

Creighton notes.

"Altogether I found four nests. Each of these was in a crevice in the limestone and the entrance of each was surrounded by a carton of silk and bits of vegetable detritus. In three of the four the entrance of the nest was simply a circular hole near the center of the carton. In the fourth nest, however, the carton around the entrance had been built into a tube about half an inch in diameter and three-quarters of an inch long. Queens were secured from three of these nests but no males or virgin queens were seen during the time I was in Cuba (October 29th to December 13th). When walking about on the rocks *porphyritis* elevates the abdomen so that the gaster is considerably above the thorax. This gives them a curious appearance somewhat reminiscent of a person carrying a parasol."

Macromischa (Macromischa) creightoni, n. sp.

Worker.—Length 3.75 mm. (fig. 2). Head oval, about one-fourth longer than broad; sides and occipital corners broadly rounded; occipital border very

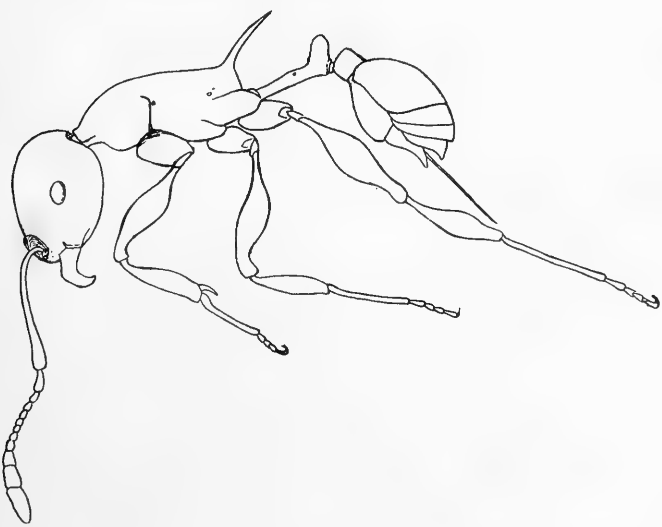

Fig. 2.

broadly rounded; mandibles stout, with five distinct teeth. Surface of clypeus broadly convex, anterior border straight, median surface with a distinct though narrow longitudinal carina on anterior half; frontal carinae short, sub-parallel. Antennae moderately stout, their scapes rather strongly curved at base, slightly surpassing the occipital corners; first funicular joint about as long as the two succeeding joints together; club well defined, its terminal joint a little shorter than the two preceding joints together. Eyes oval, situated nearly at middle of sides of head.

Thorax robust. Prothorax broadly convex above, with rounded humeral angles; anteriorly with a moderate neck. Thoracic sutures not discernible. Epinotal spines three times as long as their distance apart at base, slender, divergent, curved outward and downward. Peduncle of petiole long and slender, one and one-fourth times longer than epinotal spines; node in profile two times as high as long and less than one-third as long as the petiole; anterior surface moderately concave, posterior nearly flat; from above two and one-half times as broad as long; anterior border broadly arcuate, posterior borders straight and converging to an angle. Post-petiole in profile one and one-half times as long as the petiolar node, anterior surface nearly straight and broadly rounding into the moderately convex superior border; from above sub-campanulate, a little broader than the petiolar node and about one and one-half times as broad as long. Gaster with first segment one and one-third times longer than broad, feebly convex at sides. Legs stout, femora and tibiae strongly incrassate. Sting slender but well developed.

Body and appendages shining. Mandibles, clypeus and head coarsely and irregularly longitudinally striate, thorax with similar but transverse striae, petiole, post-petiole, gaster and legs minutely punctate and shining.

Hairs whitish, rather stiff, sub-erect, abundant on head, thorax and appendages, longest on thorax. Head and thorax violaceous; anterior portion of head and the petiolar spines greenish; base of antennal scapes, base of femora, tips of tarsi and the petiolar node brown; the remainder of legs, petiolar node, post-petiole and gaster black.

Female (*deälated*).—Length 5.5 mm. Head, exclusive of mandibles, a little longer than broad, slightly broadest behind eyes; with rounded occipital corners and nearly straight border; clypeus with median carina for entire length. Eyes situated at middle of sides of head; ocelli well developed; antennal scapes slightly surpassing occipital corners; first funicular joint as long as the second and third together; club moderately developed with a terminal joint distinctly shorter than the two preceding joints together. Thorax robust; mesothorax one and one-third times as long as broad; scutellum one and two-thirds times as broad as long; epinotal spines nearly straight, a little shorter than their distance apart at tips, rather stout basally. Peduncle of petiole twice as long as node; node in profile less than two times as high as broad; narrowly rounded above, its anterior surface sloping, the posterior flat; from above twice as broad as long, sub-angulate at sides. Post-petiole twice as broad as long, rounded above and at sides; legs as in worker.

Shining throughout. Mandibles and head irregularly and coarsely striate longitudinally; clypeus very finely punctate; pronotum transversely, mesonotum and scutellum irregularly striate longitudinally; petiole, post-petiole and gaster minutely punctate; femora with scattered foveolate punctures, the margins of punctures slightly elevated.

Hairs fine, whitish, abundant on head, thorax, and appendages. Head and thorax violaceous with greenish reflections; basal half of petiolar peduncle, tips of coxae, trochanters, and base of femora yellowish; the remainder black with violaceous reflections strongest on the femora.

Isle of Pines, Neuva Gerona, December, 1927.

Cotype no. 42746, U. S. National Museum.

This beautiful species is the second to be recorded from the Isle of Pines. It is most closely related to *Macromischa squamifera* Roger but distinct from it in the more robust thorax, more curved spinotal spines, in color and in sculpture.

I take pleasure in dedicating this species to Mr. J. S. Creighton, who writes of it:

"The first day I took only strays. It seems to be fairly abundant on the higher portions of the hills for I could usually turn up a few under any pile of fallen leaves which happened to be near the foot of a ledge. They are strictly confined to the northern and eastern slopes of the hills and seem to prefer heavily shaded nest sites. Their movements are slow even when disturbed and they frequently spend long intervals when they appear to be 'just sittin'.'"

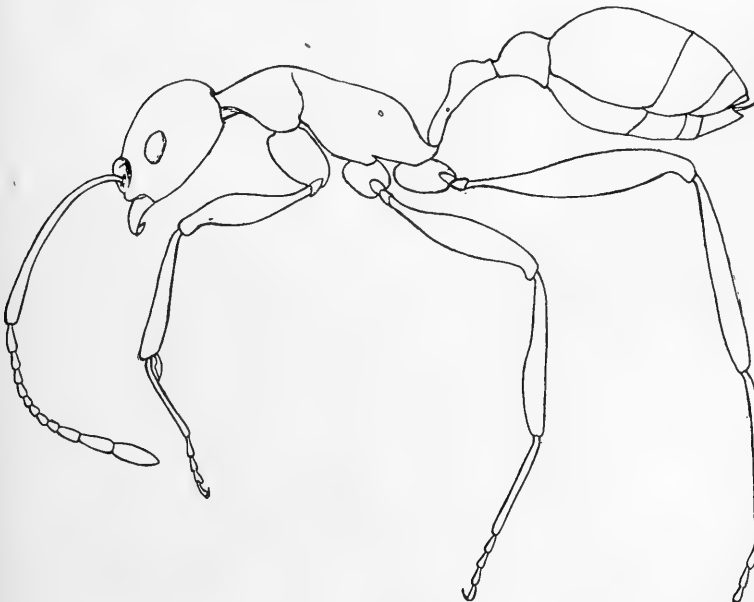

Fig. 3.

Macromischa (Croesomyrmex) versicolor Roger.

Female (deälated).—Length 6 mm. Head excluding mandibles nearly one-third longer than broad; slightly broader behind eyes; sides of cheeks nearly straight and sub-parallel; sides behind eyes and occipital corners broadly rounded; border nearly straight; mandibles with 5 distinct teeth; eyes and ocelli large; antennal scapes surpassing occipital corners by nearly one-third their length; scutellum twice as broad as long; epinotum broadly convex in profile; petiole about as long as epinotum; peduncle less than two times as long as the low rounded node, which from above is scarcely broader than the peduncle and about one-third as broad as the post-petiole; femora moderately incrassate apically.

Feebly shining. Mandibles rugosely striate longitudinally; head densely punctate and with rugose longitudinal striae, but with an area between the frontal carinae and the eye free from striae; clypeus finely and densely punctate and longitudinally striate; pronotum anteriorly densely striate, posteriorly at its sides with separated longitudinal irregular striae; meso-thorax and scutellum densely punctate and longitudinally striate, the striae sparser on the scutellum. Epinotum transversely striate; petiole, post-petiole and gaster and appendages very finely and densely punctulate. Hairs whitish, abundant on head, thorax and appendages.

Color dark reddish brown to black with very faint violaceous reflections; scutellum, epinotum and petiole, except apex of node lighter than the rest.

Isle of Pines, Nueva Gerona, December 10, 1927.

Described from a single deälated female found by Creighton. Many workers from the same locality agree well with Roger's description. This is one of the more elongate species and very strikingly sculptured and colored with its black head, post-petiole and legs, and rich reddish-brown thorax and petiole and a black tip to the petiolar node.

Creighton notes:

"This ant is abundant on the ledges of the hills to the west of Neuva Gerona. It is also present, though in lesser numbers, in the hills across the river. A great many stravs were collected but only two nests were definitely located. Both were in passageways in the rock and each was enclosed at the entrance by carton. These cartons are much inferior to those constructed by *porphyritis*. They are darker in color, looser in texture and the detritus used is coarser. *Versicolor* is by far the most active Macromischa that I have seen. Despite their large size they are quite hard to pick up, since they run rapidly when disturbed. In the first nest taken were a few males but no virgin queens. The second nest contained no sexual forms."

ON THE DIFFERENTIAL CHARACTERS OF CHELONOGASTRA ASHMEAD AND PHILOMACROPLOEA CAMERON, TWO GENERA OF ICHNEUMON-FLIES OF THE FAMILY BRACONIDAE.

By JAMES WATERSTON[1]

In a recent contribution to our knowledge of South Indian Braconidae [Mem. Dept. Agric. India, Ent. Series, vol. X, No. 3, Pt. 1, Vipioninae, p. 52 (1928)] Mr. T. V. Ramakrishna Ayyar has synonymized *Chelonogastra* Ashmead (W. H.) [Proc. U. S. Nat. Mus., vol. 23, p. 139 (1900); vol. 30, p. 195, pl. 14, fig. 3 (1906)] and *Philomacroploea* Cameron (P.) [Spol. Zeyl., vol. 3, p. 87 (1905)]. This view, however, appears to be incorrect. Cameron's genotype is deposited in the British Museum, and having through the kindness of Mr. R. A. Cushman, of the U. S. National Museum, Washingron, had an opportunity of examining two of Ashmead's paratypes, I think it well to put on record the main distinguishing features of the two genera.

Philomacroploea Cameron.	**Chelonogastra** Ashmead.
(*Type.—P. basimacula* Cameron.)	(*Type.—C. koebelei* Ashmead.)
Eyes bare.	Eyes with long, dense pubescence.
Head normal; temples about one-third the length of the eye.	Head produced greatly behind the eyes, with straight strongly convergent sides, the temples thus nearly as long as the eyes from above.
Mesonotum duller, with fine, short pubescence. Parapsidal furrows convergent on middle of scutellar suture.	Mesonotum smooth, shining, with fine, scattered bristles. Parapsidal furrows wide apart at intersection with scutellar suture.
Mid mesosternal sulcus distinct, deep, crenulate. Propodeon with strong median keel.	Sulcus indistinct and smooth. Propodeon ecarinate.
Abdominal tergites 1–6 connate, 5 and 6 feebly movable ventrally at sides. Three segments telescoped within apex of carapace.	Abdomen distinctly movable about 1st suture; tergites 2–5 connate. Four telescoped segments within apex of the carapace.
First tergite flat, and smooth save at sides, and forming along its fusion with the 2nd a strong ridge.	First tergite with deep strongly crenulate sulcus at each side. Distally in middle strongly intumescent, the raised portion with short longitudinal keels and coarse sculpture.

[1]Published by permission of the Trustees of the British Museum.

Tergites 2 and 3 with continuous well defined median carina, apart from which the whole dorsal surface shows a moderately strong, close, even, umbilicate puncturation with rather dense short pubescence.	Tergite 2 with median keel flanked on each side by two broad rather indistinct crenulate sulci, one alongside the keel, the other sub-parallel and about half way to the side. Rest of surface coarsely sculptured. Tergite 3 like tergite 2, but without keel or sulci. Tergites 4 and 5 quite different in sculpture from preceding tergites, finely and closely punctate, matt, with short sulci around the spiracles.
Lateral edge of fused tergites simple.	Lateral edge denticulate, *i. e.* the tergites postero-laterally produced slightly.
Forewings with second cubital cell short, second radial abscissa equal to first transverse cubital.	Second cubital cell long; second radial abscissa much longer than 1st transverse cubital.

Even should some of the above characters prove to have only sub-generic or even specific value, we have obviously here two abundantly distinct genera; one need only add that both are true Vipionnines, and that they were so placed by their respective authors.

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THE LIFE HISTORY OF ACHATODES ZEAE HARRIS (LEPIDOPTERA: NOCTUIDAE).

By W. V. Balduf.[1]

Achatodes zeae Harris, commonly called the spindle worm, has attracted attention during the past half century by its occasional and moderate injury to corn (1), dahlia and perhaps other thick-stemmed plants. From opinions and records in the literature and from the writer's observation it is certain that these food-plants are secondary, and that elder (*Sambucus*) is definitely preferred. The common name elder borer would therefore be more appropriate for this larva. Earlier articles admit a dearth of knowledge concerning the essentials in its life history. The studies reported here were made at Oak Harbor, Ohio, and Urbana, Illinois, in 1927 and 1928.

The Larva.

This species is best known to entomologists in its larval stage, and has been studied comparatively with similar caterpillars since the European corn borer has come among us. Doctor Mosher (2) pronounced it the most easily recognized of all the noctuid borers, and Ellis (3) states that this larva may be distinguished from other common lepidopterous borers resembling *Pyrausta nubilalis* by the anal shield which "is strongly chitinized, black, rugose, and bears on its caudal margin three pairs or a row of prominent and strongly produced spines." The description by Ellis is quoted further. "The larva is striking in appearance. Head, thoracic and anal shields, and the pinacula are glossy black; the body of the larva is yellowish-white. On all the abdominal segments, with the exception of the ninth, the two anterior median pinacula are larger than those of the caudal pair; the anterior pair are circular in contour, the caudal pair elliptical. On the ninth abdominal segment the anterior set equals the posterior in size." When mature the larva is from one to one and one-eighth inch in length.

Only half-grown to mature larvae have been found to date, but with the facts given here, the earlier instars can no doubt be found readily. The larvae have been reported as occurring, usually almost full-grown, as follows: Forbes (4) found it

[1]Contribution No. 130 from the Entomological Laboratories of the University of Illinois.

abundant in elder twigs on May 27; Felt (5) received infested elder shoots from Geneva, N. Y., in mid-June, and Ellis (3) cut quantities of the larvae from new elderberry shoots on May 21, 1921. The writer did not find the larvae earlier than May 24, 1928, at Urbana, although they were sought since May 1. When found they had become almost full-grown, but a few specimens only one-third grown were still seen on May 30. The new shoots of elder, both from the roots and the old stems, had reached a height varying between one and two feet. The new spring growth had become one to four inches high on May 2, and the large size of the borers on May 24 indicates that they enter the plant about as soon as it sends out the stems. The entrance holes are, of course, at first very small and inconspicuous, and the presence of the larva is not readily discovered until the mass of grass at the entrance is larger as produced by the big caterpillars. Several stems were found by dissection to contain advanced borers that had not yet made readily noticeable holes in the stems, which condition may be typical of the species and hence may indicate why the larvae are not discovered easily early in their development.

The large majority of larvae entered sprouts arising from the ground, and the rest occurred in the lateral shoots from the old growth at various distances from the ground. When the shoots have passed the tender succulent stage, the faeces of the larvae no longer cling to the stem at the entrance. The entrance hole is made above the node, and the borer always works upward in the internode. Boring is at first confined to one internode of the stem, usually entering at or below the second node. Some larvae seem to be able to mature in one internode when they occupy the older and thicker basal parts of the stems. But it is not uncommon to find that a larva nearer the apex of the stem has found it necessary to chew through the node into the internode above in order to secure sufficient food for maturity. In the average infestation one borer per stem is common, with many stems not inhabited, but they range from two to five in more serious attacks. In a series of 54 stems 9 contained two larvae each, each having its own entrance hole.

The food of the larva is the pith of the stem, and maturity is reached in almost all cases before the pith becomes white and tough. The earlier larvae in the most tender stems consume all the substance, leaving the stem only as a thin-walled cylinder. These are easily broken over and the tips hang down and sometimes die in consequence. Isolated stands of chiefly new growth are usually uninjured, suggesting that the moth does not exist in early spring to carry the species to them.

No evidence of cannibalism was noted. They shun the light; only one larva was noted outside by day, making its way up a smooth green stem by building a silken string ladder before itself. The tunnels become partly filled with pellets of faeces, but larvae have been observed to back down the burrows, thrust the anal end out through the exit hole, and eject the excreta. In such a case defecation took place as often as once in seven minutes, the larva feeding constantly in the intervals.

Some larvae dissected from elder in the vicinity of Urbana, and caged, were full-grown on May 26. An occasional empty burrow and the presence of a few larvae in the favored places for pupation showed that the earliest individuals had become mature about May 24. On May 30 only five of fifty-six larvae had become full-grown, but the mature state was reached by forty of this number by June 3, 1928. Almost all Urbana larvae had finished feeding on June 11, 1928.

The season of larval development is distinctly later at Oak Harbor. On June 25 and 27, 1927, about forty-five per cent of the borers were still feeding; those in a bush growing behind a barn in shade were even later than those in plants fully exposed to the sun. On June 17, 1928, twenty per cent had reached maturity in the shaded clump, and of those remaining thirty-five per cent were nearly full-size, while among the other sixty-five per cent, a few were only from one-fourth to one-half grown.

In 1928 larvae were gathered at various places in and around Oak Harbor and placed in cages. Infestations ranging from 0 to 50 per cent were found. Field observations showed that on June 19 to 21, 40 to 55 per cent had matured; 75 per cent had become mature in the field and 75 per cent in the cages on June 25, and 88 per cent on June 30. At least 85 per cent of the *A. zeae* taken from a large elder bush in an alley on June 26 had reached full size, and 97 per cent collected on a field trip on June 30 had made their full growth. No more feeding larvae were found on July 11, hence the latter limit of the growing stage of the larvae at Oak Harbor in 1928 was probably within the first week of July.

Place of Pupation.

Some earlier writers state that *A. zeae* pupates in the burrows mined by the same individuals during the larval stage. This was not found to be true in the present study. When the larva reaches maturity it turns pale yellow, due to the accumulated fat in the body, and leaves the stem in which it developed. It has also been stated that transformation to the pupa occurs on the soil under debris beneath or near the elder. Pupae were not located in such places examined by the writer.

Invariably the full-grown borer enters another stem which may be an elder or various weeds growing close to the elder. This habit was first observed by Joe Polivka[1] in 1927. The stems selected for pupation were also without exception dead, such as the stumps of elders or weeds cut off previous to the date of larval maturity, or the stems themselves lying on the ground. In most cases stems of the previous year and lying on the ground were chosen, but later maturing larvae sometimes entered the deserted burrows made by earlier members of the same generation. The stems may be hollow for most part, or still filled with firm or more or less mellowed pith.

Larvae enter these stems in one of two ways. Most of them find a stem either with or without somewhat of a cavity at one end and mine into it by pulling bits of pith away by means of the mandibles and kicking it behind them by aid of their thoracic legs, thus filling the burrow with particles like coarse saw dust as they proceed. The first dust is thrown outside the stem, forming a fresh white heap at the entrance. At times the borer makes a burrow several inches long before it settles down to pupate. In many instances the larva finds a rather old stem, frequently mined out by individuals of an earlier generation, and enters various distances, the maximum observed being 18 inches. They seem to require the presence of some solid material, or at least a tunnel no greater in diameter than their own bodies, to induce them to stay and construct a pupal cell. In a few instances, a larva crawled a foot or so up the side of a dry hollowed stem attached vertically to a growing branch several feet from the ground. Entrance was made at the terminal openings in these cases.

A smaller number was found to enter the dry stems by burrowing through the woody wall somewhere between the ends of the stem. Only such leverage as is available from chance objects near by is needed, and one larva in the act of entering in this way had the abdomen elevated into the air without attachment of the abdomen to anything. The hole made was tight for the larva. This probably aided in securing leverage for boring. Several hours are required to penetrate in this way. Stems bearing partially made entrances from the side were seen. Hence some larvae forsake spots at first selected.

As many as five yellowish larvae or pupae have been discovered in a single dry stem within an eight-inch section of the branch, but most frequently only one occurs. This, of course, depends on the degree of infestation but also on the availability of suitable dry stems. An abundance of such stems lies under large elder clumps of long standing, but in

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[1]Assistant Entomologist, Ohio Agricultural Experiment Station.

less extensive and younger growths the larvae need to crawl many feet, presumably over devious paths and with much trial and error, seeking to locate a desirable shelter. Most chrysalids were taken in free stems lying on the ground under the bushes in moist shaded situations.

Having found a place for pupation, the larva compacts the pith surrounding itself, but if a hollow stem is selected, only a plug of sawdust is present closing the cell from the rest of the burrow. Before transforming the larva chews a circular exit through the woody part of the stem, leaving the thin papery bark intact, but cuts the circumference of the hole even more nearly through, hence, the adult has usually no difficulty in pushing the lid off the opening. The larva then transforms in probably not over two or three days after the cell is completed. Measurements of 44 living pupae from Oak Harbor show they varied in length from 14.5 to 20.5 mm. with an average of 18.25 mm. The body is reddish brown, and bears two stout (1) rounded tubercles at the head end, the posterior being without stout spines.

Duration of Pupation and Adult Emergence.

The period required for pupation was found in a number of instances during mostly hot humid weather to be 18 to 19 days. These records do not include the pre-pupa period. The last Urbana larvae matured about June 11. The first pupae were taken on June 3. The first mature larvae were collected on May 26, hence pupation began no later than June 1. Dr. Forbes (4) had this stage under observation from about June 8 to 26, and some living pupae were still present on the latter date. On June 22, 1928, all individuals were in the pupal stage; the last chrysalis was seen in the cages on July 9. The first moths were reared on June 25, and the last issued July 11, with the maximum emergence going on between June 28 and July 3. Forbes took adults in lights from June 23 to July 20, and Johannsen (1) reports specimens from Orono, Maine, on August 1, and at Ithaca, New York, on July 14.

Development came later at Oak Harbor. Here the first pupa was discovered on June 19, and the last occurred about July 13. The first moth appeared in the cages on July 2, the largest numbers issued between July 13 and 23, and the last one was obtained on August 6. The known pupal period was therefore 36 days for Urbana material, and at Oak Harbor it was approximately 24 days. The known and obviously incomplete period of adult emergence for Urbana was 16 days as compared with 35 days for Oak Harbor moths. Both sexes appeared simultaneously from the inception of the emergence period.

Moths were sometimes found dead or alive stuck in the exit holes, or even in the burrows in instances where the larva happened upon a stem with a long hollow, and the moths passed beyond the exits provided by the caterpillar. Moths with the scales removed from the dorsum of the thorax were common, and in most cases these losses were explainable by the rubbing of the body on the edge of the exit holes at the time of emergence. Scales in masses are found commonly inside the burrows or at the openings. It is, it seems, generally supposed that the abnormal absence of scales on the thorax of moths is due to friction with objects after issuance from the chrysalis, which obviously, then, is not the exclusive cause of such loss.

The Moth.

Wing expanse 1 3/16 to 1 5/16 inches; front wings reddish-brown, mottled with gray especially on the discal area, three faint transverse zig-zag bands of brown on apical third, and a somewhat indistinct suboval spot of orange on the cephalo-lateral angles; hind wings much smaller, and rather uniformly yellowish-gray; a curved cloudy band extending at apical third over the under side of both wings; vertex and thorax with heavy mats of scales; the dorsomesal line of abdominal segments three to six bear tufts of brown scales or hairs, especially those of segments three and four showing above the wings when at rest, and help to create the resemblance of the moth to the irregularities of the dead wood on which the adult insect habitually rests. The antennae are setiform in both sexes.

Mating and Oviposition.

Mr. E. G. Kelsheimer[1] observed the moths in copulation on and about July 14 at night in the course of his photometry studies in which the present species was included. They exhibit a strong tendency to mate, and in doing so both sexes rest on their support with the caudal ends united. The penis is eversible, and anterior to it there is a pair of transverse sickle-shaped claspers which probably grasp the female by the small attenuated terminal abdominal segments, to which the ovipositor is attached. Other copulatory appendages are present in the male. Mating begins as soon as the first or second night of adulthood.

The time and place of oviposition has only been surmised heretofore. Felt (5) states that "it is very probable, as in the case of some of the allied stalk borers belonging to the genus *Papaipema*, that the insect winters in the egg stage." The first eggs from Urbana moths were obtained on July 2, but they probably occurred as early as June 27, and the last moths reared began laying eggs about July 12. For Oak Harbor moths,

[1]Assistant Entomologist, Ohio Agricultural Experiment Station.

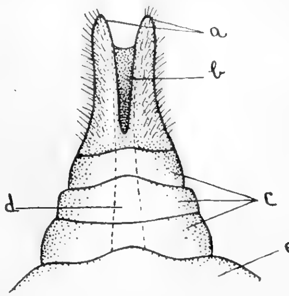
the first and last eggs were deposited about July 4 and August 7, respectively.

The three terminal segments of the female abdomen are extensible, and only about half as broad as the rest of the segments, and become narrower toward the tip. At the apex is borne a brown firm chitinized structure, the ovipositor (Fig. 1),

EXPLANATION OF FIGURE.

Ovipositor of *Achatodes zeae* Harris.

a. Chitinous forks of the ovipositor.
b. Membranous tube out of which eggs pass.
c. Terminal retractile segments of abdomen.
d. Dotted lines represent position of vagina.
e. Abdomen proper.



which when retracted, is hidden in a cup-like enclosure of scales extending backward from the end of the abdomen. The ovipositor is composed of a pair of tapering and slightly curved processes whose ends are rather sharply rounded. These structures are depressed in form and united along the basal three-fourths of their length on the mesal margins by a membranous somewhat flattened tube or vagina. The ovipositor is remarkably constructed for placing the eggs, and obviously this structure limits the moth to locating the eggs in certain peculiarly constituted situations. In the cages these were inserted under the bark of the old dried elder stems which either stood erect or lay on the ground. The particular points selected are the slightly raised bark where this is broken along cracks or rents on the surface of the stem. In outdoor cages these places were invariably chosen, and the eggs, which are flattened, are obviously inserted there by thrusting the extended ovipositor under the bark. Firmly attached, or much loosened bark is not selected usually for oviposition. A clear, colorless sticky liquid is obviously produced by the moth, inasmuch as the eggs are firmly secured to the wood beneath them, and the bark is cemented down so tightly as to impress the form of the eggs distinctly on the bark that covers them. They are always found flat and usually contiguous in a miscellaneous placement and in a single layer.

The egg is light lemon yellow; circular to subcircular in dorsal outline, depressed, equally shallowly convex above and below, with the edges more sharply rounded; diameter 0.6 mm., and about half as thick at the center, but lessening toward the edges; upper and lower surfaces glabrous, lateral surface impressed with finely angulated pits separated by almost their diameter, and margined with fine ridges; intermediate spaces smooth. Superficially the side has the appearance of being frosted. Contiguous eggs assume a hexagonal shape from mutual pressure. The shell is thick and supports considerable pressure. This texture and thickness of the shell, plus the bark and gluey covering hiding the eggs constitute an efficient equipment for surviving the varying conditions of the seasons in which the eggs are present, and would seem to give them considerable immunity from parasites, although some have been seen that were probably destroyed by a predator.

Ninety-one eggs were found in one mass, but smaller numbers are more usual. The egg-producing capacity of a single female was suggested by a dissection in which were found 410 eggs that had become yellow and of quite mature size, and also, one hundred still small and white but with the characteristic disc-like form. Hence, at least 500 eggs may be laid, and the occurrence of large yellow eggs in a one-day-old moth shows that the eggs are deposited at least as early as the second night of adult life. The eggs in the follicles have their flat surfaces at right angles to the long axis of the tube. But somewhere in passing to the ovipositor they change position and lie flat when they are placed under the bark.

Many masses of eggs have been kept out-of-doors from July, 1928, to April, 1929, and through the fall and winter were fresh and firm and contained yellow yolk as before. The larvae from these caged eggs has hatched early in April outside a window. No doubt, then, they carry the species through the winter. This is shown also by the fact that the larvae are borers only in green stems, and begin their boring as soon as elder shoots appear in the spring. Hatching probably takes place about May 1, at Urbana, and a week or more later at Oak Harbor, under ordinary natural conditions. The eggs therefore undergo a great range of weather conditions varying from hot and dry to saturated and below zero. Under natural conditions the eggs would occur in the more or less shaded and moist environment obtaining under elder clumps of various densities and extents. *Achatodes zeae* has, then, but one generation in a year, the eggs existing from July to May, the larvae from May to June (Urbana) or July (Oak Harbor), the pupae occur from early June or the middle of June through about a month, and the adults from latter June or early July through approximately the five weeks following emergence.

Here one finds an obvious instance of timing of the seasonal development of the insect to the growth of the food plant. The species exists for ten months in the egg stage, hence time enough is available for another generation which some noctuid species produce. But elder pith, which constitutes the chief food of the larva, is whitened and tough at the time of larval maturity. A second generation of larvae, if such should develop, would need to feed upon mature, relatively dry pith, remarkably different in texture and probably food value from that of the tender new shoots in May and June.

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NOTES ON LEAF MINING BUPRESTIDAE (COLEOPTERA), WITH DESCRIPTIONS OF NEW SPECIES.

BY W. S. FISHER,
Bureau of Entomology, United States Department of Agriculture.

This paper is the result of a study of a small collection of leaf-mining Buprestidae received from S. W. Frost for identification. One species received from H. Pittier is also included. Mr. Frost has been working on the biology of leaf-mining insects for a number of years, and during the early part of 1929 spent a few months at the laboratory on Barro Colorado Island, Canal Zone, collecting and rearing the larvae of various insects found mining in the leaves of plants.

Since very little is known about the biology of these small leaf-mining insects found in the tropical parts of the world, it seems advisable to publish the notes on this material at this time, so that the information will be available to students who care to make a study of these interesting insects. The plants listed in this paper have been identified by Paul C. Standley.

Pachyschelus frosti, new species.

Female.—Broadly ovate, distinctly longer than wide, about equally rounded in front and behind, feebly shining, and sparsely pubescent, but the pubescence not forming spots or designs; above uniformly greenish black, with a more or less distinct purplish reflection in certain lights; beneath piceous, with a vague aeneous tinge.

Head strongly convex, and with a vague, narrow, longitudinal groove on the front; surface with a few scattered punctures and hairs.

Pronotum slightly convex, four times as wide as long at middle, much narrower at apex than at base, and widest at base; sides feebly, arcuately rounded from base to apical angles, which are rather acutely angulated; anterior margin broadly, rather deeply, arcuately emarginate; base transversely sinuate, and broadly, transversely truncate in front of scutellum; posterior angles acute, but not projecting beyond the humeral angles of the elytra; surface not depressed toward the sides, but with a vague, round depression on each side of middle of disk, densely, obsoletely granulose, finely, very sparsely punctate, and very sparsely, uniformly clothed with short, recumbent cinereous hairs. Scutellum distinctly wider than long, and the surface nearly smooth.

Elytra as wide as pronotum at base, and widest at basal fourth; humeral angles obtusely angulated; sides vaguely rounded from base to near middle, then strongly, obliquely narrowed to near the tips, which are conjointly broadly rounded, the lateral margins vaguely serrate, and when viewed from the side are nearly straight from base to apex, except for a feeble sinuation for the posterior legs; each elytron with a deep depression between the humerus and lateral margin, extending along the margin from humeral angle to middle, and becoming deeper and broadly expanded behind the humerus, but without a distinct basal depression; surface rather densely, coarsely, irregularly punctate, and sparsely, uniformly clothed with short, recumbent cinereous hairs, which form more or less distinct rows.

Abdomen beneath rather strongly convex, densely, finely reticulate, sparsely, obsoletely punctate, the punctures very shallow, oblong, and open posteriorly, and sparsely clothed with short, inconspicuous hairs; last segment slightly sinuate at the sides near apex, which is narrowed, broadly rounded, and slightly produced downward, with a narrow V-shaped incision at the middle, and three short, blunt, equidistant teeth on each side, the surface of the segment with a transverse elevation, which is interrupted at the middle by a rather deep, longitudinal depression. Metasternum feebly, broadly, arcuately emarginate in front. Prosternum feebly, broadly emarginate in front; prosternal process very broad, the sides nearly parallel, and broadly rounded at apex. Prothoracic epipleura broad and feebly concave. Antennal groove deep, wider internally, and extending nearly to the lateral margin.

Length, 2.8 mm.; width, 1.8 mm.

Type locality.—Barro Colorado Island, Canal Zone.

Type.—Cat. No. 42168, United States National Museum.

Described from a single female collected at the type locality March 27, 1929, by S. W. Frost.

This species is allied to *purpureipennis* Waterhouse, but differs from it in being more broadly oval, and equally rounded in front and behind, upper surface uniformly greenish black, with a feeble purplish reflection, head broadly rounded in front when viewed from above, and without a distinct depression, pronotum not wider than the elytra, and the posterior angles not projecting backward beyond the elytra, sides of elytra arcuately rounded along the basal half, and the teeth arranged differently on the anal comb.

This species is named after S. W. Frost, who has done a great amount of biological work on the leaf-mining insects.

Pachyschelus pittieri, new species.

Female.—Broadly cuneiform, distinctly longer than wide, strongly narrowed posteriorly, subopaque, and nearly glabrous; above uniformly bottle green, with a more or less aeneous tinge; beneath piceous, with a vague aeneous or cupreous reflection.

Head strongly convex, and with a vague, narrow, longitudinal groove extending from vertex to epistoma; surface finely, densely granulose, with a few coarse, shallow punctures intermixed.

Pronotum slightly convex, four times as wide as long at middle, much narrower at apex than at base, and widest at base, sides feebly arcuately rounded from base to apical angles, which are rather acutely angulated; anterior margin broadly, rather deeply, arcuately emarginate; base transversely sinuate, and broadly, transversely subtruncate in front of scutellum; posterior angles acute, scarcely projecting beyond the humeral angles of the elytra, and fitting closely to them; surface scarcely depressed toward the sides, rather coarsely, densely granulose, with a few coarse, shallow punctures intermixed. Scutellum twice as wide as long, and the surface finely, densely granulose.

Elytra as wide as pronotum at base, and widest at basal fourth; humeral angles broadly rounded; sides feebly, arcuately rounded from base to behind middle, then strongly, arcuately narrowed to the tips, which are conjointly broadly rounded, the lateral margins feebly, irregularly serrate, and when viewed from the side are nearly straight from base to apex; each elytron with a broad, rather deep depression along the lateral margin behind humerus, but without a distinct basal depression; surface vaguely rugose, coarsely, sparsely, and irregularly punctate, and with a few short, inconspicuous hairs in the punctures toward apex.

Abdomen beneath rather strongly convex, finely, densely reticulate, and clothed with a few short, inconspicuous hairs; last segment narrowed, and broadly produced downward at the apex, which is broadly truncate, and with three V-shaped incisions, of which the median one is the deepest, and on each side slightly behind the apex is a long, acute tooth, the surface of segment broadly, transversely concave near the apex. Metasternum rather deeply, broadly emarginate in front. Prosternum feebly, broadly, arcuately emarginate in front; prosternal process very broad, the sides feebly expanded behind the coxal cavities, and broadly rounded or subtruncate at apex. Prothoracic epipleura rather broad and feebly concave. Antennal grooves deep, wider internally, but not extending to the lateral margins.

Length, 2.6 mm.; width, 1.6 mm.

Type locality.—Gamboa, Panama.

Type.—Cat. No. 42169, United States National Museum.

Described from a single female collected at the type locality on the flowers of *Desmoncus* sp., February 1, 1911, by H. Pittier.

This species is closely allied to *panamensis* Fisher, but differs from that species by being uniformly bottle green above, with only a feeble bronzy tinge, subopaque, head and pronotum densely granulose, and the teeth on the anal comb differently arranged.

Pachyschelus atrifrons Fisher.

Pachyschelus atrifrons Fisher, Proc. U. S. Nat. Mus., Vol. 62, 1922, Art. 8, pp. 25-27.

This species was described from two males collected at Paraiso, Canal Zone, by E. A. Schwarz and A. H. Jennings. A series of nine specimens was reared by S. W. Frost during March and April, 1929, from larvae mining in the leaves of *Acalypha diversifolia* Jacq., collected on Barro Colorado Island, Canal Zone.

These nine examples (six males and three females) show scarcely any variation in size, color, or pubescent markings. The females differ from the males in having the last abdominal segment strongly produced into an anal comb, which is very broadly and deeply arcuately emarginate at the apex, with two triangular teeth on the projection on each side of the emargination, and with a smaller acute tooth on the outer side at a much lower level.

Pachyschelus atroviridis Fisher.

Pachyschelus atroviridis Fisher, Proc. U. S. Nat. Mus., Vol. 62, 1922, Art. 8, pp. 13-14.

This species was described from a unique male collected at Lion Hill, Canal Zone, by August Busck.

A series of twenty-seven specimens was reared by S. W. Frost during February, March and April, 1929, from larvae mining in the leaves of *Serjania* sp., collected on Barro Colorado Island, Canal Zone.

These twenty-seven examples (fourteen males and thirteen females) show very little variation in the pubescent markings, but vary in length from 2.2 to 2.8 millimeters and in width from 1.6 to 2 millimeters. They also show a slight variation in color, some examples being slightly more violaceous than others. The females differ from the males in having the last abdominal segment broadly rounded, not produced, but armed with from six to eight crenulate teeth placed close together, and bent downward at a right angle to the abdomen, the teeth being more or less obsolete posteriorly.

Hylaeogena alibertiae, new species.

Female.—Broadly ovate, distinctly longer than wide, slightly more narrowly rounded behind than in front, glabrous, and strongly shining; above uniformly bluish black, with a distinct violaceous tinge in certain lights, especially on the elytra; beneath piceous, with a vague aeneous reflection.

Head flat, with a small, oblong, shallow depression on the front; surface coarsely, irregularly punctate, the punctures shallow and distinctly separated.

Pronotum moderately convex, three and one-half times as wide as long at middle, much narrower at apex than at base, and widest at base; sides feebly, arcuately rounded from base to apical angles, which are rather acutely angulated; anterior margin broadly, arcuately emarginate, and vaguely sinuate at middle; base extending slightly obliquely backward to the elytral lobe, where it is arcuately emarginate, then transversely truncate in front of scutellum; posterior angles rectangular, and not projecting beyond the humeral angles of the elytra; surface vaguely depressed toward the sides, sparsely, coarsely, irregularly punctate, the punctures very shallow, and the intervals finely, obsoletely, and irregularly punctate. Scutellum slightly wider than long, and the surface obsoletely reticulate.

Elytra as wide as pronotum at base, and widest along basal sixth; humeral angles obtusely angulated; sides strongly arcuately expanded behind base, feebly rounded to behind the middle, then strongly, arcuately narrowed to the tips, which are conjointly broadly rounded, the lateral margins entire, and when viewed from the side are nearly straight from base to apex; each elytron with a broad, vague depression at base, and a deeper one between the humerus and lateral margin, extending along the margin from humeral angle to middle, and becoming broader behind the humerus; surface sparsely, coarsely, and irregularly punctate, the punctures very shallow, and forming more or less distinct rows in the sutural region.

Abdomen beneath nearly flat, sparsely and obsoletely punctate, the punctures large, very shallow, and open posteriorly, and sparsely clothed with short, inconspicuous hairs; intervals finely, obsoletely reticulate; last segment broadly rounded at apex. Metasternum broadly, vaguely emarginate in front. Prosternum nearly transversely truncate in front; prosternal process broad, the sides parallel to behind the coxal cavities, and broadly rounded at apex. Prothoracic epipleura broad and nearly flat. Antennal groove very deep, narrow, and extending to the lateral margins near middle.

Length, 2.4 mm.; width, 1.8 mm.

Type locality.—Barro Colorado Island, Canal Zone.

Type.—Cat. No. 42170, United States National Museum.

Described from a single female reared by S. W. Frost April 21, 1929, from a larva mining in the leaves of *Alibertia edulis* (L. Rich) A. Rich, collected at the type locality.

This species resembles *Hylaeogena coelicolor* described by Obenberger from Colombia. It differs, however, from that species in being slightly more elongate, the anterior margin of pronotum not so deeply emarginate and slightly sinuate at the middle, sides of the elytra more parallel along the basal third, and the lateral margins when viewed from the side are nearly straight, scutellum only slightly wider than long, and the prosternal process is flat, with the sides parallel to behind the coxal cavities.

Hylaeogena coelicolor Obenberger.

Hylaeogena coelicolor Obenberger, Sbornik Entomologického Odděleni Národniho Musea v. Praze, Vol. 3, 1925, pp. 13, 137.

This species was described by Dr. Obenberger from Colombia. A small series was reared by S. W. Frost April 1 and 2, 1929, from larvae mining the leaves of an undetermined plant collected on Barro Colorado Island, Canal Zone. The four specimens examined are uniform in size, and seem to agree very well with the description of *coelicolor* except that in one of the specimens (female) the head is of a uniform violaceous blue like the balance of the dorsal surface as stated by Obenberger, but the last abdominal segment is armed with a short, but rather distinct, broadly rounded anal comb, which is bordered anteriorly with eight short, crenulate teeth, subequal in length and distance apart, and resembles his figure of the anal comb of *analis* Obenberger (Sbornik Entom. Odd. Nar. Musea, Vol. 3, 1925, fig. 108). The other three specimens are males, and have the last abdominal segment narrowly rounded at the apex, and the head and sides of pronotum of a golden bronzy color.

TAXONOMIC CHARACTERS FOR THE IDENTIFICATION OF THE MATURE LARVAE OF PISSODES STROBI PECK AND PISSODES APPROXIMATUS HOPKINS (FAM. CURCULIONIDAE).

By Adam G. Böving.

In the bulletin "Contributions toward a monograph of the bark-weevils of the genus *Pissodes*" (Technical series, No. 20, Part I, Bur. of Entomology, U. S. Dept. of Agriculture, 1911) Dr. A. D. Hopkins has published a full generic description with accurate figures of the larval form of these weevils, but no actual generic diagnosis. As far as the separation of the larvae of the different species of the genus is concerned, Dr. Hopkins mentions that he has examined the larvae of fourteen of the species and found considerable variation between them in regard to the presence or absence of the eye-spots and the form and proportions of several anatomical parts, particularly the frons and the mandibles; he also mentions that there are differences in the distinctness of the abdominal spiracles in the various species.[1] However, he states that "all of these characters have not been sufficiently studied to present them in tabular form for the identification of the species." No subsequent attempt has been made by any other author to accomplish this, nor are the following remarks intended for that purpose. Their scope is very limited, being principally to call attention to a few structural differences which may serve as distinguishing characters between the larvae of the two closely related species, *Pissodes strobi* and *Pissodes approximatus*, which have the same general distribution throughout the entire eastern part of the United States and Canada and also have some host trees in common, particularly the white pine (*Pinus strobus*). Normally, to be sure, *P. strobi* is found in the top of the trees infesting the terminals and *P. approximatus* near the ground in the bark on the trunk of trees and the base of saplings, but sometimes in small trees about two feet tall the larvae of *P. strobi* may extend their burrow to or even beneath the ground and under these conditions cause an injury very similar to that of *P. approximatus*.

Only the mature larvae of the two species will be considered and no attempt will be made to describe or characterize the larvae of the stages preceding the mature larval stage. In fact, even with extensive material of all the stages at one's disposal, it appears impossible to decide how many stages there really are. There may be five or six stages but the definite number can not be stated. Grouping the larvae according to their different sizes and counting the number of the groups is of no avail as the female larvae probably are larger than the male larvae and no method is known by which larvae of different sexes can be recognized. However, the characters by which the mature larvae of the two species are distinguished seem to apply also to the larvae of the previous stages.

The material investigated originates from white pine (*Pinus strobus*), was determined by rearing, and was mainly collected during the years from 1924 to 1929, at the instigation of Dr. F. C. Craighead, in charge of forest insect investigations, U. S. Bureau of Entomology, by H. J. MacAloney at New York State College of Forestry, Syracuse, A. H. MacAndrews at Asheville,

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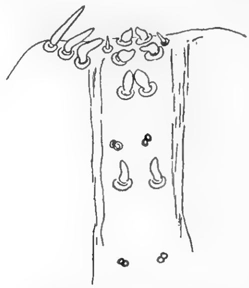
[1]When Dr. Hopkins (p. 23, l. c.) describes the spiracles as "round and not oblong or oval, as in Hylobiinae" it must be borne in mind that both the Pissodini and the Hylobiini have bifore spiracles. The differences in the two tribes might therefore have been more definitely characterized as "Spiracles bifore, short, broad, and each air-tube provided with about five sets of taenidia in the Pissodini, but oblong or oval and each air-tube provided with about ten sets of taenidia in the Hylobiini."

North Carolina, and R. Saint George at Asheville, North Carolina, and East Falls Church, Virginia.



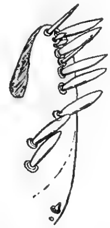
Text fig. 1. *P. strobi.*
Epipharynx with setae and punctures.

In common the mature larvae of *P. strobi* and *P. approximatus* possess a single, in reality two more or less confluent dark ocellar spots on each side of the head.[1] The number and arrangement of the setae and the form and size of the individual setae on the epipharynx are identical in both species. The mandibles (Plate 8, figs. 1 and 2) are also built alike. Distally they are cleft into a ventral and a dorsal tooth of which the ventral one (v), being the stronger and extending in front of the dorsal, constitutes the apical tooth of the mandible and the dorsal one (d) forms the subapical tooth. Medianly the inner margin projects into a small triangular third tooth (m). Between this latter and the subapical tooth the mandible is thickened on the ventral side into an incurved rim (r) that recedes somewhat from the thin and sharp free cutting edge (c), forming together with it an elongate concavity. The cutting edge itself between the two mentioned teeth has medianly a deep notch which divides it into an anterior part (a) that slopes down from the subapical tooth and a posterior part (p) that forms an obtuse projection just in front of the pointed third mandibular tooth (m).[2] The proximal half of the inner margin of the mandible is simple, without appendices, hairs or projections. The exterior side or the back of the mandible has a large,

[1]Ocellar spots have been found in all specimens of both species examined by me, but, possibly owing to defective preservation of the material before him, Dr. Hopkins states (l. c., p. 79) that the larvae of *P. approximatus* have no distinct eye spots.

[2]Dr. Hopkins does not describe the curved rim and the elongate cavity on the ventral side of the mandible, and therefore his comprehensive and simple presentation applies to the mandible only when viewed from above.

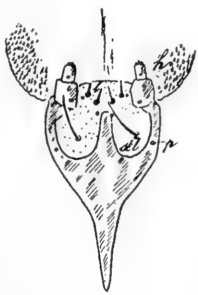
transverse, sausage-like swelling (s) at base between the dorsal and ventral articulations, and it carries two setae between the swelling and the apex of the mandible.



Text fig. 2. *P. strobi.*
Lobe of maxilla.

The number, arrangement, form, and size of the setae on the maxillary lobe are the same in both species.

The prementum (= labium) has in both *P. strobi* and *P. approximatus* a well developed, curved, posterior sclerome with a long, median, unpaired, spear-shaped prolongation. Each stipes labii carries one long seta and one sensory puncture. The ligula is short, broad, slightly convex in front, armed with two pairs of short setae, all of the same size and form, but in *P. strobi* distinctly shorter than in *P. approximatus*, and there is one sensory puncture to each seta.



Text fig. 3. *P. strobi.*
Prementum, ligula and hypopharynx—h, hypopharynx; l, ligula; p, puncture; st. l, stipes labii.

The characters by which the larvae of *P. strobi* and *P. approximatus* can be separated are the following:

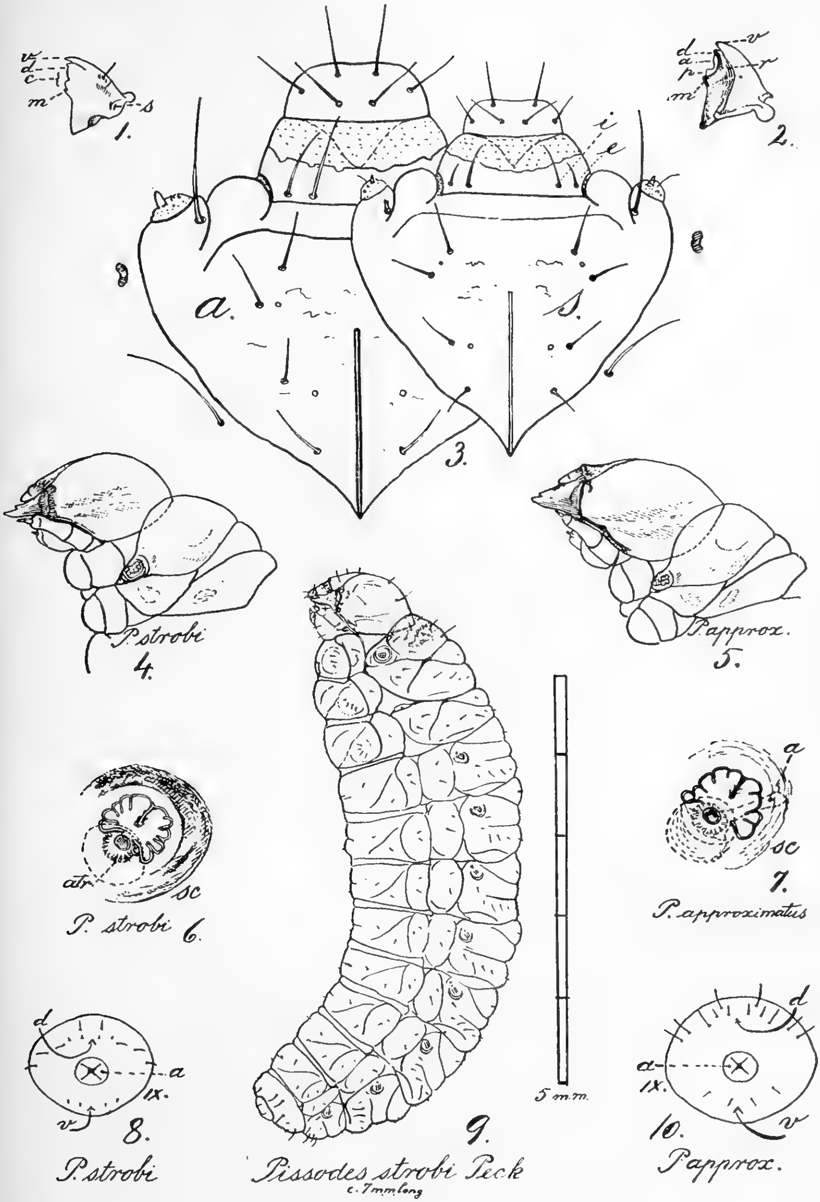
1. In *P. strobi* the head is short and round, and the anterior margin of the frons is not raised (fig. 4); in *P. approximatus* the head is more elongate and the anterior margin of the frons is somewhat raised (fig. 5).

2. In *P. strobi* (fig. 3, s) the anterior margin of frons has approximately the same length as each of the two lateral margins of frons; in *P. approximatus* (fig. 3, a) the anterior margin is slightly longer than the lateral margins; accordingly the frontal shield is proportionately slightly broader than in *P. strobi.*
3. In *P. strobi*, when the labrum is completely extended, the interior of the two setae present on each side of the clypeus (i, fig. 3) does not reach the hind margin of the labrum, and the exterior seta (e, fig. 3), being about half as long as the interior, does not reach beyond the transverse band-shaped sclerome at the base of the clypeus; in *P. approximatus* the inner clypeal seta reaches to or even beyond the hind margin of the labrum, and the exterior clypeal seta, being almost as long as the interior one, extends much beyond the clypeal sclerome.
4. In *P. strobi* (fig. 8) the setae of the ninth abdominal segment are generally shorter than the corresponding ones in *P. approximatus*, and this is particularly true with the setae of a transverse row of four situated straight above the cross-shaped anus which in *P. strobi* are about one-third the length of one of the four radii from the center of the anus, whereas in *P. approximatus* (fig. 10) they are about as long as an anal radius.
5. In *P. strobi* each spiracle is surrounded by a distinct, crescent-shaped, anteriorly open sclerome (sc, fig. 6), but in *P. approximatus* it is either entirely without it or surrounded by an indistinct crescent-shaped sclerome (sc, fig. 7).

Explanation of Plate 8.

(Drawings by the author.)

1. *Pissodes strobi.* Right mandible in dorsal view; c, cutting edge; d, dorsally placed subapical tooth; m, third tooth; s, swelling on exterior side; v, ventrally placed apical tooth.
2. *Pissodes strobi.* Right mandible in ventral view; a, anterior projection of cutting edge; d, subapical tooth; m, third tooth; p, posterior projection of cutting edge; r, incurved rim on ventral side near cutting edge; v, apical tooth.
3. *Pissodes strobi* (s) and *Pissodes approximatus* (a). Frontal shield, clypeus, and labrum in dorsal view; e, exterior seta of clypeus; i, interior seta of clypeus.
4. *Pissodes strobi.* Lateral view of head, prothorax, and mesothorax.
5. *Pissodes approximatus.* Lateral view of head, prothorax, and mesothorax.
6. *Pissodes strobi.* Third abdominal spiracle; atr, atrium; sc, crescent-shaped sclerome.
7. *Pissodes approximatus.* Third abdominal spiracle; a, arm of the closing apparatus; sc, sclerome.
8. *Pissodes strobi.* Ninth and tenth abdominal segments; ix, ninth abdominal segment; a, tenth abdominal or anal segment; d, dorsal transverse row of four small setae; v, ventral transverse row of four small setae.
9. *Pissodes strobi.* Mature larva in lateral view.
10. *Pissodes approximatus.* Ninth and tenth abdominal segments; explanation as in fig. 8.



Pissodes strobi and approximatus

Adam G. Böving del.

MATHESON'S HANDBOOK OF THE MOSQUITOES OF NORTH AMERICA.[1]

The content of this work is indicated accurately by its title. It is an abridgment of the taxonomic, biologic and economic literature of the mosquitoes of the region, arranged to serve as an admirable introduction to a knowledge of this highly important group. It occupies a place in the literature which is filled by no other extant work.

Diagnostic keys to the tribes and species, illustrated by clean line drawings of the structures used in classification both for the adults and larvae, should render it comparatively easy for even the elementary student of the culicids to identify his material. In addition to the keys, the female of each valid species is completely redescribed and the differential characters of both the male and the larva of each species are outlined.

An index to genus and species is provided in which the synonymy is indicated by the use of italics. The enamel paper used throughout is pleasing to the eye in that it is pure white in color, and exhibits no offensively reflecting surface even in the brightest light.—*W. R. Walton.*

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[1]A Handbook of the Mosquitoes of North America by Robert Matheson; Springfield, Ill., Chas. C. Thomas, 1929, $5.50.

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 32 JANUARY 1930 No. 1

LIST OF THE APHID GENERA PROPOSED AS NEW IN RECENT YEARS.

By Ryoichi Takahashi,

Department of Agriculture, Research Institute, Taihoku, Formosa.

In 1920, A. C. Baker considered all the aphid genera then known to him in his excellent paper on the generic classification of the family Aphididae and in 1921 F. Schumacher published supplementary notes to Baker's paper referred to. A number of genera erected before 1920 were, however, overlooked by these authors, and since 1921 numerous genera of these insects have been proposed as new, from various parts of the world. In the present paper I will list all the aphid genera proposed since the publication of Baker's paper as far as I am aware and also those not mentioned by Baker and Schumacher. I am indebted to Messrs. M. Hori, F. C. Hottes, G. F. Knowlton, A. Mordvilko, and V. Nevsky who have sent me valuable genotype specimens.

SUBFAMILY APHIDINAE.

Tribe Lachini.

(Subtribe Anoecina.)

GENUS AICEONA Takahashi.

Aphididae of Formosa, part 1, p. 85 (1921).
Genotype.—Aiceona actinodaphni Takah.

Differs from Anoecia Koch in the twice branched media of the front wing.

(Subtribe Eulachnina.)

GENUS NEONIPPOLACHNUS Shinji.

Dobutsugaku Zasshi, xxxvi, p. 343 (1924).
Genotype.—Neonippolachnus betulae Shinji.

I have not studied the type of the genus and the description is too short. But judging from the description, this genus seems to be closely allied to or synonymous with Eulachnus Del Guercio.

(*Subtribe Lachnina.*)

GENUS PANIMERUS Laing.

Entom., lix, p. 322 (1926).
Genotype.—Dilachnus gracilis Wilsn.

As Dilachnus proposed by Baker was preoccupied, this new name was given by Laing.

(*Subtribe Pterochlorina.*)

GENUS MACULOLACHNUS Gaumont.

Bull. Soc. Ent. France, 1920, p. 30 (1920).
Genotype.—Lachnus rosae Cholod.

This genus is apparently a synonym of Pterochlorus Rond. as pointed out by Laing. Wilson placed Pterochlorus rosae Cholod. in the genus Nippolachnus Mats., but this species is not a Nippolachnus, differing from it in the presence of ocular tubercles in the apterous form.

GENUS MACULODRYAPHIS Gaumont.

Ann. Epiph., ix, p. 340 (1923).
Genotype.—Not indicated.

No species of the genus is mentioned. According to the key, Gaumont separates this genus from Pterochlorus by the coloration of the wing, but this is a specific character and the genus seems to be a synonym.

TRIBE THELAXINI.

GENUS KURISAKIA Takahashi.

Philippine Jl. Sc., xxiv, p. 715 (1924).
Genotype.—Kurisakia juglandicola Takah.

This aphis is apparently a Glyphina, the genus sinking as a synonym.

TRIBE CALLIPTERINI.

(*Subtribe Tamalina.*)

GENUS STEGOPHYLLA Oestlund.

19th Rept. St. Ent. Minnesota, p. 146 (1922).
Genotype.—Phyllaphis quercicola Baker (syn. *Phyllaphis querci* Davis).

Closely related to Tamalia Baker, but differs in the following characters: Antennae not minutely setose, with circular sensoria. Eyes without ocular tubercles. Oviparous female apterous.

GENUS PEMPHIGLACHNUS Knowlton.

Ann. Ent. Soc. Amer., xxi, p. 264 (1928).
Genotype.—Pemphiglachnus kaibabensis Knowl.

Near to Tamalia Baker, differing in the shape of the cauda, the not minutely setose antennae, etc.

(Subtribe Lizerina.)

GENUS LIZERIUS Blanchard.

Physis, vii, p. 120 (1923).
Genotype.—Lizerius ocoteae Blanchard.

Blanchard has erected the tribe Lizerini for this aphis, but I treat it as a subtribe of the tribe Callipterini.

(Subtribe Callipterina.)

GENUS BETULAPHIS Glendenning.

Can. Ent., lviii, p. 96 (1926).
Genotype.—Betulaphis occidentalis Glend.

Closely related to Calaphis Walsh, differing in the shape of cauda.

GENUS CEPEGILLETTEA Granovsky.

Proc. Ent. Soc. Wash., xxx, p. 114 (1928).
Genotype.—Cepegillettea betulaefoliae Granov.

GENUS CALLIPTERINOLA Strand.

Arb. aus Syst.—Zool. Inst. Lettlaend. Univ., No. 27, p. 47 (1928).
Genotype.—Callipterus juglandis Frisch.

Strand proposed this new name for Callipterous Koch, since Koch's name was preoccupied by Callipterus Agassiz (Nomencl. Zool. Index, 1846, p. 59).

GENUS SAPPOCALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 107 (1919).
Genotype.—Sappocallis ulmi Mats.

Differs from all the other genera of this subtribe in the only once branched media of the front wing.

GENUS TELOCALLIS Shinji.

Dobutsugaku Zasshi, xxxiv, p. 731 (1922).
Genotype.—Telocallis alnifoliae Shinji.

I have not studied the specimens and the description is too brief, but judging from the accompanying figure, this genus must be regarded as a synonym of Sappocallis Matsumura.

GENUS PTERIAPHIS Gaumont.

Ann. Epiph., ix, p. 342 (1923).
Genotype.—Not indicated.

No species of the genus is mentioned. Gaumont distinguishes this genus from Myzocallis Pass. by the absence of capitate hairs on the body. This character is nothing more than specific in my opinion and Pteriaphis must be now regarded as a synonym of Myzocallis.

GENUS MELANOCALLIS Oeslund.

19th Rept. St. Ent. Minnesota, p. 136 (1922).
Genotype.—Callipterus caryaefoliae Davis.

This aphid is a Myzocallis, and the genus sinks as a synonym.

GENUS TINOCALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 100 (1919).
Genotype.—Tinocallis ulmiparvifoliae Mats.

The genotype possesses transversely narrowed sensoria, but this is specific in my opinion and the genus becomes a synonym of Myzocallis Pass.

GENUS TUBEROCALLIS Nevsky.

Zool. Anz., lxxxii, p. 221 (1929).
Genotype.—Tuberocallis saltans Nevsky.

The secondary sensoria are transversely narrowed, but in my opinion this is a specific character and I regard this genus as a synonym of Myzocallis Pass.

GENUS MESOCALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 103 (1919).
Genotype.—Mesocallis sawashibae Mats.

The stigmatic vein is absent, but this is nothing more than a specific character in this subtribe. All the characters indicate that this aphis is a Myzocallis.

GENUS NEOCALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 104 (1919).
Genotype.—Neocallis carpinicola Mats.

This genus is a synonym of Myzocallis Pass. Matsumura described the sexual forms as viviparous females.

GENUS SARUCALLIS Shinji.

Dobutsugaku Zasshi, xxxiv, p. 730 (1922).
Genotype.—Sarucallis lythrae Shinji.

Judging from the very brief description the genotype seems to be Myzocallis kahawaluokalani Kirk., the genus sinking as a synonym.

GENUS LUTAPHIS Shinji.

Dobutsugaku Zasshi, xxxvi, p. 346 (1924).
Genotype.—Lutaphis nirecola Shinji.

The description is too short, but the genus seems to be a synonym of Myzocallis Pass.

GENUS RECTICALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 106 (1919).
Genotype.—Recticallis alnijaponica Mats.

Differs from Myzocallis Pass. in the presence of very short, but distinct, frontal tubercles, as well as in possessing a protuberance on the apical part of the inner side of the first antennal joint. This genus is also different from Calaphis Walsh in the deeply bilobed anal plate and in the character of the first antennal joint.

Myzocallis yokoyamai Takah., M. querciformosanus Takah., M. nigra Okam. et Takah., and M. pilosus Takah. must be removed to Recticallis.

GENUS NEOCHROMAPHIS Takahashi.

Japanese Aphididae, 1, p. 28 (1921).
Genotype.—Neochromaphis carpini Takah.

Closely related to Chromaphis, differing in having large waxplates on the abdomen.

GENUS CHAITOCALLIPTERUS Theobald.

Plant Lice Brit., ii, p. 329 (1927).
Genotype.—Not indicated.

No description is given of the genus, not mentioning any species of it. According to the key, this genus differs from Symydobius Mordvilko in having longer hairs on the body. This character seems to be specific.

GENUS QUIPPELACHNUS Oestlund.

19th Rept. St. Ent. Minnesota, p. 134 (1922).
Genotype.—Euceraphis gillettei Davidson.

Judging from the description of Euceraphis gillettei it seems unnecessary to separate this species from Euceraphis Walk., and I regard Oestlund's genus as a synonym. The distal part of the last antennal joint is a little shorter than the base, but this is a specific character.

(Subtribe Saltusaphidina.)

GENUS PHYLLAPHOIDES Takahashi.

Aphididae of Formosa, part 1, p. 75 (1921).
Genotype.—Phyllaphoides bambusicola Takah.

Differs from Thripsaphis Gillette in the following characters: Head not protruding on the front. Antennae not minutely setose. Hind wings with 2 obliques. Body with cottony secretions, lacking spine-like setae.

GENUS ALLAPHIS Mordvilko.

Puceron des Gram., 1, p. 57 (1921); Bull. Ent. Res., xiii, p. 32 (1922).
Genotype.—Allaphis caricis Mordvilko.

This genus is synonymous with Thripsaphis Gillette.

(Subtribe Drepanosiphina.)

GENUS CHAITOPHORAPHIS Shinji.

Dobutsugaku Zasshi, xxxv, p. 307 (1923).
Genotype.—Chaitophoraphis acerifloris Shinji. (This species is a synonym of *Drepanaphis tokyoensis* Takah.)

This genus is different from Drepanaphis Del Guercio in that the cornicles are curved, and swollen at the middle.

GENUS MIMOCALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 109 (1919).
Genotype.—Mimocallis betulijaponicae Mats.

The type species is apparently a Drepanaphis and this genus becomes a synonym.

GENUS BETACALLIS Matsumura.

Trans. Sapporo Nat. Hist. Soc., vii, p. 110 (1919).
Genotype.—Betacallis alnicolens Mats.

This genus is a synonym of Drepanaphis Del Guercio.

(Subtribe Chaitophorina.)

GENUS LAINGIA Theobald.

Bull. Ent. Res., xii, p. 429 (1922).
Genotype.—Laingia psammae Theob.

Near to Sipha Pass. and Atheroides Haliday, differing in the shape of cauda.

(Subtribe Pterocommina.)

GENUS PLOCAMAPHIS Oestlund.

19th Rept. St. Ent. Minnesota, p. 122 (1922).
Genotype.—Melanoxanthus flocculosus Weed.

The type species possesses cornicles slightly swollen and abruptly constricted at the apex. I regard this genus as a synonym of Clavigerus Szépligeti.

(Subtribe Paoliellina, new subtribe.)

GENUS PAOLIELLA Theobald.

Bull. Ent. Res., xix, p. 177 (1928).
Genotype.—Paoliella hystrix Theob.

This aphis apparently belongs to the tribe Callipterini, but is very peculiar in being provided with many spines and 3-facetted eyes, and I propose a new subtribe for it. The eyes of the apterous forms of the subtribes Neophyllaphidina and Lizerina are also of 3 facets.

GENUS CTENOCALLIS Klodnitzki.

Trans. 4th All Russ. Ent. Phytopath. Meet. Moscow, p. 61 (1922).
Genotype.—Ctenocallis dobrovljanskyi Klodn.

I have not been able to secure a copy of the description. The position of this aphid in the tribe Callipterini is not known to me.

TRIBE GREENIDEINI.

GENUS GOODEA Shinji.

Dobutsugaku Zasshi, xxxiv, p. 731 (1922).
Genotype.—Goodea narafoliae Shinji.

This genus is synonymous with Eutrichosiphum Essig et Kuwana.

TRIBE CERVAPHIDINI.

GENUS DIVEROSIPHUM Shinji.

Dobutsugaku Zasshi, xxxiv, p. 791 (1922).
Genotype.—Diverosiphum kunugii Shinji.

The type species is identical with Cervaphis quercus Takah., the genus sinking as a synonym of Cervaphis van der Goot.

TRIBE SETAPHIDINI.

GENUS CERCIAPHIS Theobald.

Bull. Ent. Res., xi, p. 70 (1920).
Genotype.—Cerciaphis bougainvilleae Theob.

This genus is a synonym of Setaphis van der Goot.

GENUS BRASILAPHIS Mordvilko.

Chacaras e Quintas, xxx, p. 115.
Genotype.—Brasilaphis bondari Mordv.

I have noticed this genus in Moreira's paper, but have not been able to secure a copy or any details of the description.

TRIBE APHIDINI.

(Subtribe Aphidina.)

GENUS NEOACAUDUS Theobald.

Plant Lice Brit., ii, p. 326 (1927).
Genotype.—Acaudus bipapillata Theob.

The genotype of Acaudus van der Goot is an Anuraphis, Acaudus sinking as a synonym, and this new name was proposed for Acaudus bipapillata. The generic name Acauda used by Shinji (*Dobutsugaku Zasshi, xxxvi, p. 353*) is perhaps a lapsus of Acaudus.

GENUS AMPHICERCIDUS Oestlund.

19th Rept. St. Ent. Minnesota, p. 126 (1922).
Genotype.—Aphis pulverulens Gillette.

According to Gillette the cornicles of the type species are short, cylindrical and not swollen, and the cauda is short and broadly rounded, and I regard this genus as a synonym of Neoacaudus Theobald.

GENUS BRAGGIA Gillette et Palmer.

Ann. Ent. Soc. Amer., xxii, p. 28 (1929).
Genotype.—Braggia echinata Gillette et Palmer.

Very closely related to Anuraphis Del Guercio, differing only in having heavy blunt hairs on the apterous form. The distal part of the last antennal joint is as long as the base, but this is nothing more than a specific character.

GENUS CEDOAPHIS Oestlund.

19th Rept. St. Ent. Minnesota, p. 127 (1922).
Genotype.—Aphis symphoricarpi Thomas.

The type species differs from the typical Anuraphis in the longer cornicles, but such a character is specific in my opinion, and the genus must be a synonym of Anuraphis Del Guercio.

GENUS XEROBION Nevsky.

Acta Univ. Asiae Mediae, ser. viii-a, Zool. 3, p. 22 (1928).
Genotype.—Xerobion eriosomatinum Nevsky.

This genus seems to be not different from Anuraphis Del Guercio.

GENUS CERURAPHIS Börner.

Abderhalden's Handb. biol. Arbeitsm., Abt. ix, Teil i-ii, p. 226 (1926); Franssen, Aphis fabae Scop., p. 55 (1927); Roepke, Stett. Ent. Zeit., lxxxix, p. 25 (1928).
Genotype.—Aphis viburnicola Gillette.

The type species belongs to Anuraphis Del Guercio in my opinion, the genus sinking as a synonym of Anuraphis. The characters given by Franssen are specific. Anuraphis viburnicola Gill., A. viburniana Frans., Macrosiphum smilacicola Takah., and several species of Chaitophorus possess sensoria on the hind tibiae of the viviparous females.

GENUS LACHNAPHIS Shinji.

Dobutsugaku Zasshi, xxxiv, p. 729 (1922).
Genotype.—Lachnaphis yomogi Shinji.

The description is too short, but this aphis seems to be a synonym of Anuraphis Del Guercio.

GENUS ACAUDELLA Nevsky.

Zool. Anz., lxxxii, p. 211 (1929).
Genotype.—Acaudella puchovi Nevsky.

Differs from Neoacaudus Theobald in the 5-jointed antennae and the cornicles swollen about the middle, with expanded tips.

GENUS ANURIELLA Del Guercio.

Redia, xiv, p. 115 (1921).
Genotype.—Anuriella dorsolineata Del Guercio.

Differs from Anuraphis in the longer clavate cornicles.

GENUS APHIDIELLA Theobald.

Ent. Mth. Mag., ix, p. 105 (1923); Plant Lice Brit., ii, p. 219 (1927).
Genotype.—Aphidiella secretocauda Theob.

Differs from Anuraphis in the longer reticulated cornicles and in the triangular cauda.

GENUS GYPSOAPHIS Oestlund.

19th Rept. St. Ent. Minnesota, p. 126 (1922).
Genotype.—Aphis lonicerae Monell.

Closely related to Anuraphis Del Guercio, but differs in the shorter cornicles which are broader than long. According to the figure of Davis, the anal plate is conical.

GENUS HEMIAPHIS Börner.

Abderhalden's Handb. biol. Arbeitsm., Abt. ix, Teil i-ii, p. 226 (1926).
Genotype.—Aphis trirhodus Walk.

The type species is the same with that of Longicaudus van der Goot, and this genus must be a synonym.

GENUS BREVICORYNELLA Nevsky.

Acta Univ. Asiae Mediae, ser. viii-a, Zool. 3, p. 21 (1928).
Genotype.—Brevicorynella quadrimaculata Nevsky.

Differs from Brevicoryne van der Goot in lacking ocular tubercles and in the very short distal part of the last antennal joint.

GENUS MIRAPHIS Nevsky.

Acta Univ. Asiae Mediae, ser. viii–a, Zool. 3, p. 25 (1928).
Genotype.—Miraphis agabiformis Nevsky.

Near to Brevicoryne van de Goot and Hyalopterus Koch.

GENUS APHIDULA Nevsky.

Zool. Anz., lxxxii, p. 208 (1929).
Genotype.—Aphidula althaeae Nevsky.

This genus is apparently a synonym of Cerosipha Del Guercio.

GENUS BRACHYSIPHONIELLA Takahashi.

Aphididae of Formosa, part 1, p. 61 (1921).
Genotype.—Brachycolus gramini Takah.

Closely related to Brachycolus Buckton, differing in the very long cauda rounded at the apex and constricted about the middle.

GENUS PSEUDOLACHNUS Shinji.

Dobutsugaku Zasshi, xxxiv, p. 730 (1922).
Genotype.—Pseudolachnus yomogi Shinji.

This genus is a synonym of Cryptosiphum Buckton.

GENUS XEROPHILAPHIS Nevsky.

Acta Univ. Asiae Mediae, ser. viii–a, Zool. 3, p. 4 (1928).
Genotype.—Xerophilaphis saxaulica Nevsky.

This genus is not separable from Pergandeidia Schouteden, and if it is distinct from the latter, it must be a synonym of Brachyunguis Das. Some species of Xerophilaphis described by Nevsky are to be relegated to Anuraphis Del Guercio.

GENUS MINUTICORNICUS Knowlton.

Florida Entom., xii, p. 59 (1929).
Genotype—Minuticornicus gravidis Knowlton.

Closely related to Siphonotrophia Swain, but differs in the 6-jointed antennae.

GENUS CACHRYPHORA Oestlund.

19th Rept. St. Ent. Minnesota, p. 132 (1922).
Genotype.—Rhopalosiphum serotinae Oestlund.

According to Oestlund this genus differs from Rhopalosiphum Koch in the cornicles swollen at the middle and at the tip, as well as in having capitate hairs on the body. These characters seem to be specific and this genus may be a synonym of Rhopalosiphum Koch.

GENUS THARGELIA Oestlund.

19th Rept. St. Ent. Minnesota, p. 127 (1922).
Genotype.—Aphis albipes Oestlund.

Differs from the typical species of Rhopalosiphum Koch in the shorter cornicles somewhat constricted at the base.

GENUS NEAPHIS Nevsky.

Zool. Anz., lxxxii, p. 206 (1929).
Genotype.—Neaphis viridis Nevsky.

The type species is identical with Rhopalosiphum lahorensis Das, the genus sinking as a synonym of Rhopalosiphum. If this species represents a genus distinct from Rhopalosiphum, then Stephensonia Das has precedence over Neaphis. The antennae of the apterous form are sometimes 5-jointed.

GENUS CHAITAPHIS Nevsky.

Ent. Mitt., xvii, p. 197 (1928).
Genotype.—Chaitaphis tenuicauda Nevsky.

Resembles Durocapillata Knowlton of the subtribe Macrosiphina, but differs from it in lacking frontal tubercles, as well as in the long slender cauda destitute of capitate hairs.

GENUS EPAMEIBAPHIS Oestlund.

19th Rept. St. Ent. Minnesota, p. 132 (1922).
Genotype.—Aphis frigidae Oestlund.

This genus is very peculiar in the following characters: Eyes distinctly protruding, lacking ocular tubercles. Cornicles long, slender, cylindrical, expanded at the apex. Body bearing many long capitate setae.

GENUS TRILOBAPHIS Theobald.

Ent. Mth. Mag., 3rd ser., viii, p. 137 (1922); Plant Lice Brit., 1, p. 259 (1926).
Genotype.—Trilobaphis caricis Theobald.

This genus is a synonym of Vesiculaphis Del Guercio. The specific name caricis, as proposed by Theobald, was preoccupied by caricis Fullaway, and I will give a new name, viz: Vesiculaphis theobaldi, to Theobald's species.

V. theobaldi is different from V. caricis Fullaway in the more slender cornicles, as well as in the more distinct median process on the front.

GENUS HYDRONAPHIS Shinji.

Dobutsugaku Zasshi, xxxiv, p. 790 (1922).
Genotype.—Hydronaphis impatiens Shinji.

The description is too short, not including characters of prime importance, and I can not discuss this genus which will perhaps fall in this subtribe.

GENUS NEOLACHNAPHIS Shinji.

Dobutsugaku Zasshi, xxxvi, p. 353 (1924).
Genotype.—Neolachnaphis itadori Shinji.

The description is too brief to be considered.

GENUS SIPHONOCORYNE Shinji.

Dobutsugaku Zasshi, xxxiv, p. 793 (1922).
Genotype.—Siphonocoryne polygoni Shinji.

No description is given of the genus, with very brief notes on the species. This new generic name is perhaps a lapsus of Siphocoryne.

GENUS GEOKTAPIA Mordvilko.

Pucerons Gram., 1, p. 53 (1921); Bull. Ent. Res., xiii, p. 30 (1922).
Genotype.—Geoktapia areshensis Mordvilko.

The keys of Mordvilko do not include characters of prime importance and this genus can not be considered.

GENUS ARESHA Mordvilko.

Pucerons Gram., 1, p. 54 (1921); Bull. Ent. Res., xiii, p. 31 (1922).
Genotype.—Aresha shelkovnikovi Mordvilko.

This genus seems to run to Cerosipha Del Guercio in Baker's key.

(Subtribe Macrosiphina.)

GENUS TRITOGENAPHIS Oestlund.

19th Rept. St. Ent. Minnesota, p. 142 (1922).
Genotype.—Aphis rudbeckiae Fitch.

Oestlund separates this genus from Macrosiphum Pass. by the numerous scattered sensoria on the 3d antennal joint, but this is a specific character in my opinion, and this genus must become a synonym of Macrosiphum Pass.

GENUS SITOBION Mordvilko.

Pucerons Gram., 1, p. 43 (1921); Bull. Ent. Res., xiii, p. 26 (1922).
Genotype.—Macrosiphum granarium Kirby = *Sitobion avenae* Fab. of Mordvilko.

This genus is a synonym of Macrosiphum Pass. Sitobium Mordvilko (*Faune Russie, i, 1, p. 65*) is perhaps the same as this genus.

GENUS STATICOBIUM Mordvilko.

Faune Russie, i, 1, p. 66 (1914).
Genotype.—Staticobium otolepidis Nevsky.

No species of the genus has been mentioned by Mordvilko and I have designated Nevsky's species as type. This species is apparently a Macrosiphum with stout cornicles and a slightly constricted cauda, and the genus must sink as a synonym.

GENUS PACZOSKIA Mordvilko.

Faune Russie, i, 1, p. 63 (1914); ibid., 2, p. 330 (1919).
Genotype.—Paczoskia paczoskii Mordv.

This genus is a synonym of Macrosiphum.

GENUS ANAMESON Mordvilko.

Faune Russie, i, 1, p. 63 (1914); ibid., 2, p. 336 (1919).
Genotype.—Anameson kamtschaticum Mordv.

This genus is also a synonym of Macrosiphum.

GENUS METOPOLOPHIUM Mordvilko.

Faune Russie, i, 2, p. 270 (1919).
Genotype.—Aphis dirhodum Walk.

This genus is a synonym of Macrosiphum.

GENUS CATAMERGUS Oestlund.

19th Rept. St. Ent. Minnesota, p. 141 (1922).
Genotype.—Nectarophora fulvae Oestlund.

Differs from Macrosiphoniella Del Guercio in the longer, Aphis-like cauda. Obtusicauda Soliman is perhaps a synonym of this genus.

GENUS OBTUSICAUDA Soliman.

Univ. Calif. Publ. Ent., iv, p. 98 (1927).
Genotype.—Obtusicauda essigi Soliman.

This genus is perhaps a synonym of Catamergus Oestlund.

GENUS TITANOSIPHON Nevsky.

Ent. Mitt., xvii, p. 189 (1928).
Genotype.—Titanosiphon bellicosum Nevsky.

Closely allied to Macrosiphum Pass., differing, however, in the very long cornicles, which are about half length of the body and somewhat dilated on the apical portion. Macrosiphum neoartemisiae Takah. must be removed to this genus.

GENUS BIPERSONA Hottes.

Proc. Biol. Soc. Washington, xxxix, p. 115 (1926); Soliman, Univ. Calif. Publ. Ent., iv, p. 96 (1927).
Genotype.—Aphis torticauda Gillette.

Related to Macrosiphum Pass., differing in the funnel-shaped cauda and the large, projecting, conical anal plate.

GENUS TUBEROSIPHUM Shinji.

Dobutsugaku Zasshi, xxxiv, p. 789 (1922).
Genotype.—Tuberosiphum impatiens Shinji.

T. impatiens and T. camphorae were described by Shinji. The descriptions are too brief, but the genus seems to be synonymous with Megoura Buckton, since T. camphorae is a synonym of Megoura citricola van der Goot.

GENUS CLAVOSIPHUM Shinji.

Dobutsugaku Zasshi, xxxiv, p. 790 (1922).
Genotype.—Clavosiphum adenocaulis Shinji.

This genus seems to be a synonym of Amphorophora Buckton.

GENUS EUCARAZZIA Del Guercio.

Redia, xiv, p. 135 (1921).
Genotype.—Eucarazzia picta Del Guercio.

As pointed out by Theobald this genus sinks as a synonym of Rhopalosiphoninus Baker.

GENUS ALPHITOAPHIS Hottes.

Proc. Biol. Soc. Washington, xxxix, p. 116 (1926).
Genotype.—Aphis lonicericola Williams.

This genus is provided with short, but distinct, frontal tubercles and I regard it as belonging to the subtribe Macrosiphina. Differs from Trichosiphonaphis Takahashi in the following characters: Frontal tubercles not protruding on the inner side. Cornicles without setae.

GENUS CRYPTOMYZUS Oestlund.

19th Rept. St. Ent. Minnesota, p. 139 (1922).
Genotype.—Aphis ribis L.

This genus is a synonym of Capitophorus van der Goot, the genotype belonging to it.

GENUS NEOMYZAPHIS Theobald.

Plant Lice Brit., i, p. 262 (1926).
Genotype.—Aphis abietinus Walk.

Differs from Capitophorus van der Goot in the less developed frontal tubercles as well as in lacking capitate setae, and from Myzus Pass. in the less developed frontal tubercles.

GENUS JACKSONIA Theobald.

Scot. Nat., 1923, p. 9 (1923), Plant Lice Brit., i, p. 261 (1926).
Genotype.—Jacksonia papillata Theobald.

Closely related to Myzus Pass., but different in the cornicles sloping at the tip, with no flange, and in the frontal tubercles slightly projecting on the inner side.

GENUS MATSUMURAJA Schumacher.

Zool. Anz., liii, p. 187 (1921).
Genotype.—Acanthaphis rubi Mats.

As Acanthaphis proposed by Matsumura was preoccupied, this new name was given.

GENUS NEOPHORODON Takahashi.

Proc. Ent. Soc. Washington, xxiv, p. 204 (1922); Aphididae of Formosa, part 2, p. 16 (1923).
Genotype.—Neophorodon rubi Takah.

Differs from Matsumuraja Schumacher in lacking large dorsal tubercles and in the swollen cornicles.

GENUS TRICHOSIPHONAPHIS Takahashi.

Proc. Ent. Soc. Washington, xxiv, p. 205 (1922); Aphididae of Formosa, part 2, p. 19 (1923).
Genotype.—Myzus polygoniformosanus Takah.

Differs from Myzus Pass. in that the hind wings have only one oblique, and the cornicles are furnished with setae.

GENUS RHOPALOMYZUS Mordvilko.

Pucerons Gram., 1, p. 45 (1921); Bull. Ent. Res., xiii, p. 27 (1922).
Genotype.—Rhopalosiphum poae Gillette.

Differs from Myzus Pass. in that the front of head is strongly produced at the middle, and from Francoa Del Guercio in the shorter cauda and in the shape of the protuberance on the front.

GENUS MYZOTOXOPTERA Theobald.

Entom., lx, p. 31 (1927).
Genotype.—Myzotoxoptera wimshurstae Theob.

Differs from Myzus Pass. in the only once branched media on the front wings, and in the triangular cauda.

GENUS HAYHURSTIA Mordvilko (nec. Del Guercio).

Pucerons Gram., 1, p. 45 (1921); Bull. Ent. Res., xiii, p. 27 (1922).
Genotype.—Hyalopterus dactylidis Hayhurst.

The type species is apparently a Hyalopteroides, the genus sinking as a synonym.

GENUS NEANURAPHIS Nevsky.

Ent. Mitt., xvii, p. 192 (1928).
Genotype.—Neanuraphis tarani Nevsky.

Differs from any other genus of this subtribe in the very short rounded cauda.

GENUS DUROCAPILLATA Knowlton.

Ann. Ent. Soc. Amer., xx, p. 229 (1927).
Genotype.—Durocapillata utahensis Knowl.

The frontal tubercles are very short, but distinct, and I list this genus in this subtribe.

GENUS DELPHINIOBIUM Mordvilko.

Faune Russie, i, 1, p. 65 (1914).
Genotype.—Not indicated.

No species of this genus has been mentioned. This genus was not listed in Baker's paper.

(Subtribe Pentalonina.)

GENUS PICTURAPHIS Blanchard.

Physis, vi, p. 43 (1922).
Genotype.—Picturaphis vignaphilus Blanch.

Differs from Micromyzus van der Goot in the hind wings reduced in size, lacking cubitus, and from Idiopterus Davis, in the venation, as well as in the somewhat swollen cornicles and the cauda somewhat constricted about the middle.

GENUS NEOAMPHOROPHORA Mason.

Proc. Ent. Soc. Washington, xxvi, p. 49 (1924).
Genotype.—Neoamphorophora kalmiae Mason.

Differs from Microparsus Patch in the swollen cornicles and in the presence of media on the hind wings.

SUBFAMILY ERIOSOMATINAE

TRIBE ERIOSOMATINI.

GENUS COLOPHELLA Börner.

Abderhalden's Handb. biol. Arbeitsm., Abt. ix, Teil i-ii, p. 233 (1926).
Genotype.—Tetraneura graminis Monell.

According to Patch the wingless viviparous females of the type species have 6-jointed antennae, in this respect differing from the typical forms of Tetraneura Hartig in which those have usually 5-jointed antennae. But the antennal joints are variable in these forms and I regard this genus as a synonym of Tetraneura.

GENUS GEORGIAPHIS Maxson et Hottes.

Ent. News, xxxvii, p. 267 (1926).
Genotype.—Georgia ulmi Wilson.

As Georgia, proposed by Wilson, was preoccupied, this name was given.

TRIBE PEMPHIGINI.

GENUS GOOTIELLA Tullgren.

Centralanst. försök. jordbruk. Meddel., no. 280, p. 22 (1925).
Genotype.—Gootiella tremulae Tullgren.

Near to Pachypappella Baker.

GENUS TRUNCAPHIS Theobald.

Entom., li, p. 25 (1918).
Genotype.—Truncaphis newsteadi Theob.

The apterous form has one-jointed tarsi, and is without cornicles.

TRIBE FORDINI.

GENUS ASIPHONELLA Theobald.

Bull. Soc. Royal Ent. Egypte, 1922, p. 76 (1923).
Genotype.—Asiphonella dactylonii Theob.

The eyes of the apterous form are very peculiar, being of 3 facets placed on a projection.

GENUS PEMPHIGETUM Mordvilko.

Bull. Soc. Zool. France, liii, p. 359 (1928).
Genotype.—Pemphigetum muticae Mordv.

This genus was regarded by Mordvilko as a synonym of Geoica Hart. in his later paper (*Compt. Rend. Acad. Sc. URSS., 1928, p. 526*).

GENUS HEMITRAMA Mordvilko.

Pucerons Gram., 1, p. 63 (1921); Bull. Ent. Res., xiii, p. 35 (1922); Schumacher, Deut. Ent. Zeits., 1923, p. 403 (1923).
Genotype.—Hemitrama bykovi Mordv.

This genus seems to be a synonym of Forda Heyden.

GENUS NEOSCHOUTEDENIA Schumacher.

Deut. Ent. Zeits., 1923, p. 403 (1923).
Schoutedenia Mordvilko, Pucerons Gram., 1, pl 63 (1921); Bull. Ent. Res., xiii, p. 35 (1922).
Genotype.—Geoica cyperi Schouteden.

The name proposed by Mordvilko was preoccupied by Schoutedenia Ruebsaamen and this new name was given by Schumacher to Mordvilko's genus. The original description of the type species is too brief.

TRIBE MELAPHIDINI.

GENUS SLAVUM Mordvilko.

Mem. Soc. Zool. France, xxviii, p. 74 (1927).
Genotype.—Slavum lentiscoides Mordvilko.

Near to Aploneura Pass.

GENUS FORMOSAPHIS Takahashi.

Aphididae of Formosa, part 4, p. 52 (1925).
Genotype.—Formosaphis micheliae Takah.

Differs from other genera in the reticulated sensoria on the antennae of the winged form.

SUBFAMILY HORMAPHIDINAE

TRIBE OREGMINI.

GENUS TRICHOREGMA Takahashi.

Trans. Nat. Hist. Soc. Formosa, xix, no. 102 (1929).
Genotype.—Oregma bambusifoliae Takah.

Closely related to Oregma Buckton, differing in that the cornicles are on elevated hairy cones.

GENUS DORAPHIS Hori et Matsumura.

Trans. Sapporo Nat. Hist. Soc., x, p. 112 (1929).
Genotype.—Doraphis populi Hori et Mats.

Near to Cerataphis Licht., but differs in the simple media of the front wings and in lacking cubitus on the hind wings. The antennae of the winged form are usually 4-jointed.

GENUS GISTELIELLA Strand.

Arb. aus Syst.—Zool. Inst. Lettlaend. Univ., no. 27, p. 46 (1928).
Genotype.—?

Strand proposed this name for Aphanus Gistel (Faunus, i, p. 111, 1837), since Gistel's name was preoccupied by Aphanus de Laporte, 1832. Gistel's paper is not accessible to me and I can not consider this genus.

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VOL. 32 FEBRUARY 1930 No. 2

NOTES ON SYNONYMY OF DIPTERA, NO. 4.

By J. M. Aldrich, *U. S. National Museum.*

The preceding number of this series was published in these Proceedings, Vol. 31, 1929, pp. 32–36.

1. Trixoscelis. When I published a note on this genus in the paper just mentioned I overlooked the disposition made of it by Tonnoir and Malloch, who placed it in the family Heleomyzidae in their paper on the family in Records of the Canterbury (New Zealand) Museum, Vol. 3, 1927, p. 83.

2. *Sturmia schizurae* Coquillett. In discussing this species and the name *Argyrophylax piperi* Townsend, in the same article, p. 36, I made a curious mistake in failing to notice that Townsend's reference of his own *schizurae* to *Argyrophylax* was equally erroneous with his reference of *schizurae* Coquillett to that genus. Instead of having one *schizurae* belonging to *Argyrophylax* and one to *Achaetoneura* (in which case *piperi* would be an unnecessary change of name), we have both belonging to *Achaetoneura*; so by the double error the name *piperi* is still necessary, but is in *Achaetoneura*, for Coquillett's species (Revision, 1897, p. 113).

3. *Ptychomyia selecta* Meigen. That this European species occurs in North America has now been ascertained. Townsend described the male as *Daeochaeta harveyi* in Trans. Amer. Ent. Soc., Vol. 19, 1892, p. 98; and the female as *Masicera tenthredinidarum* in the same volume of the journal, p. 285. I have recently examined the type of *harveyi*, and *tenthredinidarum* has been identified for many years as a common parasite of sawflies in the United States, although its type is not in existence unless it was returned to James Fletcher and deposited in the Canadian National Collection. Suspecting that the European *selecta* was the same, I sent several specimens from our material to Dr. J. Villeneuve, who confirmed the identity. *Selecta* has been reared from sawflies several times in Europe.

4. *Grisdalemyia bigelowi* Curran. (Canad. Ent., Vol. 58, June, 1926, p. 133.) My *Psiloneura flavisquama* (Proc. U. S. Nat. Mus., Vol. 69, art. 22, Dec. 1926, p. 23), is a synonym of this. As both species are genotypes, my genus is also a synonym of his.

5. In proposing the genus *Reedia* (Proc. U. S. Nat. Mus.,

Vol. 74, Art. 1, 1928, p. 17) I unfortunately overlooked the prior use of the name in Hymenoptera; I therefore now propose EDWYNIA as a new generic name in the place of my *Reedia*.

6. *Chiloepalpus aurifacies* Townsend (Ent. Mitteil., Vol. 16, 1927, p. 281) was identified in the National Museum by Dr. Townsend on his recent visit. I had previously identified the species as *Jurinia callipyga* Bigot (Annales Soc. Ent. France, 1857, p. 279, figs.), which is far from being a *Jurinia*,—in fact Bigot was very uncertain about the genus when he described it. On examining Bigot's types, through the kindness of Mr. J. E. Collin, I found my identification confirmed. Bigot's *Epalpus ochricornis* (Annales Soc. Ent. France, 1888, p. 95), also from Chile, is probably a synonym, differing only in having the antennae wholly red. I examined the single female type.

The genus *Edwynia* has many characters in common with *Chiloepalpus*, but has the propleura bare, the second abdominal segment with a marginal row of ten stout spines, and is in general a more robust and spiny form.

7. In commenting upon some of Enderlein's genera, I made the statement (Proc. Ent. Soc. Wash., Vol. 30, 1928, p. 143) that he had proposed the new genus *Euestelia* for *Rhicnoessa coronata* Loew. All he said was, "Typus E. coronata (Lw. 1858)," the E. standing merely for the new genus. Professor Hendel informs me that the *coronata* Loew of 1858 is his European *Ochthiphila coronata*, the *Rhicnoessa* dating from 1865. Thus I mistook the genotype, and the genus is not a synonym of *Pelomyia*.

In this connection I should add that Professor Hendel has more than half convinced me that his *Hypaspistomyia*, with *coquilletti* as type and including our *Desmometopa latipes* Meigen, is a valid genus; at any rate I was getting into deep water for me when I expressed my opinion that it probably was not, on the same page as the preceding.

8. While in Copenhagen last summer, I found the types of *Musca frigida* Fabricius in the collection of the Zoological Museum. There are two male types, and they are the same as *Coelopa gravis* Haliday, which is thus a synonym, just as Haliday thought in 1839. In my recent paper on *Coelopa* (Proc. U. S. Nat. Mus., Vol. 76, Art. 11, 1929, p. 3), I adopted the view that *frigida* is not a *Coelopa* at all and used *gravis* for our species of the New England coast; this change of name proves to be a mistake, and the species is *frigida*, as it has long been called.

9. *Belvosia recticornis* Macquart. In my paper on *Belvosia* (Proc. U. S. Nat. Mus., Vol. 73, Art. 8, 1928, p. 14), I have used this name for the species described later by Giglio-Tos as *bella;* specimens received from the Vienna Museum and connecting with Brauer's published statement about the Macquart type

seemed to make this disposition of *bella* necessary, unless I greatly misidentified it. On receiving my paper, Mr. Collin tried it on his specimens, and believed that I was in error here. He generously brought the types of Macquart with him to Washington in 1928, and I have reviewed the matter.

Macquart's *Gonia recticornis* was described without locality. He mentioned that the material was in M. Bigot's collection, now the property of Mr. Collin. Three specimens were received by me, one of which was headless and evidently a later specimen, as it is fresher and has not been in fluid, as Macquart stated that his specimens had been. Disregarding this one, the other two are male and female of one species, the former bearing Brauer's manuscript note, "Brauer, Wien, cvi (No. 94)." They run directly to *mexicana* Aldrich in my key; they also agree with my types, and I do not hesitate to sink *mexicana* as a synonym. This leaves *bella* Giglio-Tos as a valid species, which I erroneously called *recticornis* in my paper. All the bibliographical references are in my paper.

10. An overlooked work on South American Diptera. Edwyn C. Reed, a professor of natural history in the Naval School of Chile, published a catalogue of Diptera of Chile in 1888 (Catalogo de los Insectos Dipteros de Chile. Anales de la Universidad de Chile, Tomo LXXIII, pp. 271–316). The title is mentioned in Zoological Record for 1888, but the single new generic name is omitted and the entire list seems to have been overlooked by others as it has been by myself. It contains 716 numbered species of Chilean Diptera, well arranged and indexed. There is one new generic name, "Tana Reed," on p. 284, with the sole species "176 Paulseni (Lagarus) Ph. l. c., p. 729."

Inasmuch as *Lagarus* was used in Coleoptera thirty years before Philippi's paper, it is apparent that Reed is proposing Tana as a new name to replace it in Philippi's sense, although he does not explain the intention. So far I can, however, find no earlier use of *Tana* by him, and believe it should date from 1888.

11. *Mesembrinella purpurata* Aldrich (Proc. U. S. Nat. Mus., Vol. 62, Art. 11, 1922, p. 16) is a synonym of *M. nigrifrons* Bigot (described as *Ochromyia* in Annales Ent. Soc. France, 1878, p. 39, from Brazil). Mr. Collin very kindly sent me the Bigot types, two females, for examination.

Nigrifrons had previously been considered a synonym of *aeneiventris* Wiedemann, but proves to be distinct.

12. In the Canadian Entomologist, Vol. 23, 1891, p. 88, W. A. Snow described *Haematobia alcis*, a biting fly, collected the previous year by Professor L. L. Dyche on moose in northern Minnesota. Professor Dyche brought back only a small vial of specimens in alcohol. Snow mentioned the species again in the 22d Report of the Entomological Society of Ontario for

1891, p. 19; Dr. Hough published some notes on the types in Biol. Bull., Vol. 1, 1899, p. 22; Malloch in Annals and Magazine of Natural History, series 10, volume 2, 1928, p. 318, was inclined to believe Snow's species to be a synonym of the horn fly *Haematobia irritans* Linnaeus.

Recently Professor F. M. Gaige, of the University of Michigan, sent to the Museum 13 females of the species found attacking moose on Isle Royale, Michigan. This is the first discovery of *alcis* since Dyche collected it thirty-nine years ago. It is not only distinct from *irritans*, but belongs to the genus *Lyperosiops* Townsend, Proc. Ent. Soc. Wash., Vol. 14, 1912, p. 47. The genus was established without description by the designation of *Stomoxys stimulans* Meigen, a European species, as type.

The most striking character of this genus is the presence of distinct setules on the first longitudinal vein. *Alcis* differs but little from the type species of Europe and it may even prove identical when more material of both sexes is obtained. It is a remarkable fact that it has not yet been found, except attacking the moose.

13. In these Proceedings, Vol. 31, May, 1929, p. 91, I designated *Musca frit* Linnaeus as the type of the genus *Oscinella* Becker (Arch. Zool., Vol. 1, 1910, p. 150, where it is described as a new genus). Afterward I noticed that Enderlein (Zool. Anz., Vol. 42, 1913, p. 355) mentioned that *Oscinella* really dates from an earlier paper. On looking this up I find that Becker (Bull. Mus. d'Hist. Nat. Paris, 1909, p. 120) described a species from British East Africa as "*Oscinella deficiens* nov. sp. (*Oscinis olim*)." This having appeared earlier than the description as a new genus, evidently fixes the type as *deficiens*, not seen by me, and apparently a somewhat peculiar species.

THREE NEW GALL-FLIES FROM ARIZONA (HYMENOPTERA: CYNIPIDAE).

By Lewis H. Weld, *East Falls Church, Va.*

While camping for two winters at Camp Creek (nearest post-office Cave Creek, Ariz.), fifty miles north of Phoenix, Mrs. Nettie Weld Capron sent me galls which she collected on various occasions from the only oak which grows in that vicinity and which seems to be *Quercus subturbinella* Trelease. Not all of the forty-four kinds of galls sent could be reared, but of those from which adults were obtained the three following are described as new. For the convenience of fellow students in the group paratypes are deposited in three widely separated museums so that they may be consulted without too extensive travel.

Diplolepis capronae, new species.

Female.—Red. Head from above transverse, narrower than thorax, cheeks prominent but not broadened behind the eyes, occiput slightly concave; from in front broader than high, facial quadrangle 1.3 times as broad as high, malar space .4 eye without groove, antennae filiform, 14-segmented, lengths as (scape) 18 (9): 6: 25 (5): 21: 17: 14: 11: 9: 8: 7 (6): 6: 5.5: 5: 8 (5). Sides of pronotum punctured and pubescent. Mesopleura pubescent. Mesoscutum shiny, with scattered punctures bearing silvery hairs, parapsidal grooves deep, smooth and percurrent, no median, broad lateral line areas bare and smooth. Two large pits at base of the scutellum opening out on to disk behind and separated by a narrow but prominent median carina. Disk rugose, coarser posteriorly, margined on sides. Carinae on propodeum narrow, slightly curved, enclosed area widest above. Tarsal claws with tooth. Wing hyaline, pubescent, ciliate, the type with a small round spot in radial cell, a cloud back of it in base of third cubital and a group of confluent markings near apex. These spots are absent in some of the paratypes cut from the galls in November. The basal and first abscissa of radius are clouded and the second abscissa is bent upward and thickened toward tip which does not reach the margin. Areolet reaches one-fifth way to basal. Abdomen longer than head and thorax, length to height to width as 35: 29: 21; lengths of tergites along dorsal curvature as 29: 4: 2, their hind margins oblique, the rest hidden, abdomen reaching a little beyond areolet. Ventral spine stout, bristly, triangular in outline in ventral and side view. Using width of head as a base the length of mesonotum ratio is 1.5, antenna 2.1, ovipositor 2.1, wing 4.1. Length 3.0–3.35 mm. Average of six specimens 3.15 mm.

Its red coloration, less distinct spotting of wings, rugose scutellum with more distinct pits will distinguish it from the related *Diplolepis bella* (Bassett) which also occurs in the same locality and on same host.

Type.—Cat. No. 42884, U. S. Nat. Mus. Type. Paratypes (antennae broken) in Field, Stanford and American Museums.

Host.—*Quercus subturbinella* Trelease.

Gall.—Globular, 8 to 18 mm. in diameter, attached to midrib or strong vein on under side of leaf. Its straw-yellow color with vertical purple streaks makes it a beautiful object when fresh. The outer shell is about half a millimeter thick and crinkly radiating fibers support a central larval cell.

Habitat.—The type locality is Camp Creek, Arizona, where Mrs. Capron, for whom the species is named, collected galls on five different occasions in November and December, 1927 and 1928. Unfortunately most of the adults had emerged and the type material consists of flies which were dead when cut out of the galls.

Andricus scutella, new species.

Female.—Reddish brown, base of abdomen and of scutellum lighter. Head as broad as thorax, coriaceous, cheeks scarcely broadened behind the eyes, outline from in front almost circular, interocular space broader than high, malar space one-third eye without groove; antennae 13-segmented, lengths as (scape) 9: 6: 11: 9: 8: 7: 6: 6: 5.5: 5: 5: 4.5: 10. Mesoscutum longer than broad, coriaceous under high power, shining, with scattered setigerous punctures, parapsidal grooves narrow, deep, percurrent, a slight trace of a median behind, lateral lines smooth, shining. Scutellum with two small smooth pits, disk alutaceous, margined on sides. Carinae on propodeum angled. Mesopleura smooth, polished. Wing pubescent, ciliate, veins yellowish-brown, second abscissa of radius arcuate, radial cell five times as long as broad, areolet reaching one-tenth and cubitus two-thirds way to basal. Claws with a tooth. Abdomen shining, length to height to width as 21: 18: 9, lengths of tergites along dorsal curvature as 55: 15: 2: 2: 2: 6, second tergite with pubescent patches at base, its hind margin at angle of 45° to long axis. Ventral spine slender, in side view seven times as long as broad. Using width of head as a base the length of mesonotum ratio is 1.4, antenna 2.8, ovipositor 3.7, wing, 5.1. Length 1.6–2.15 mm. Average of 55 pinned specimens 1.78 mm.

Distinguished from *Andricus parmula* Bassett, which forms a similar but shallower gall on several species of oak in California, by its lighter color, shorter abdomen, and its more shining and nearly bare mesoscutum.

Type.—Cat. No. 42885, U. S. Nat. Mus. Type and 9 paratypes. Paratypes in American Museum, Field and Stanford.

Host.—*Quercus subturbinella* Trelease.

Gall.—A cup-shaped spangle up to 4.5 mm. in diameter and 3.5 mm. high, brown with a whitish bloom, attached to under side of leaf. The edge of the cup is thin, not in-rolled, often collapsed. The larval cell 2 mm. long by .7 mm. in diameter is placed transversely in very base of cup. The exit hole is into the bottom of cup. The gall resembles that of *Trigonaspis cupella* Weld on the same host, but lacks the in-rolled margin and dark color of that species and the adult is fully winged.

Habitat.—The type locality is Camp Creek, Arizona, where Mrs. Capron collected some on January 21, 1928. Some adults had already emerged and others were cut out of the galls on February 4. More galls were sent from the same locality on November 20 and December 8, 1928, and living flies cut out December 14 and January 3, 1929.

Xanthoteras mediocre, new species.

Female.—Head piceous, thorax and abdomen black; from above massive, length to width as 25: 44, wider than thorax, occiput concave; cheeks ample but not broadened behind the eyes; from in front as broad as high, interocular space .7, transfacial and area 1.75 times as broad as high, malar space .6 eye with groove; antennae 14-segmented, lengths as (scape) 11: 7: 11 (5): 7 (5): 7: 6: 5: 4.5: 4.5: 5: 5 (5): 5: 5: 8. Sides of pronotum with setigerous punctures. Mesoscutum smooth, shining, a few punctures along the deep percurrent parapsidal grooves.

Scutellum tapering suddenly to a blunt point behind, not gradually as in *Acraspis*, transverse groove at base but indistinctly subdivided, disk shining with a few scattered punctures. Carinae on propodeum angled. Mesopleura bare, shining. Wing rudimentary, reaching about to hind margin of tergite III, veins brown, no areolet. Tarsal claws with a tooth. Abdomen as long as head and thorax, higher than long, lengths of tergites along dorsal margin as 14: 4: 3: 2: 2: 4, ventral valves oblique, ventral spine tapering, in side view stout, three times as long as broad, with scattered bristles. Using the width of the head as a base the length of mesonotum ratio is 1.06, antenna 2.4, ovipositor 3.0, wing 1.3–1.6. Length 1.4–2.2 mm. Average of 104 specimens 1.93 mm.

Type.—Cat. No. 42886, U. S. N. M. Type and 19 paratypes. Paratypes in American Museum, Field and Stanford.

Host.—*Quercus subturbinella* Trelease.

Gall.—Similar in color and structure to the gall of *Xanthoteras forticorne* (Walsh) but not so large. The clusters are roughly globular, about 20 mm. in diameter, on young shoots under débris. The individual fig-shaped galls contain from 2–6 cells, while those of *forticorne* are monothalamous.

Habitat.—The type material is from Camp Creek, Arizona. Mrs. Capron sent galls on November 20, 1928, and living flies were cut out on December 8. On December 27, 1928, she collected another lot of galls and flies were cut out January 2 and others emerged indoors about January 22, 1929.

THE CYCLES AND HABITS OF PHLYCTAENIA TERTIALIS (GUENEE) (LEPIDOPTERA, PYRALIDAE).

By W. V. Balduf[1]

Phlyctaenia tertialis (Guenee) (*plectilis* G. and R., *syringicola* Pack.) has received scant consideration in the literature of insects. It is a widespread species, being reported by Chittenden (1) from Maine, New Hampshire, Massachusetts, New York, New Jersey, Virginia, Ohio, Illinois, and Kansas. But it rarely has attacked cultivated crops. Chittenden records it from Virginia on grape, whose leaves "they fold together near the middle and join with their scanty web." But this attack was believed to be secondary, the larva having been found later "in greater abundance upon a cultivated ornamental plant of the genus *Sambucus*, called flowering elderberry," from which it perhaps spread to the grape. Englehardt (2) bred it from "dead and dry shoots of elderberry" and the writer watched it from October to October of 1927–28 at Urbana, Illinois, and at

[1]Contribution No. 131 from the Entomological Laboratories of the University of Illinois.

Oak Harbor, Ohio, during the summer of 1928, obtaining it always from *Sambucus*. Some of its habits are similar to those of its notorious relative, *P. rubigalis* (Guenee), the greenhouse, or celery, leaf tyer, and therefore it may appropriately be known by the common name elder leaf tyer.

Description of the Stages.

The Egg.—Length 0.78 mm., width 0.60 mm., whitish, shiny; oval in outline, ends broadly rounded, moderately and quite uniformly convex; surface sculpture consisting of minute quadrate to subquadrate areas, sometimes pentagonal, rarely hexagonal or subcircular; placed in masses of various numbers from 1 to 16 and irregular shape, latter determined by the presence on the leaf of strong cilia which the moth apparently avoids in ovipositing. The distribution of the cilia is not uniform, and the clear spaces of the leaf are selected, with the result that the moth moves hither and yon, as shown by the positions of the egg masses.

The Larva.—Larvae believed to be of the second instar were slender, whitish to pale or medium green, and 7 to 9 mm. long. Individuals about three-fourths grown have a broad light-colored longitudinal stripe on each side of the dorsomedian line, and resemble the more advanced greenhouse leaf tyer. The condition of maturity of the elder leaf tyer may be known by the change in color from green to a conspicuous deep pink which later fades to pinkish-white to dull white when the insect is in the pre-pupa stage or in hibernation.

The head of the mature larva is medium brown and the ana tergite is not heavily chitinized: length 20 to 22 mm., width about 2.5 mm., tapering more caudad than cephalad. Only the prothorax bears a pair of spiracles, which are positively on the propleura, distinctly subovate, and larger than those on abdominal segments one to seven, and about the size of the pair on segment eight. The body is sparsely clothed with short and longer stiff hairs, which are arranged essentially as follows: four long on each side of the head, of which two form a transverse row mesad of the eyes, and one below and one in front of the eyes; thoracic segments with two transverse rows dorsad between spiracles, anterior row larger, the two rows converging on meso- and metanota: propleuron with a pair borne on a fleshy tubercle above base of legs, and a pair (dorsal member smaller) anterior to spiracle: on the meso- and metapleura there is a single, larger hair above bases of legs, and a smaller hair occupies places corresponding to the position of the prothoracic spiracle: the nota of the abdominal segments bear four hairs each, forming a subquadrate figure; on the pleura are a single hair above the spiracle, and a smaller pair below the spiracle; on the antero-lateral side of the base of the prolegs is a curved row of three about as long as the prolegs themselves; this set of three assumes the position of the prolegs on segments one, two and seven. One prominent hair is intermediate between the above sets of three and the subspiracular hairs.

The Pupa.—The pupa is medium brown, which turns to deep brown in individuals about to yield moths. Length 10–11 mm., maximum width 2 mm. or slightly more. The form is typically lepidopterous, the surface glabrous and bare excepting a few short hairs above and below the abdominal spiracles and a group of eight spine-like hairs on the black protuberance at the tip of the abdomen.

The Moth.—The adult is slightly larger and more robust than *P. rubigalis*. The expanse of the front wings varies from 15 to 21 mm., that of the hind from 13 to 16 mm. In color they are predominantly moderate brown with varying amounts of yellowish-brown. Usually the front wings have three patches of the latter color, one mid-way on the anterior margin, another subterminal on that margin, and the third behind the latter. The hind wings bear two, more elongate, patches of irregular form on the median third, the two overlapping along the middle. A narrow zig-zag curved band of the same color borders these patches on the distal edge on the apical fourth of both wings.

Hibernation and Spring Appearance.

The fall and winter period of inactivity is spent in the final larval instar. The earliest larva found entering hibernation was taken on July 26 (Urbana), and many had occupied the typical wintering places on August 22 (Oak Harbor). All of these were still in this condition on November 1, 1928. Reared larvae from the latest spring generation moths at Oak Harbor were still in the second and third instars on August 22, hence, some larvae are not mature and presumably do not begin to hibernate before the first half of September. When the species was observed quite extensively on October 29, 1927 (Urbana), all individuals were larvae in hibernation. Wintering therefore begins in late summer, and continues to late April and early May (Urbana) of the next year.

The larva, upon reaching maturity from feeding on the elder leaves, goes groundward in search of elder or weed stems in which it forms a hibernaculum. Such stems are sometimes few and scattered, and then considerable crawling is obviously necessary to find suitable shelter. Climbing up a standing stump two feet high to enter the broken end was also observed to have taken place. Along the Big 4 railroad (Urbana), the elder had been mowed down before the time for entering hibernation, and the larvae were common in the pith of the stumps or of the parts cut off and lying on the ground. Where growth is not disturbed, the larvae were found in the stumps and stems of elder broken by natural agencies. Wintering larvae were also commonly taken in old stems of large weeds, probably goldenrod and ragweed, lying broken on the soil. Some stems selected were still solid with pith, others were hollowed by age. When the stem is filled with pith, the larva mines in from the cut or broken end to varying distances, but not farther than three inches, and usually within the first one or two inches from the end of the stem. Frequently the outer end of the cocoon closes the outer end of the burrow. If a hollow stem is occupied, the larva may enter it a foot or more, or lesser distances, to construct its shelter.

The hibernaculum is a structure of whitish silk and about five-eighths inch long, and often mixed with more or less of pith particles formed when the larva mines into the stem. In large hollow stems these are fastened to the inner wall of the cavity, and have rather oblique ends, while in smaller stems the tunnel may be completely obstructed by the construction, the ends of which are flat and placed obliquely across the cavity, as above in solid pith stems. Instances were observed in which as many as five hibernacula were made in a series in single stems. Sometimes, especially in old hollow stems, one larva may construct as many as four oblique silk walls across the tunnel between its hibernaculum and the outer entrance, all parallel with one another and about one-fourth or one-eighth inch apart. Not uncommonly, larvae and chrysalids were seen in cocoons made in the empty chrysalids of *Achatodes zeae*, the elder stem borer.

Larvae collected October 29 (Urbana) transformed to moths in the laboratory between December 15 and March 21. On May 10, 1928, 40 larvae and 83 pupae were removed from hibernacula in nature, whereas on May 12, 47 larvae and 36 pupae were taken. Some of them had pupated several days before,—their color was a deeper brown than that of newly transformed individuals. From these records it is known that pupation began about the first week of May, when new elder growth was less than six inches high. On May 24, new elder was one to two feet high. In thin sunny stands of the food plant, most *P. tertialis* had pupated, but in a denser growth under shade trees more than half were still larvae, on May 30.

The earliest freshly empty chrysalids were seen on May 12, and moths issued in cages during the rest of that month, and emergence of the adult obviously continues into the middle of June, in as much as some larvae persisted to at least May 30. On June 10 (Urbana) elder had grown to three feet or more in height, and moths flew commonly from place to place among the elder clumps when disturbed, and were most numerous in the denser bushes. They come to rest quickly on the under sides of leaves after a short darting flight. At this time no conspicuous feeding injury was noticeable on the foliage, and larvae were not found. Moths reared in the laboratory on May 24 and 25 deposited eggs in an indoor cage on May 26, and the first generation was well started on June 11 when the writer went to Oak Harbor, Ohio, for the summer. Materials sent him at intervals during that time by Dr. A. E. Miller made it possible to follow developments of the Urbana moths in a general way.

The First Generation.

During the week following June 21, no larvae in hibernacula or on leaves were seen, but both empty and entire chrysalids, and also moths in flight among elder, were rather general at Oak Harbor and Reno, Ohio. Hence, development here was probably only a week or two behind that at Urbana. Moths reared from chrysalids collected in the above time were among the last to issue from the hibernacula. The progeny of these moths was observed throughout the season in laboratory cages, and supplementary studies were made of out-of-doors Oak Harbor material in addition to that from Urbana.

Several masses of eggs were deposited by these late moths on or before July 3. The larvae hatched between July 5 and 9. On July 19 they had made their first moult. All instars are very active when disturbed, and wriggle to the leaf edges and spin down, later regaining the leaves by ascending the silk line. They fed upon the leaves of elder, chiefly on the lower surfaces, and webbed them together quite flatly,—did not curl or roll them. Even at this age some had chewed holes entirely through the leaves. On July 17, the larger larvae had reached a length of 14 to 20 mm., and were still relatively slender, and whitish to pale green. Their method of attack was still to web adjacent leaves together and to eat the tissues while hiding within the silk coverings and foliage. But there was also a considerable amount of leaf-rolling by these larger individuals. This form of injury was common, too, in nature. They feed voraciously when almost mature. Large larvae were reported abundant at Urbana on July 18. On July 19, several reared Oak Harbor larvae had turned mature pink, and made cocoons in the corners of the cage, especially on the floor, but only a few between the tied leaves or leaf remains, the latter situations probably being selected due to cage conditions. All had become mature and most were pupae on July 29. A number of pink larvae placed in a large outdoor cage containing a growing elder, and otherwise constructed to simulate the favored habitat, were later found to have tied some leaves together, but made burrows and cocoons only in the dead, dry stems on the ground. Later, corrugated cardboard was found suitable for pupation in the cages. Thereafter, mature larvae and chrysalids were always found in such pithy or hollow stems, under natural conditions, on or near the ground as were occupied by the same stages of the overwintering generation. It is of interest in this connection, to recall that in the case of the greenhouse leaf tyer (3), "pupation takes place in folded leaves," except when the leaves are "badly skeletonized." This difference in habit is probably significant ecologically. In all other essential respects, the ways of these two species are alike.

Within a few days the pink larva becomes shorter and pale white. New pupae were obtained from the field at both Urbana and Oak Harbor on July 23, but larvae of all sizes occurred on the leaves, hence the generations seem to overlap considerably. The smaller ones were early individuals of the second generation because those reared in the laboratory were from the last moths to emerge, and these laboratory larvae were almost mature at this time. The first cycle, from mature wintered larvae to the next appearance of mature larvae, occurred from the first half of June to latter July at Oak Harbor.

The Second Generation.

The pupa stage in the heat of summer is 11 to 12 days, but others required 14 days to transform. The first reared moths of this generation issued on or about August 6, and these being late comers, the earliest probably emerged in mid-July. Issuance of moths from material reared entirely in cages continued to August 20. An adult on wing was seen about elder in nature on August 22, and on the same day several live pupae from out-of-doors were still to yield adults. One late adult issued from Urbana material on August 29. The time required for the species to pass through one cycle, from adult to adult, in the summer generation, was about five weeks.

Oviposition by late reared moths of the first generation took place in the cages about August 10, but egg laying began before July 30 and continued to the first or second week of September out-of-doors, according to general evidence. On August 20, numerous larvae in the second instar were on the leaves in the cages. These reached full size and constructed their hibernacula between August 31 and September 15, and on November 1 were still in the larval state. Larvae from moths seen on August 22 and from other adults issuing about August 30, would not mature until late in September. The first of the second generation to reach the pink stage (Urbana) were taken on July 26. The first mature Oak Harbor larvae were found on August 22, but earlier individuals no doubt occurred. Many hibernating larvae therefore existed in this state during a month or more of warm weather when green elder foliage is still on the plants.

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NOTES ON THE CAÑAFISTULA WEEVILS OF THE GENUS PHELOMERUS PIC (COLEOPTERA: MYLABRIDAE).

By WILLIAM DWIGHT PIERCE, Ph. D.

Among the interesting insects intercepted by the Federal Horticultural Board, E. R. Sasscer found specimens of a "bruchid" weevil attacking the beans of the Cañafistula (*Cassia fistula*). As the species has not been studied morphologically, the following notes and descriptions will serve to identify the two species.

The interesting photographs of beans from "F. H. B. 23957" lot, illustrate an infested bean, one with adult emerging, one broken to show pupa, and another to show larva (Plate I).

Phelomerus Pic.

Phelomerus Pic, 1912, L'Echange Linneene, Vol 28, p. 92.

Type, hereby designated, *ochropygus* Pic.

Also included (*distinctus* Pic) = aberrans Sharp.

In addition to the two originally included species and the synonymy suggested above, Pic in 1913 added *Pachymerus lineola* Chevrolat (1871).

It is of great interest to note that the two original species breed in the seed pods of the huge podded Cassias, known as cañafistula, *Cassia fistula*, and *C. grandis*. This is quite in harmony with the author's findings of a correlation between habit and classification.

Pic's original description of the genus and also of the first two included species was very brief and inadequate. A translation follows:

Phelomerus, near Pachymerus Latreille. Form relatively elongate, posterior femora long, greatly surpassing the other femora, flattened and multidentate beneath. Head long, carinate; antennae with last joints very transverse. Genus established for the two following species from Colombia: *ochropygus* (Jekel), black, clad with a fulvous pubescence above and white beneath and on the pygidium, the latter bordered with black at base; front of head, greater part of antennae and four anterior legs more or less testaceous; prothorax unequal above, long, very constricted in front, with posterior angles very salient: and *distinctus* (Jekel), of a form a little less elongate and moderate size, with bands or spots of variable pubescence above, partly glabrous beneath and on the posterior legs; pygidium black, in greater part glabrous, ornate with a pubescent white spot, more or less large, toward the apex, and maculate with yellowish brown at base.

Although these descriptions are very brief, I believe that the two species discussed below are properly identified:

Phelomerus ochropygus Pic.

Phelomerus ochropygus Pic, 1912, L'Echange Linneenne, Vol 28, p. 92.

Described below from two specimens bred from beans of cañafistula (*Cassia grandis*) (det. H. C. Skeels) from Panama and taken in quarantine at Washington, D. C., by E. R. Sasscer, March 18, 1918, under F. H. B. No. 23957.

This large beautiful beetle (fig. 1) measures when fresh and fully extended, 9 mm. in length and 4 mm. in breadth. It can probably draw in its abdomen enough to reduce its length from one to two mm. It is in general brownish testaceous with conspicuous white pubescence on the venter and pygidium.

I shall proceed to a rather detailed description of this insect in order to introduce a more modern morphological description of a species of this family. In the past we have dealt

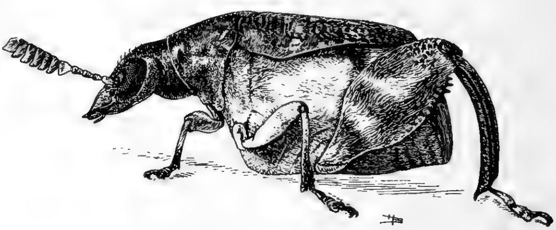


Figure 1. Adult *Phelomerus ochropygus* Pic, from side. Drawn by H. S. Bradford.

with more or less vague terminology in Coleopterous descriptions, paying no respect to the value of morphological studies. Descriptions need not necessarily be long, but it is at least essential that one species in a genus be fully described.

The head is elongate, but hardly to be described as rhynchophorous. It is as long in front of the anterior margin of the eyes as behind it. The posterior portion of the head, or *collum*, which telescopes within the prothorax, is separated from the epicranium proper by a slight transverse constriction. This part is often called the neck. The dorsal portion of the collum, or occiput, is very minutely transversely rugulose and clothed with fine, golden brown pubescence. In front of the collum, between the eyes is the *epicranium*, medianly divided by the *epicranial suture*, in the form of a ridge. The epi-

EXPLANATION OF ILLUSTRATION.

Plate I. Photograph of four cañafistula beans, infested with *Phlomerus ochropygus* Pic, showing larva, pupa and adult (photo by E. A. Sasscer).

cranium is separated behind from the pregena by a distinct suture from the base of the eye to the collum, and in front by a ridge over the antennal scrobes, from the dorsal edge of the emargination of the eye to the frontal suture, near the articulation of the mandible. The epicranium anteriorly is defined by the *frontal sutures* which branch forward from the epicranial suture. Along side of eyes the *vertex* portion of epicranium is very distinctly grooved. The surface of epicranium is finely punctate, densely pubescent with golden decumbent hairs, and with a row of sparse, long and close, short, erect superciliary hairs. The epicranium is laterally strongly emarginate by the inner lobes of the eyes.

The *eyes* are large, multiple-facetted, deeply emarginate, the inner lobe being narrower. The *frontal sutures* diverge from the epicranial suture, forming a very obtuse angle with the apex opposite the antennal fossae. They cut laterally the ridge from mandible to eye above the antennae, and terminate opposite the attachment of the mandibles. In front of these sutures is a large pentagonal piece, of which the black basal triangle is densely pubescent and the apical trapezoid very sparely pubescent and reddish yellow in color. The lateral angles of the trapezoid are pedunculate. These two areas, triangle and trapezoid, represent the *frons*, and the *clypeus;* separated by the *epistoma*, which, however, is merely indicated by the change of vestiture. The epistoma probably meets the frontal sutures at the supra-antennal ridge, which is incidentally the suture between epicranium and *gena*. In front of clypeus is the black, broadly transverse, semilunar *labrum*, which bears a row of long discal hairs and also a fringe of apical pubescence. The *pregena* is well defined. Posteriorly it is separated from collum by the basal

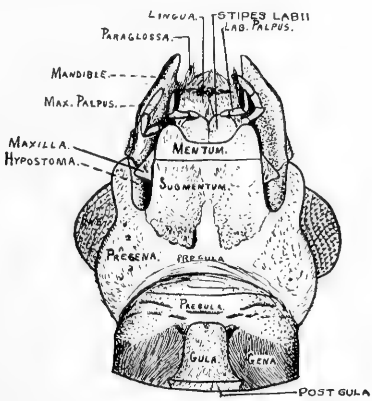


Figure 2. Venter of head of *P. ochropygus*. Drawn by W. D. Pierce.

constriction; dorsally it is bounded by a suture separating it from epicranium, and by the inferior lobe of the eye; anteriorly it invades the eyes, and is bounded by the supra-antennal ridge, the epistoma-frontal suture, and pleurostomal margin of the mandibles, and bears the antennae in front of the emargination of the eyes. Ventrally (fig. 2), it is bounded by hypostoma and the basal lobe of the submentum; but is separated from pregula only by a change of vestiture. Throughout, the pregena is clad with long golden or white hairs, which become very sparse near the pregula, and very dense in the emargination of the eye. The pleurostomal margin of the pregena is emarginate.

The antennae are borne on a ball socket, with the first joint, or scape, slightly broader than the following, but little longer than broad, the funicular joints are three in number; the fifth joint is triangulately enlarged, the sixth to eleventh laterally produced, eleventh acute at outer apical angle, these seven joints constituting a broad, flattened club.

The *hypostoma* is a narrow glabrous piece, clearly separated from the pregena, but basally inseparable from the submentum, except by its absence of vestiture.

Hidden by the prothorax and only visible when the head is removed, we find the pregular area extending back of the constriction to the tongue-shaped *gula* and the genae at its sides. The base of the gula is the *postgula*. The gula forms the sternum, the genae the pleuri, and occiput the tergum of the collum.

The *pregula* is the ventral piece cut by the constriction of the collum. It is glabrous, but otherwise not separable from pregena or submentum. This glabrous pregular area is broad at base and projects forward between two pubescent lobes of the submentum with an acute apex, and two acute lateral processes into the area of the submentum.

The large quadrate *submentum* is, as just mentioned, divided basally into two lobes by the pregular area. The lateral processes of the pregula separate off a basal depressed, pubescent area on each lobe. The anterior portions are pubescent, merely adjoining the mentum. The *mentum* is a clearly defined subquadrate transverse piece, with broad, rounded lobes extending forward on each side of the labium. It bears a small clump of white hairs at each side. *Stipes* labii is broad, quadrate at base; the *palpi* three-jointed with basal joint small, second twice as long, enlarged at apex, third a little longer, the two latter black, the basal joint brownish; anterior lobes yellow, strongly fringed. The *maxillae* lie in a deep groove formed by the mandibles and hypostoma below, and the submentum, mentum and labium above. The palpi are four-jointed, the basal joint small and brown, the other three long and black. The mandibles are interesting in that their edges are shining glabrous, rounded, and the pleural face is depressed and densely pubescent; the apices are bluntly pointed.

The prothorax is about twice as wide at base as apex and with the posterior angles acute. The median dorsal line is depressed. There is a lobe on each side at base near the posterior angles. The base is broadly truncate lobate. The dorsal surface is densely clothed with golden brown decumbent pubescence. There are no distinct sclerites on the prothorax. The sternum is acutely angulately produced between the coxae, but does not completely separate them. The coxal cavities are open behind. Coxae elongate, contiguous at apex; trochanters minute; femora moderately slender, slightly enlarged beyond middle; tibiae slender; tarsi five-jointed with first longest, second broader at apex, third broadly bilobed, fourth minute in base of emargination of third, fifth elongate, with claws appendiculate-toothed at base.

The vestiture of the prothorax beneath, and of the legs to the middle of tibiae is densely white, decumbent; the apical half of the tibiae beneath is clad with brown hairs, otherwise the tibiae and tarsi are clad with white; tarsal pods spongy beneath.

The scutellum is minute, medianly sulcate. The elytra are short, broadly, separately rounded at apex, emarginate by the prothoracic lobe; basal margin irregularly elevated; ten-striate; the first four striae strongly marked by elongate slash-like punctures, the others less distinct; lateral interspaces transversely slashed; vestiture dense, golden brown with lighter streakes.

The mesosternum and legs are densely white pubescent. The mesoepisternum only reaches the elytra externally. The mesosternum extends back, completely separating the coxae by about two-thirds their breadth. The coxae are more oval in shape, compressed, roundingly grooved for the femora. Otherwise this pair of legs is like the preceding. A narrow transverse sternellum closes the coxae behind.

The metasternum is also completely clad with white beneath. The metepisternum is almost completely covered by the elytra. The epimeron is a broad quadrate piece. The metasternum is tumid in front, but not perpendicular. There is a median sternal suture, and at base there is an emargination caused by a small acute process of the abdominal intercoxal piece. There is a transverse trochantin in front of the transverse coxae, which are broadly separated by the broad intercoxal process of the abdomen.

The posterior legs have a transverse coxa, a small acute trochanter, a huge inflated femur; an arcuate, ribbed, acutely pointed tibiae, and normal tarsus. The femora are grooved beneath for reception of the tibiae and bear an external row of about eleven denticles, and an internal row of five or more slightly larger teeth guarding the groove. The hind femora are rather roughly granulate toward apex.

The abdomen is dorsally clothed with dark brownish pubescence, except that the apical half of the pygidium is densely clothed with white, which extends forward in three points. Each abdominal segment, except the last, consists of a tergal plate with the areas merely indicated by faint pubescences; a small tergal spiracle-bearing plate, with oval annular spiracles; a small epipleurum, a small hypopleurum, and the sternum divided transversely into basisternum and sternellum. The basisternal plates are glabrous; the sternellar plates are densely white pubescent, except at the sides of the second and third segments. The pubescence on the fifth ventral is more silvery, but there is a dense white patch toward the side. The pygidium in the male is clothed with white almost to the base. When the abdomen is contracted, the basisternal plates are concealed.

Larva.—This is illustrated by figures 3, 4 and 5. Frons bearing three pairs of setae, one pair discal, one pair lateral, and one pair latero-anterior. Antennae rudimentary two-jointed. Labrum broadly rounded. Mandibles obtuse, with a single seta. Maxillae with two-jointed rudimentary palpi. Labial palpi merely indicated.

The thoracic segments are made up as follows: three dorsal sclerites—

Figure 5. Face of larva.

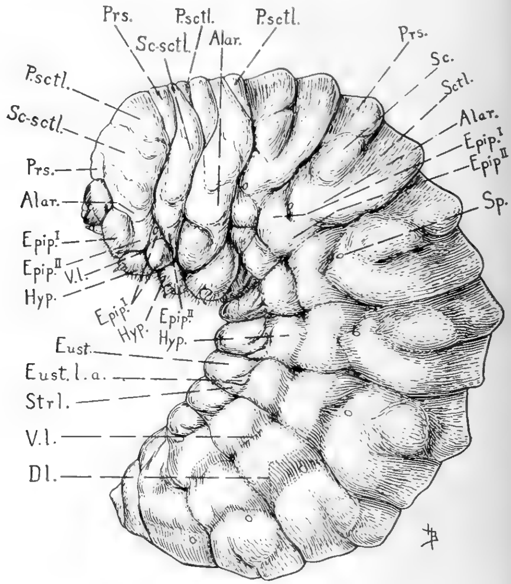


Figure 3. Larva of P. ochropygus.

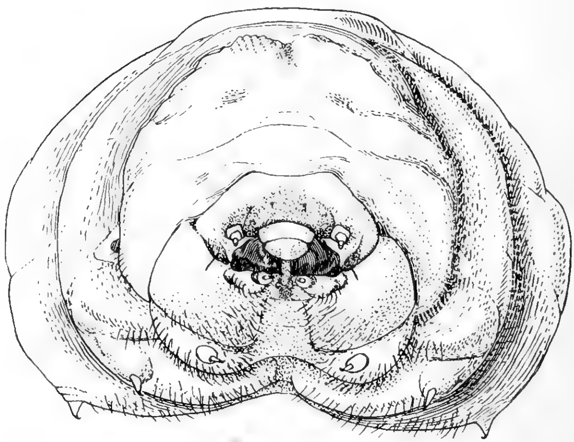


Figure 4. Front view of head and thorax of larva.

prescutum, scuto-scutellum and postscutellum, the first and last being spindle-shaped, while the scuto-scutellum extends from alar area to alar area. The alar area, fused with the second part of epipleurum is not strongly differentiated from the scuto-scutellum. The anterior part of epipleurum is a separate lobe and bears many small hairs. Below the ventro-lateral suture is the hypopleurum which is also setigerous and bears the tiny legs. The meso-thoracic spiracle is annuliform and borne in a tiny area belonging to but above, the first part of epipleurum. The eusternum is a simple piece.

The first seven abdominal segments are as follows: Dorsally there are but two large pieces, the prescutum and scutellum. The scutum lies below the prescutum. The prescutum is divided by a median depression, thus forming with the scutum, four anterior prominences on each segment. The alar area lies below the scutum and is not strongly differentiated. It bears the annuliform spiracle. The dorso-lateral suture immediately below the alar area, is angulate on each segment, thus partially dividing the epipleurum into two parts, the anterior of which extends upward on the anterior margin, and the posterior of which extends upward on the posterior margin. Below the epipleurum is the ventro-lateral suture separating epipleurum from hypopleurum. The sternum is composed principally of the eusternum, with a small lateral arm of eusternum, and behind this at each side, the lateral arm of sternellum. The eighth segment contains only scutoscutellum with spiracle, epipleurum, hypopleurum and eusternum. The ninth and tenth segments are simple, the latter bearing the anus.

Pupa.—This is illustrated in figures 6 to 9. The figures illustrate the characters very distinctly, showing the kidney-shaped eyes, the epicranial and frontal sutures, frons, clypeus and labrum, mandibles, maxillae.

The abdominal regions are well shown in figure 8, which shows a transverse basal pretergite, the central prescutum, which by figure 7, we see is longitudinal divided. Behind this is the short transverse scutellum. At the sides of the prescutum are the scuti, and beyond these the alar regions. The dorso-lateral fold separates alar regions from epipleurum, the front portion of which bears the elliptical spiracle with linear valve. The ventro-lateral fold separates the epipleurum from hypopleurum. The sternum consists of three transverse sclerites, basisternum, eusternum and sternellum.

From a systematic standpoint the armature of the last segments is always very important in weevil pupae. In figures 6, 8 and 9 it is noticeable that the ninth pleural region bears an acute lobe or process directed laterally.

Phelomerus aberrans (Sharp) Junk.

Bruchus aberrans Sharp, 1885, Biol. Centr-Amer., Coleopt., Vol. 5, November, p. 448.

Phelomerus distinctus Pic, 1912, L'Echange Linneenne, Vol 28, p. 92.

Phelomerus aberrans and var. *distinctus* Pic, 1913, Junk's Coleop. Cat., part 55, p. 9.

The typical form *aberrans* was described from David, Bugaba and Taboga Island, Panama. The variety *distinctus* was described from Colombia and Brazil. Specimens of typical

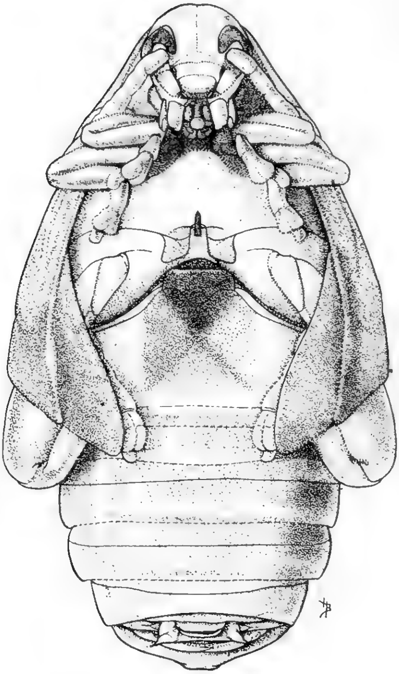


Figure 6. Venter of pupa.

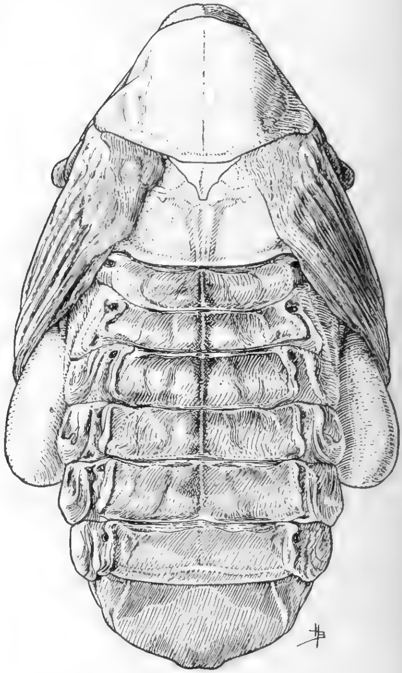


Figure 7. Dorsum of pupa.

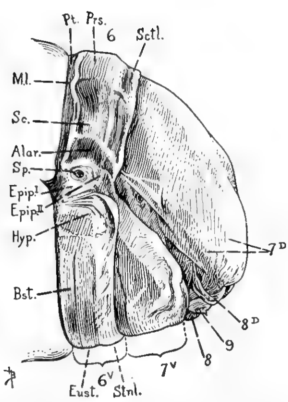


Figure 8. Side view of seventh to tenth pupal segments.

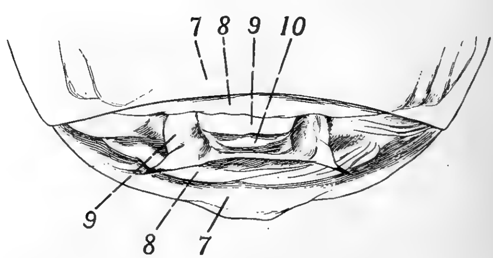


Figure 9. Posterior view of end of pupal abdomen.

aberrans are at hand from Belize, British Honduras, bred from Cassia beans, by C. F. Baker, under No. 5487. A large series was bred by E. A. Schwarz from pods of the cañafistula cimarrona, *Cassia grandis*, collected at Old Panama, Panama, in 1911, and at Paraiso, Canal Zone, March 15, 1911. Specimens were taken by August Busck on Tobaga Island, Panama, June 9, 1911, and at Tabernilla, Canal Zone, June 17, 1911.

This is also a very pretty species. Only those points will be mentioned below in which it differs from *ochropygus*.

The constriction at base of epicranium, forming the collum, is absent, being replaced merely by a change of sculpture above. Beneath, this constriction is deep. The occipital area of collum is coarsely punctate, minutely reticulose. The epicranial suture is strongly elevated, and at base medianly sulcate. The suture separating epicranium from pregena behind the eyes is raised. The surface of the epicranium is densely rugoso-punctate, rather sparsely clad with brownish hairs with denser golden pubescence in the basal corners and in front of the eyes, and also is provided with the superciliary hairs on vertex. The labrium is reddish. The head beneath is reddish. The pregena is densely clad with golden hairs in parts adjacent to the eyes, but toward the pregula it is very sparsely punctate and setose. The antennae are reddish brown, with the 6th to 10th joints darker. The pregular smooth area projecting into the submentum is very small and inconspicuous. The pubescence of the under parts of the head is golden. The collum is very much inflated, globose, beneath; the depression being a broad deep arc, while the mental zone of the head is flattened. Generally speaking the collum consists of four zones, the occipital or dorsal, separated laterally from the genal by a faint line; the genal or lateral; and the gular or ventral. On the collum the gula and gena are deeply separated by depressions. From the base passing forward, are the two deep lines of the gular sutures which curve away from each other and terminate on the disc. A little in front of these are deep diagonal lines which almost meet medianly and which reach the transverse impression behind the eyes. These separate the gena and the gula from pregena and pregula. The pregular area is divided in two by the collar constriction, the basal portion being strongly convex and the apical portion, which may be more or less hyposternal, is flattened. At the base of the gula is a small definitely defined transverse quadrate piece, the postgula of Hopkins, or intersternite of Crampton.

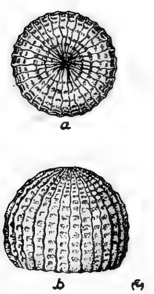
ABBREVIATIONS.

Alar = alar region.
Bst. = basisternite.
D. = dorsum.
Dl. = dorso-lateral suture, or fold.
Epip. I = first epipleurite.
Epip. = IIsecond epipleurite.
Eust. = Eusternite.

Eust. l. a. = ateral arm of eusternite.
Hyp. = hypopleurite.
Prs. = prescutum.
P. sctl. = postscutellum.
Pt. = pretergite.
Sc. = scutum.
Sc.-sctl. = scuto-scutellum.
Sctl. = scutellum.
Sp. = spiracle.
Stnl. = sternellum.
V. = venter.
V. l. = ventro-lateral suture, or fold.

THE EGG OF LAPHYGMA EXIGUA HÜBNER.

By Roy E. Campbell and Victor Duran,
Bureau of Entomology, United States Department of Agriculture.



The description and drawing of the egg of *Laphygma exigua* after Hoffman[1] quoted and illustrated in many old accounts of this insect, are incorrect, the upper cap, separated by a ring, being absent in all eggs examined by the writers. The eggs (Fig. 1) are typically noctuid, being spherical, but slightly flattened on top, with faint radiating longitudinal lines; iridescent pearly white or pinkish, 0.5 mm. in diameter. Before hatching they become darker and the head of the embryonic larva may be seen through the shell. The eggs are laid in clusters and are covered with hairs from the body of the moth.

Figure 1.—Egg of *Laphygma exigua*. *a.* Top view, *b.* side view (much enlarged).

A NEW SPECIES OF NOTARIS (COLEOPTERA: CURCULIONIDAE).

By F. H. Chittenden.

Notaris flavipilosus, new species.

Of similar form to *bimaculatus* Fab., elytra rather densely yellow-brown pubescent. Head distinctly, rather coarsely and densely punctate. Rostrum shining black, somewhat finely and sparsely punctate, more coarsely so at base

[1]Die Ranfeu der schmetter Cinge Europas Eur. 50.68c.

and sides. Antennae red. Pronotum slightly wider than long; sides moderately arcuate; surface moderately coarsely, very densely, not subrugosely punctate, median smooth line polished with tendency to elevation; surface with scale-like yellow setae, directed irregularly transversely, forming a pronounced dorsolateral fascia each side. Elytra much wider than prothorax, arcuate at sides; humeri prominent, rounded; striae shallow, feebly, scarcely visibly punctate except in first three; intervals a little elevated, rather coarsely granulose, strongly pubescent, the vestiture consisting of elongate yellow hairs, especially long on the alternate intervals and toward the apex and a little more condensed to form an inconspicuous spot on third interval behind the middle. Lower surface coarsely, densely and nearly uniformly punctate, and with sparse squamules, fine and yellow. Apex of fifth abdominal segment distinctly reflexed. Tibiae serrate on inner edge, anterior pair more strongly so.

Length, 7.5–8.5 mm.; width, 2.8–3.5 mm.

Type-locality.—St. Michael, Alaska, July 31, 1916 (J. Aug. Kusche).

Type.—Male, Cat. No. 28834, U. S. National Museum. Type and allotype. Paratype in the collection of Dr. E. C. Van Dyke.

The writer is indebted to Dr. E. C. Van Dyke for the presentation of the type and allotype to the National Museum.

By its tibial structure and well developed elytral granulations this species will come next to *bimaculatus* Fab. in the key (Brooklyn Ent. Soc., Vol. 22, 1927, p. 37). The vestiture of elytra in *flavipilosus* is much more abundant and more hair-like than in *bimaculatus*. The former species differs also in having the sides of the prothorax less strongly arcuate, and sides of elytra a little more rounded.

BOOK NOTICE.

General Catalogue of the Hemiptera: Fascicles II and III of this work have recently been issued. Fascicle I appeared in 1927 and embraces the known Membracidae of the world, its author being Doctor W. D. Funkhouser. In this volume, which contains more than 560 pages, the general plans of the proposed comprehensive catalogue were announced. The project was first outlined at the Cincinnati meeting of the Society for Advancement of Science in the winter of 1923–24, when a committee of ten was appointed to undertake the work. The General Editor is Doctor G. Horvath of the Musée National Hongrois, Budapest, Hungary, and the Managing Editor is Doctor H. M. Parshley of Smith College, Northampton, Mass., which institution has published the fascicles previously mentioned. The general foreword written by Doctor Horvath, indicates the plan and form of publication which will be adhered to throughout the work. This is followed by a list of 45 families in the Heteroptera and 19 in the Homoptera which it is proposed to recognize. In his introduction the author of Fascicle I emphasizes the principal objects of the catalogue as the recording of the history and synonymy of the insects treated. Complete synonymies of family, subfamily, genus, species and in some cases even subspecies, are included together with references to the original descriptions, including an indication of the general character of the articles in which these occurred. By the method followed, the synonyms are cross indexed and in addition are included in the general index at the end of the volume.

The genotypes are recorded throughout, the synonyms being italicised and the State, Province or Country of habitation of the species where known, are recorded at the right hand margin of the page.

Fascicle II, embracing the Mesoveliidae, a small family of bugs inhabiting stagnant or tranquil waters, is under the authorship of Doctor Horvath and consists of 15 pages.

Fascicle III embraces the Pyrrhocoridae, a family segregated in recent years from the Lygaeidae. It is a comparatively small group, only 360 species being recognized at present, many of which are brilliantly colored and of large or medium size. The family is primarily of tropical and subtropical distribution and it is believed has been but superficially investigated. The authorship of this volume is Doctor Roland F. Hussey of 660 Madison Avenue, New York, with a bibliography by Elizabeth Sherman. This catalogue when complete will undoubtedly comprise one of the most comprehensive and useful publications of its kind ever issued.

—*W. R. Walton.*

Actual date of publication, March 24, 1930.

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 32 APRIL 1930 No. 4

DESCRIPTION OF THE LARVA OF CEROTOMA TRIFURCATA FORSTER (COLEOPTERA: CHRYSOMELIDAE).

By Adam G. Böving,

Bureau of Entomology, U. S. Dept. of Agriculture, Washington, D. C.

The main purpose of this paper is to give an illustrated, full description of the mature larva of *Cerotoma trifurcata*. The descriptive matter is followed by a discussion of the systematic position of the genus, particularly in relation to the genus *Diabrotica*, and, in conclusion, the results of this discussion are summarized in the form of a short key.

ACKNOWLEDGMENT.

The following description and drawings are made from specimens of a well preserved and copious lot of mature larvae of the species which most kindly were submitted to me by Dr. Dwight Isely, Associate Entomologist at the Agricultural Experiment Station of the University of Arkansas, Fayetteville, Arkansas, who has just completed a biological study of the beetle.

Description of *Cerotoma trifurcata* Forster.[1]

Mature Larva.

(U. S. National Museum; one vial marked "University of Arkansas, College of Agriculture; received October 2, 1929. Reared and given by Dwight Isely.")

General Aspect.

The larva (figs. 9 and 11) is about 7 to 10 mm. long and about 1 to 1.5 mm. in width. It is legged, subcylindrical, somewhat flattened above and below, and rather straight. The individual segments of the body do not differ much from one another in length and the whole body tapers only slightly forward from the first six abdominal segments toward the anterior margin of the prothorax and backward to the beginning of the ninth abdominal segment. The

[1]A description with habitus figures of the larva was published for the first time in 1897 by F. H. Chittenden in his paper "The Bean Leaf Beetle" (U. S. Dept. of Agriculture, Entomological Bulletin No. 9, new series, pp. 64–71). The latest contribution with habitus figures of egg, larva, pupa, and imago is given by Dwight Isely (Agricultural Experiment Station, Arkansas, Bulletin No. 248, pp. 1–20; 1930).

head is broadly oval, hypognathous, somewhat retractile into the prothorax and the ratio of its greatest width to the width of the prothorax at its posterior margin is as one to one and one-half. The prothorax is provided with a dorsal shield; the meso- and metathorax are without any, and the abdominal segments are also completely soft with the exception of the ninth which carries a large pygidial shield or plate. The different areas of the segments are distinguishable but not limited by deep grooves, intersegmental belts are present and complete between the abdominal segments, and the tenth abdominal segment is developed as a soft pygopod. The legs (fig. 7) are inserted far apart, are attached to small hypopleural scleromes (*hy*, fig. 7), are short, and all of about the same size. Each consists of a sessile, low, and oval coxa, a trochanter, a femur, a tibia, and a falciform claw covered on the posteriorly facing side by a thin, clear, leaflike paronychial appendix. The spiracles (fig. 4) are circular, small, and in nine pairs and all lateral.

The head capsule is shining, generally dark olive-brown but the epicranial halves are lighter colored on the middle of the dorsal surface and the frontal sutures are white; the epistoma, a stiletto mark in the sagittal middle line of the frons, the antennal rings, and the hind margins of the epicranial halves are almost black; the mentum (*m*, fig. 5b) is white with a paramedian pair of darker spots, and the prementum (*pm*) is white with a dark brown thin band at base; the tips of the mandibles are almost black; the setae on the head, almost white.

The soft-skinned parts of the body are milky white; the prothoracic shield is light olive-brown but with numerous, irregularly arranged, cloudy, dark spots and a white line sagittally (fig. 6). The main color of the pygidial plate (fig. 8) is dark olive-brown, but posteriorly it becomes almost black while anteriorly and toward the lateral margins it is rather light; it is densely speckled all over with small blackish dots except medio-anteriorly in an elongate triangular area that is whitish, and medio-posteriorly where the small dots gather together into a paramedian pair of large, blackish, more or less confluent round spots. On the under side of the free and thick margins of the shield is a paramedian pair of light olive-brown round spots and on each side of the base of the pygopod is a small darkening of the skin (fig. 10). The hypopleural scleromes are blackish; the legs (fig. 7) are pale grayish brown with the coxal ring blackish and the other joints dark colored at the articulations; the claws are black, and the paronychial appendices clear and colorless like water. The spiracles are pale and easily overlooked (fig. 4). Setae and setal cups are whitish.

Details.

The head capsule (figs. 1a, 1b, and 2) has distinct, nearly straight frontal sutures converging posteriorly and forming an almost right angle. The epicranial suture is only slightly shorter than one-half the length of the frons measured from the middle of the anterior edge of the epistomal margin to the posterior end of the frontal shield. The frons bears a median inner carina marked on the upper side by the stiletto-like dark figure. The epicranial halves have rounded, not greatly produced hind margins, which are separated posteriorly by an approximately semicircular space. The setae of the head are fairly long and on each side placed as follows: On the frons, four setae, viz., one in the epistomal margin (*e*) midway between the frontal carina and the dorsal mandibular articulation (*m*); one in the dark antero-lateral corner of the frons between the mandibular articulation and the basal skin of the antenna; one in the middle part of the frons equidistant from both of the two former setae, marking together with them an imaginary isosceles triangle; and a small one near the posterior angle of the frons. On the epicranium there are four setae in a semicircle around the antennal ring, namely, one dorsal (*a*) near the frontal suture, one ventral (*d*, fig. 2) diametrically opposite, placed in the peristomal margin (*p*), and two lateral (*b* and *c*, fig. 2) between these; on the dorsal epicranial surface, two setae are placed at each end of an imaginary oblique transverse line somewhat anterior to the middle, and on the ventral epicranial surface are two setae.

The clypeus (*Cl*, fig. 1b) is about eight times as wide as long; posteriorly it is thinly chitinized and is furnished on each side with a single transverse series of three to four minute setae.

The labrum (*L*, fig. 1b) is free, has a corneous part posteriorly about as long as and three-fourths as wide as the clypeus, and has a fleshy, transversely oval part anteriorly which is continuous with the epipharynx below. One long seta is present near the lateral margin, another similar seta is found between this and the sagittal middle line, and along the soft-skinned anterior margin is a transverse series of densely set, small setae of slightly varying length and shape.

The ocelli are absent.

The antenna (fig. 1a) is apparently two-jointed but has in reality only one joint (*l*) which carries apically, besides some small sensory papillae, a joint-like sensory appendix (*s*). The basal membrane (*mb*) is large, permitting a complete retraction of the antenna; the antennal joint is provided with a rather low, pale cylindrical sclerome at base and a well developed membrane apically; and the sensory appendix has also a low, ring-shaped basal chitinization and is tipped by a large, thin, white tactile conus, three times as long as the basal chitinization.

Each mandible (figs. 2 and 3) is palmate with inner surface concave; there are five teeth distally of which the exterior and ventral fifth is smaller than the rest, while the third is the largest; the third, the second, and the fourth are slightly serrated. The inner margin of the mandible carries, about medianly between the base of the first tooth and the inner end of the hind margin, a series of three stiff, short, closely set bristles (*b*) which gradually decrease in length from the anterior to the very small posterior one. The exterior side of the mandible has two well developed setae.

The ventral mouthparts (figs. 5a and 5b) are retracted; the maxillary articulating area (*mart*) is slightly corneous and indistinctly separated by a fine groove from the submental-mental area.

The maxilla (figs. 5a and 5b) has a simple, transverse cardo, a large subtriangular stipes, and a mala divided into galea and lacinia. The stipes is armed with four large setae, namely, one in the corneous margin behind the mala, two exteriorly in the broad anterior part, and one seta in the attenuated posterior part of the chitinization. The galea consists of a distal and a proximal section; the distal (g^2) is slightly corneous and carries several irregularly distributed, rather short setae and, in its antero-interior corner, a conical peg (*pg*) in a cylindrical basal piece; the proximal section (g^1) is soft skinned and without setae. The lacinia (*la*) is covered ventrally by the posterior section of the galea but freely exposed dorsally toward the cavity of the mouth, and it is armed with a series of about five strong, pointed, somewhat flat, shining setae. The rather large palpiger (*plg*) is furnished with a corneous plate and armed with two setae. The palpus is three-jointed; the basal joint is short, cylindrical, about two times as wide as long, and has a ring-shaped sclerome at its base; the second joint also is furnished with a corneous ring at base, twice as long as that of the basal joint and about as wide as long, and it carries two well developed setae; the apical joint is conical, half as wide as and as long as the second, and it has one seta.

The gula is not present.

The submentum and mentum (*sm* and *m*, fig 5b) are fused, membranous, light colored with a pair of darker spots in the central part of the region. Near the anterior end of each spot are two setae, one in front of the other, and posterior to it is a third seta.

The prementum (*pm*, fig. 5b) is limited behind by a narrow, transverse, curved, and corneous band; one seta is present in the band and another in front of it at the beginning of the ligula. The labial palpi are well developed and two-jointed with the basal joint about half as long as wide; and the conical apical joint about twice as long as the basal joint and half as wide.

The ligula is soft, short, rather wide, indistinctly limited.

The epipharynx (*Epip*, fig. 1b) is soft and carries numerous straight or curved, rather long papillae.

The hypopharynx (*h*, fig. 5a) is soft, and its anterior region above the ligula bears minute papillae; the paragnaths (*pgn*) are present as a pair of low, soft lobes, densely beset with dome-shaped warts tipped by very short hairs.

The prothorax (figs. 6, 9, 11) is slightly broader than long with the greatest width somewhat in front of the hind margin where it is almost twice as wide as the head; the tergal shield is rather flat, smooth, formed as a broad escutcheon and separated sagittally by a whitish, finely jagged suture extending throughout its entire length; setae-bearing tubercles absent. On each side are found four setae anteriorly in a transverse row and three setae in an imaginary oblique line from the middle of the lateral margin to the beginning of the posterior fourth part of the sagittal suture; alar area (*al*, fig. 11) with two setae. The pre-epipleurum (*e*) has one seta close to the anterior end of the hypopleural chitinization; the post-epipleurum (e^2) also has one seta. The hypopleurum (*hy*, fig. 7) has a sclerome with a subtriangular, anteriorly wider, thick and almost black-colored lower margin; it bears no setae. The jugular membrane (*j*, fig. 11), possibly homologous with the presternum, is crescent-shaped and without setae. The eusternum and the sternellum are not distinctly separated but form together a common area. This is marked with a median arrow-like and forward-pointing figure, and is armed on each side with an anterior seta about in transverse line with the arrow's point and a posterior seta in transverse line with the hind end of the arrow's shaft. The posternellum is triangular, large, and without setae (*pstl*, fig. 11).

The mesothorax is wider than the prothorax, and the metathorax wider than the mesothorax. The mesothorax is provided with a fully developed spiracle, but the metathorax has a vestigial one only. Otherwise the two segments are much alike (figs. 9 and 11). The dorsal part of the tergum of each of the segments is divided by a transverse groove into two areas, namely, prescutum (*ps*) and scuto-scutellum (*s-sl*) and each of these is again subdivided by faint longitudinal and curved grooves into a median division (*md* and *mx*, fig. 9) and, on each side, an exterior division (*ed* and *ex*); the median divisions carry a seta on each side, and each of the exterior divisions has one seta. Each alar area (*al*, fig. 11) bears two setae. Each epipleurum is divided by the alar area into a pre-epipleurum (*e*), with one seta, and a large triangular post-epipleurum (e^2), with one seta. Each hypopleurum has a sclerome but no seta. The sternum is divided into a presternum (*prs*), paired, lateral, and subtriangular; a eusternum, unpaired; a sternellum, almost paired and separated from the eusternum by a V-shaped groove; and a post-sternellum (*pstl*), unpaired, lanceolate, and limited behind by the presternal parts of the next segment. The presternum and post-sternellum are without setae, the eusternum and sternellum have one each.

The first to seventh abdominal segments (figs. 9 and 11) are all alike in general shape, slightly decreasing in length and width forward from the third and backward from the fifth segment, and each segment is separated from the subsequent one by an intersegmental ring-shaped region (*i*); the latter is formed above the ventro-lateral suture (*v*) by postscutellum (*psl*) and below it by a fusion of post-sternellum and the presternum of the following segment. The setal arrangement on each side is as follows: Intersegmental region (*i*) without setae, prescutum (*ps*) with three setae in a transverse series, scutum (*s*) with one seta, scutellum (*sl*) with two setae, alar area (*al*) with one seta, epipleural lobe (*el*) with two or three setae, hypopleurum (*h*) with two or three setae, the eusternum (*st*) with one seta, and the sternellum (*stl*) with two setae.

The eighth abdominal segment (figs. 9, 10, 11) has the same number of setae as do the preceding segments but is not separated from the ninth by an intersegmental ring.

The ninth abdominal segment (figs. 8, 9, 10 and 11) is about as long as one of the preceding segments and is almost as wide anteriorly, but it is approximately semicircular, merely slightly longer than wide in dorsal view. The pygidial shield is flat, covering the entire dorsal side of the segment; no urogomphi (=cerci auctorum). The surface of the shield is leather-like and colored as described above. On each side it is armed with four well developed setae arranged in a single row and inserted either in, slightly below, or slightly above the free margin of the shield; in the central part of the shield are two minute setae, one in front of the other. On the ventral side of the segment (fig. 10) and situated anteriorly to the base of the pygopod is a transverse row of four small setae, two on each side.

The tenth abdominal segment (fig. 10) is developed as a soft pygopod, with a dark spot and a minute seta on each side. The anus is in the center of the rounded sucking surface.

Taxonomic Comments.

The *Cerotoma* larva belongs to the group of chrysomelid larvae, including those of *Diabrotica* and *Phyllobrotica*, which occupies an intermediate position between the Galerucinae and the Halticinae but which approaches the latter more closely, and logically seems to have its place in this rather than in the former subfamily. As with the typical Galerucinae the larvae of this group possess an epicranial suture, very short in *Phyllobrotica* but well developed in *Diabrotica* and *Cerotoma*, whereas typical halticine larvae are without it. However, unlike the galerucine larvae in which is found one well developed, projecting ocellus on each side of the head, these larvae are entirely without a similar ocellus or even a pigmented ocellar spot and resemble, not only in this character but in general habitus, the Systenini-Crepidoderini-Psylliodini group of the Halticinae.

The *Phyllobrotica* larva is characterized, in addition to the just-mentioned extreme shortness of its epicranial suture, by having the prothoracic shield and the pygidial plate poorly sclerotized and indistinctly limited, in contrast with which the *Diabrotica* larva has a well developed epicranial suture, a distinct prothoracic shield, and a distinct pygidial plate; and in these and most other characters the *Cerotoma* larva is identical with the *Diabrotica* larva. In fact, the larvae of these two genera can be separated only by the following small differences: In *Cerotoma* the body is somewhat shorter and broader, and the grooves that limit the segmental areas are not so deep as in the known larvae of the different species of *Diabrotica;* the frontal sutures are straight, and form posteriorly an angle of about 90° in *Cerotoma* while in *Diabrotica* they are somewhat curved and form an angle of about 60° only; the mandible has three short spines posteriorly on the inner margin in *Cerotoma* but four fairly long ones in *Diabrotica;* and the inside of the spiracular mouthpiece is smooth in *Cerotoma* but beset with numerous short spinules in *Diabrotica*. In *Cerotoma trifurcata*, the only species of the genus present in North America, the pygidial plate is entirely without urogomphi (=cerci) and differs in this character from the larvae of *Diabrotica duodecimpunctata* Fabricius, *Diabrotica vittata* Fabricius, and other species of the genus, but not from *Diabrotica longicornis* Say in which the urogomphi also are absent.[1]

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[1]Böving, Adam G.—Descriptions of larvae of the genera *Diabrotica* and *Phyllobrotica*, etc. (Proc. Ent. Soc. Washington, Vol. 29, 1927, pp. 194–206, 1 plate).

Böving, Adam G.—Beetle larvae of the subfamily Galerucinae (Proc. U. S. Nat. Mus. No. 2773; Vol. 75, 1929, pp. 40–41).

The results of this discussion on the systematic position and characterization of the larva of *Cerotoma* may briefly be expressed by the following key.

Key Showing the Taxonomic Relationship of Cerotoma.

1. Ocelli and epicranial suture present; first to eighth abdominal segments never entirely without small dorsal plates and setae, and with dorsal setae arranged in two or three transverse rows.......................... *Galerucinae.* (in limited sense).

— Either without ocelli, or without epicranial suture, or without both; or first to eighth abdominal segments either fleshy and without setae, or with dorsal setae arranged in a single transverse row.......................... 2

2. Epicranial suture absent except in genera with a single transverse row of dorsal setae on the abdominal segments; ocelli present or absent.......... *Halticinae.* (as commonly conceived.)

— Epicranial suture present (dorsal setae arranged in three transverse rows on the abdominal segments) ocelli absent.......................... 3

3. Dorsal shields of prothorax and the ninth abdominal segment poorly developed and indistinctly limited; urogomphi absent; epicranial suture very short.......................... *Phyllobrotica.*

— Dorsal shields of prothorax and ninth abdominal segment distinct; urogomphi absent or present; epicranial suture of moderate length.......................... 4

4. Frontal sutures straight and forming posteriorly an angle of about 90°; mandible with three short bristles posteriorly on inner margin (urogomphi absent).......................... *Cerotoma.*

— Frontal sutures somewhat curved and forming posteriorly an angle of about 60°; mandible with four moderately long bristles posteriorly on inner margin.......................... 5

5. Urogomphi absent.......................... *Diabrotica longicornis.*

— Urogomphi present.......................... *Diabrotica duodecimpunctata*, *D. soror*, *D. vittata*, and other species.

Explanation of Plate.

(drawn by the author)

Cerotoma trifurcata Forster.

Fig. 1. Dorsal part of head capsule showing exterior view (*1a*) to the left, and interior view (*1b*), to the right; *a*, seta from a series around the antennal base; *b*, another seta from series around antennal base; *Cl*, clypeus; *e*, epistoma; *Epip*, epipharynx; *L*, labrum; *m*, dorsal mandibular articulating place; *mb*, basal membrane of antenna; *s*, sensory appendix of antenna.

Fig. 2. Back of mandible, and antenna seen from above; *a*, *b*, *c*, and *d*, setal cups around base of antenna; *p*. peristoma; *1–5*, five teeth of mandible.

Fig. 3. Left mandible; *b*, bristle on inner margin; *1*, dorsal tooth.

Fig. 4. Mesothoracic spiracle.

Fig. 5. Ventral mouthparts, dorsal side (*5a*) to the left, ventral side (*5b*) to the right; g^1 and g^2, galea; *h*, hypopharynx; *la*, lacinia; *m*, mentum; *mart*, maxillary articulating area; *pg*, peg-like process on galea; *pgn*, paragnath; *plg*, palpiger; *pm*, prementum; *sm*, submentum.

Fig. 6. Prothoracic dorsal shield.

Fig. 7. Left leg, posterior view; *cl*, claw; *coxa*, coxa; *f*, femur; *hy*, hypopleural sclerite; *pa*, paronychial appendix (=empodium); *ti*, tibia; *tr*, trochanter.

Fig. 8. Pygidial plate (or pygidial shield) dorsally on ninth abdominal segment.

Fig. 9. Dorsal view of larva, about 7.5 mm. long; *ed*, exterior portion of prescutum; *ex*, exterior portion of scuto-scutellum; *md*, median portion of prescutum; *mx*, median portion of scuto-scutellum.

Fig. 10. Eighth, ninth, and tenth abdominal segments, ventral view.

Fig. 11. Lateral view of larva, about 7.5 mm. long; *al*, alar area; *e*, pre-epipleurum; e^2, post-epipleurum; *el*, epipleural lobe; *h*, hypopleurum; *i*, intersegmental region; *j*, jugular area; *prs*, presternum; *ps*, prescutum; *psl*, postscutellum; *pstl*, post-sternellum; *s*, scutum; *sl*, scutellum; *s-sl*, scuto-scutellum; *st*, eusternum; *stl*, sternellum.

Scale applicable only to figs 9, 10 and 11.

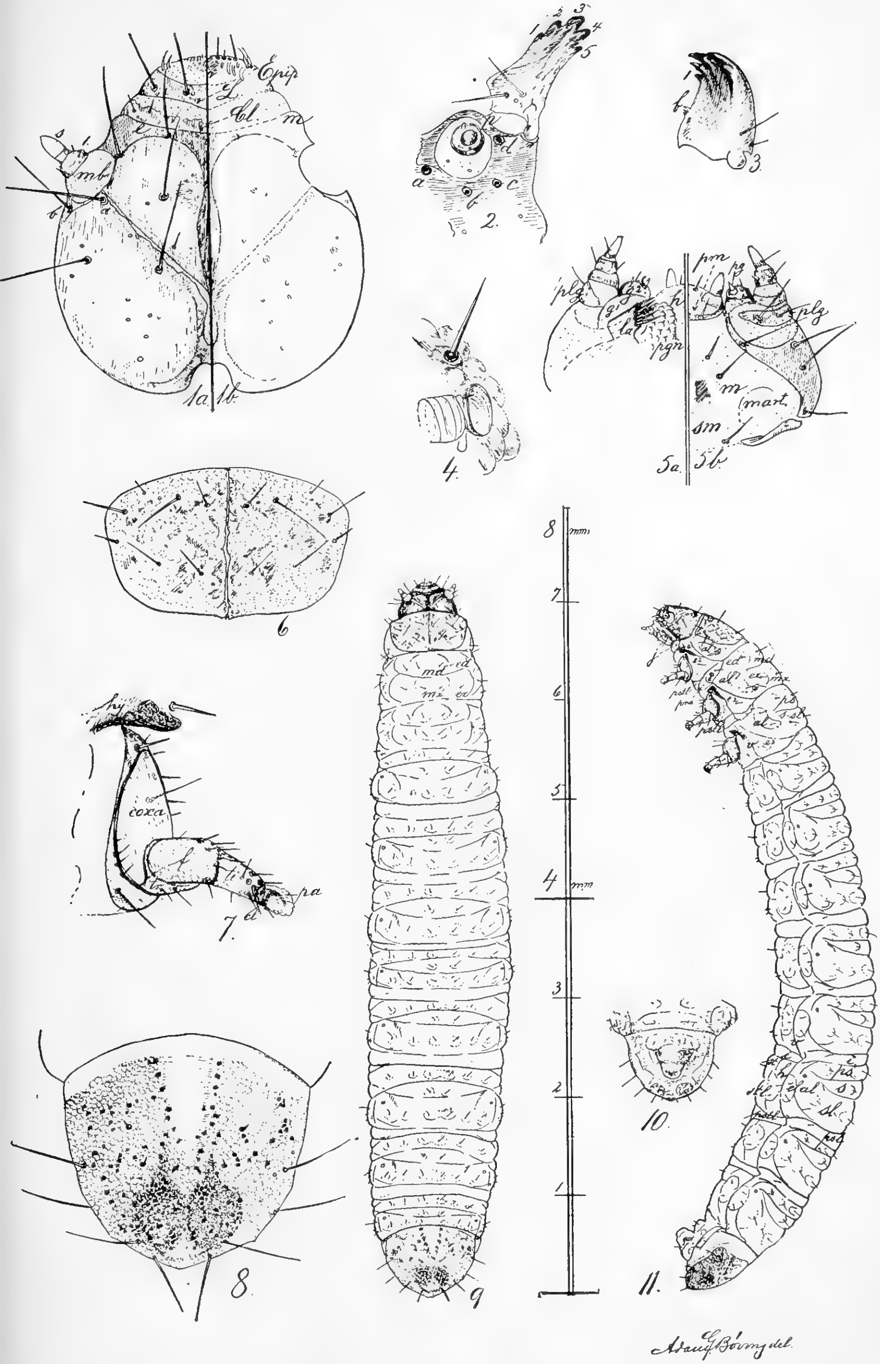
THE EFFECT OF LIGHT UPON THE DEVELOPMENT OF THE DARK MEAL WORM, TENEBRIO OBSCURUS FAB.

By Richard T. Cotton, *Senior Entomologist, U. S. Bureau of Entomology.*

Owing to the fact that but few experiments designed to show the effect of light on the normal rate of growth and development of insects have yielded positive results, it seems worth while to record the following observations on the effect of light on the development of the dark meal worm, *Tenebrio obscurus* Fab.

Under favorable conditions, larvae of the dark meal worm, that hatch in the spring or early summer months, become apparently fully grown by the middle of August. They do not transform at that time but normally remain as larvae, with but little change in size or outward appearance, until the following spring. If the larvae are kept in a heated room, development is hastened and a certain percentage may begin to pupate in November or December.

During the course of a study of the biology of the dark meal worm it was noted that light had a marked effect upon the larvae, so much so that, when well grown worms were kept continuously in light they quickly began to pupate regardless of the season. Many such observations were made and, for



Adam G. Böving del.

Cerotoma trifurcata - Forster

purposes of record, detailed notes were kept on a group of ten worms that were removed from the stock colony and placed in a small incubator at room temperature but with continuous light. The worms were placed in a glass petri dish with a quantity of food sufficient for feeding purposes but not great enough to afford protection from the light. The stock colony was kept in a covered tin box from which light was excluded.

The ten worms were exposed to the continuous light (provided by a 10-watt lamp), on August 23, 1929. They pupated on the following dates: No. 1 on Sept. 14, 1929; no. 2 on Sept. 17; no. 3, on Sept. 20; no. 4 on Sept. 21; no. 5 on Sept. 22; no. 6 on Sept. 26; no. 7 on Oct. 18; no. 8 on Nov. 5; no. 9 on Nov. 18. The 10th had not pupated by the 1st of February, 1930.

In the stock colony, kept in complete darkness but at the same temperature as the others, the first pupation occurred on Dec. 7. In similar colonies a few pupations occurred in late November.

The above records indicate that the effect of continuous light upon full grown larvae of the dark meal worm, that normally breed in a darkened environment, is to accelerate markedly the transformation to the pupal state.

It is well known that many insects have a higher rate of metabolism in light than in darkness, hence it seems probable that a sudden increase in the metabolic rate, induced by the exposure to continuous light, is responsible for shortening the larval period of the meal worms and accelerating the process of transformation to the pupal and adult stages.

Under normal circumstances the meal worms transform in the spring or early summer months when there is a considerable increase in temperature over winter conditions. This increase in temperature causes a corresponding increase in the rate of metabolism of the over-wintering meal worms which in this case doubtless exerts a controllong influence over the process of transformation.

By holding meal worm larvae at temperatures below normal they can be prevented from transforming at the regular period, and by the use of light and warmth they can be induced to transform without passing through the normal hibernation period; hence, with the proper use of these three agents, a supply of all stages of the dark meal worm can be obtained at all times of the year.

These methods of controlling the development and transformations of the meal worm should be of particular interest to those who wish to breed meal worms for bird or fish food or for purposes of research.

A NEW NAME FOR THE GENUS QUIPPELACHNUS OESTLUND (APHIIDAE, HOMOPTERA).[1]

By A. A. Granovsky, *University of Wisconsin.*

In the study of aphids belonging to the tribe Callipterini one meets with a number of difficulties and apparent confusion as to the correct generic position of several species, as well as to the proper definition of certain genera. In 1920 Baker (2), in his generic classification of aphids, redefined with synonymy all of the aphid genera then known to him and listed the type species of each genus, thus rendering immeasurable aid to aphidologists. Since that time several new aphid genera have been erected and among them is *Quippelachnus* proposed by Oestlund (7) with the type species *Euceraphis gillettei* Davidson. He based his genus on the relative length of unguis as compared with the base of the sixth antennal segment, the presence of radial sector and the bulging at the base cornicles.

Davidson (3 and 4) described two species *flava* and *gillettei* under the genus *Euceraphis*, erected by Walker (13) with *Aphis betulae* Linn. as type of the genus. Unfortunately Walker, as many workers of his day, did not define his genus, but the genotype *betulae* Linn. is a well known species and offered no difficulty in including under Euceraphis several closely related species.

Although both species, *flava* and *gillettei* have several characters in common, and typically those of Euceraphis, Davidson (4) three years later, after *flava* was described, realized that his *flava* departs in a number of characters from the species correctly belonging to Euceraphis, and placed it in the genus *Eucalipterus* erected by Schouteden (8 and 9) with *Aphis tiliae* Linn. as the type. In this he was followed by Essig (5) and Swain (11), showing that they agreed with him in existing generic differences of *flava*.

Since *tiliae* Linn. is co-generic with *ononidis* Kalt., the type of *Therioaphis* Walker, as shown by Baker (2), and Schumacher (10) further showed that *Therioaphis* is a synonym of *Leptopteryx* Zetterstedt with *L. nivalis* Zett. as a type of the genus, it is evident that *Eucalipterus* becomes a synomym of *Leptopteryx* Zett. However, *flava* Davidson can not be included in this genus for it is widely different from the species treated under it. It is much nearer to Euceraphis, and yet differs from it in several respects.

The characters of Euceraphis are well defined by Baker (2) and need not be repeated here. Baker (1) also gave the key to the American species of Euceraphis in which he included *flava*

[1]Contribution from the Department of Economic Entomology, Wisconsin Agricultural Experiment Station.

Davidson. From this key it is evident that *flava* differs from the typical Euceraphis species by having a distinctly bilobed anal plate.

Oestlund (7) in erecting his *Quippelachnus*, used *gillettei* Davidson as the type of the genus. He doubtless misinterpreted the species. He evidently mistook *gillettei* for *flava*, because the cornicles of *gillettei* are not bulging at the base in the Lachnus-like fashion as the name of his genus indicates. This character is typical of *flava* as illustrated by Davidson (3 and 4) and is shown here (fig. 7).

Takahashi (12) in his recent list of aphid genera correctly placed Quippelachnus as a synomym of Euceraphis, in so far as *gillettei* Davidson is concerned, for it is quite similar to *betulae* (Linn.) in all of the generic characters.

Both species *flava* and *gillettei* are quite common on Alnus in northern Wisconsin as they probably are throughout the northern states and Canada. The writer had the opportunity of collecting them frequently and studying their characters and habits. In addition to his own material, the writer examined the type slides of both *flava* and *gillettei* through the kindness of Mr. W. M. Davidson and the U. S. Bureau of Entomology. While visiting Dr. O. W. Oestlund in 1925, the writer had the opportunity through Oestlund's courtesy to examine his material of both species. At that time Oestlund's attention was called to the possible misinterpretation of species.

It may be of interest to mention here that *gillettei* Davidson is treated by Oestlund (7) as *alnifoliae* (Fitch) under Euceraphis; and in a like manner *Myzocallis alnifoliae* (Fitch) he erroneously considers under *Pterocallis alni* (De Geer), as shown by Granovsky (6) after examining Oestlund's material.

The genera of the Callipterini are quite well differentiated and are founded, among other structures, mainly on such characters as the types of cornicles, antennae, sensoria, wing venation, caudae and anal plates.

A careful study of *flava* Davidson reveals that it differs from Euceraphis species in a number of generic characters such as the cornicles, sensoria, cauda and anal plate, and deserves an independent position, as was recognized by the several workers mentioned above. In order to remove the already existing and possibly future confusion, it is deemed advisable to propose a new name for *Quippelachnus* Oestlund, which was erected for *flava* characters, but for which *gillettei* was used as the type by error. This new genus, *Oestlundiella*, the writer is erecting in honor of Dr. O. W. Oestlund, one of the oldest living aphidologists, whose contributions to the knowledge of aphids, although not many, are of interest and value.

Oestlundiella, new genus.

Body elongated. Antennae of six segments, somewhat longer than the body, provided with subcircular or oval sensoria and a few bristle-like hairs. Sensorium at the base of the unguis small, circular with a few auxiliary sensoria on each side. Antennae placed on distinct, but not large, diverging frontal tubercles. Cornicles truncate, constricted in the middle and placed on broad swollen or bulging bases. Cauda elongated, cordiform and indefinitely knobbed in spear-like shape, with constriction near its distal half. Anal plate distinctly and broadly, but not deeply bilobed. Both, cauda and anal plate, hairy. Forewing with venation normal, media twice branched; stigmal vein present, not deeply curved; hind wings with media and cubitus present. Forms are large, but delicate, living in small colonies and singly. Waxy secretion on legs and body is present. Antennae of oviparous females also bear a few subcircular secondary sensoria.

Genotype, *Euceraphis flava* Davidson.

This genus is closely related to *Euceraphis* and occupies the position between *Calaphis, Cepegillettea* and *Euceraphis.*

In the structure of antennae, body form and waxy secretion *Oestlundiella* resembles the genus *Euceraphis,* but it differs from it in that of having its anal plate definitely bilobed, cordate cauda with a broad spear-like constriction, and cornicles placed on broad, swollen bases. All of the species belonging to *Euceraphis* in contrast, have their anal plates usually entire or only very indistinctly imarginate, caudae perceptibly knobbed and cornicles much longer than wide, which are not placed on swollen bases.

The genus *Oestlundiella* approaches *Calaphis* and *Cepegillettea* by subcircular or oval sensoria; notched anal plate and by the presence of sensoria on the antennae of oviparous females. It differs from *Calaphis* by the large cauda in which respect it approaches *Cepegillettea,* although the type of cauda is differently shaped.

The figures depict the type of sensoria of antennal segment III, cornicles, caudae and anal plates of alatae of *betulae* (Linn.) the type of *Euceraphis; flava* (Davidson) the type of *Oestlundiella;* and *Euceraphis gillettei* Davidson with which *flava* was confounded.

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Explanation of Drawings.

Euceraphis betulae (Linn.).

1, Sensoria of antennal segment III; 4, cauda and anal plate; 8, cornicle.

Euceraphis gillettei Davidson.

2, sensoria of antennal segment III; 5, cauda and anal plate; 9, cornicle.

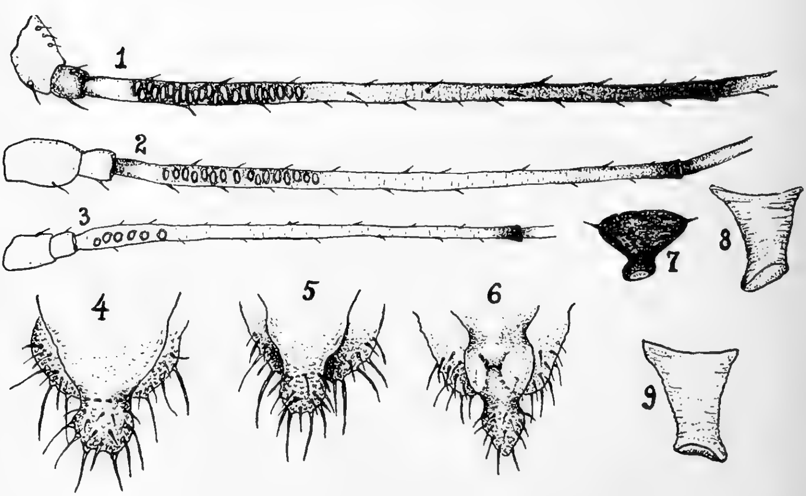
Oestlundiella flava (Davidson).

3, sensoria of antennal segment III; 6, cauda and anal plate; 7, cornicle.

Note.—All antennal segments are drawn to the same scale.

All drawings of cornicles, caudae and anal plates are made to the same scale.

All drawings therefore are comparable.



A NEW SPECIES OF MACROCENTRUS FROM OHIO (HYMENOPTERA: BRACONIDAE).

By Frank D. DeGant.

Macrocentrus pallisteri, new species.

Female.—Length 7 mm. Length of exerted portion of ovipositor 8 mm., issuing before apex of abdomen. Length of anterior wing, 5 mm. Head transverse, smooth and shining; face with weak setigerous punctures and clothed with short fine hairs which are longer on the clypeus. Clypeus convex, truncate at apex. Eyes regularly elliptical. Ocelli prominent; distance between the lateral ocelli slightly greater than the distance between the lateral and median ocellus and about equal to that from lateral ocellus to eye margin. Scutum and scutellum polished, impunctate. Notauli weakly foveolate, joined at middle of mesoscutum and continued as a groove to the base of the scutellum. Scutellar groove foveolate. Propodeum finely transversely rugose, without a median carina. Mesopleura polished with sparse punctures. Hind basitarsus not quite so long as the following tarsal joints together. The distance between the spiracles of first abdominal segment distinctly greater than the distance from spiracle to base of tergite. First three tergites finely aciculate striate, the following tergites very faintly shagreened.

Stramineous: interocellar area, vertex, eyes, metathorax, propodeum, and tergites beyond the third black; flagellum reddish-brown. Mandibles pale yellow, tips black. Wings hyaline; stigma dark brown, pale yellow at base; veins dark brown. Legs uniformly stramineous.

Type locality.—Cleveland, Ohio.

Type.—Cat. No. 41909, U. S. N. M.

Described from one female, collected July 28, 1928. Named in honor of my friend, Mr. J. C. Pallister, Curator of Entomology, The Cleveland Museum of Natural History.

THE SCIENTIFIC ATTITUDE IN NOMENCLATURE.

By W. L. McAtee.

The systematic nomenclature of organisms has grown to be a very complex matter and sound decisions as to details can be rendered in each case only by an advanced specialist in the particular field involved.

Interference in nomenclature by non-taxonomists and by those poorly informed about the matter at issue, which from the very nature of the subject usually is the case when action is taken by committees and congresses, can not be accepted by specialists as binding upon them.

When the ruling is in accordance with his findings from the available data, well and good, but when it is not, the systematist can not be expected to reject evidence, disregard principles, and in general stultify himself in order to conform to an ill-considered decision. The attempt to fix nomenclatorial points definitely and for all time disregards the fact that new evidence is constantly turning up and must be considered. It is unjust, illogical, and unscientific to try to prevent the consideration of all the evidence bearing on a given topic. In true science all questions are forever regarded as open, and all findings subject to change.

In brief we conclude that "decisions" of committees and congresses on details of nomenclature, the selection of certain names to be permanently conserved, and in fact the making of any exceptions to the basic principles of nomenclature, are not binding on systematists. The latter must work out nomenclatorial problems according to recognized principles, must take into account all available data, reconsider decisions whenever new information comes to hand, and preserve an open and flexible mind in all cases. No other attitude is scientific.

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SOME NEW SPECIES AND A NEW GENUS OF PARASITIC HYMENOPTERA FROM BRITISH COLUMBIA.

By Oscar Whittaker.

The specimens upon which the following descriptions are based were all collected by the writer, in whose collection, except where otherwise stated, all type material remains.

BETHYLIDAE.

ANTEON Jurine.

Anteon flaviscapus, new species.

Male.—Black; mandibles, except tips, pale yellowish; antennae dark brown, the scape yellow; legs, including coxae, yellow, hind femora and tibiae and all tarsi apically slightly dusky. Head, viewed from above, about one and one-half times as wide as long, viewed from in front, a little more than one and one-third times as wide as long; front margin slightly convex, hind margin separated from occiput by a fine carina; vertex with a shallow, transverse depression in front of anterior ocellus, without a carina as in *A. hirtifrons* n. sp.; with very shallow punctures and scattered white hairs; frons more densely hairy; temples and cheeks smooth, separated from eyes and occiput by fine carinae and with a carina running from base of mandibles to eyes. Eyes and ocelli large, the latter in a triangle; lateral ocelli as far apart as from the occiput and considerably further than this from the eyes. Antennae longer than head and thorax combined, clothed with erect pubescence; scape slightly wider than the flagellum, two and one-half times as long as wide; pedicel two-thirds as long as scape; joints 3, 8 and 9 equal, about one and one-half times as long as pedicel; joints 4–7 equal, very slightly longer than joint 3, three times as long as wide; apical joint the longest, as long as scape. Thorax smooth and shining; pronotum short, mesonotum with very shallow, indistinct punctures; notauli reaching to about the middle of mesonotum, a fine carina running from the humeral angles to base of scutellum which is separated from the mesonotum and metanotum by deep, punctate foveae. Propodeum coarsely rugose. Wings hyaline, with fine brown pubescence, nervures and stigma brown, the latter basally white; radius about as long as stigma, straight, obtusely angled about two-thirds its length from the base. Abdomen smooth and polished.

Length, 1.5–1.8 mm. *Expanse*, 3.5–4.0 mm.

Described from eight specimens: six from Hollyburn, British Columbia (Type loc.), 7–18 June, 1928; one from Chilliwack,

B. C., 12 June, 1927, and one from Galiano, B. C., 27 June, 1929.

Paratypes sent to U. S. N. M., Mr. Robert M. Fouts and Dr. A. A. Ogloblin.

Anteon hirtifrons, new species.

Male.—Black; mandibles, except tips, pale yellowish; antennae rufous, basal half of scape brownish-yellow; front and middle legs, including coxae, yellow, middle femora dusky beneath; hind legs with the coxae, except apically, black; femora of hind legs dorsally black, except about the basal one-fourth, beneath with only the apical third black; hind tibiae with the apical half piceous brown, the rest yellow; apical joint of all tarsi dusky. Head, seen from above, about one and one-half times as wide as long, seen from in front, about one and one-third times as wide as long; front margin rounded, hind margin straight and finely carinate. Eyes and ocelli large, the latter in a triangle; lateral ocelli about as far apart as from the eyes and nearer than this to the occiput. Vertex rugose, with a large, deep, triangular depression in front of anterior ocellus from the apex of which a fine carina extends to the clypeus, the surface with scattered, short, erect, white hairs; the frons clothed with dense, silvery hairs; temples and cheeks smooth, separated from the eyes and occiput by fine carinae, and with a carina running from the eyes to base of mandibles. Antennae longer than head and thorax combined, with coarse pubescence; scape three times as long as wide; pedicel oval, about one-half times as long as scape; joint 3 one and one-half times as long as pedicel; joints 3–9 equal, two and one-half times as long as wide; apical joint one and one-third times as long as preceding joint. Thorax with scattered, erect hairs; pronotum short; mesonotum, scutellum and metanotum smooth and polished; the mesonotum with shallow punctures; mesonotum with traces of notauli anteriorly and with a fine carina running from the humeral angles to base of scutellum; scutellum separated from mesonotum and metanotum by deep, punctate foveae. Propodeum coarsely, reticulately rugose, the posterior face with two longitudinal carinae, enclosing an elongate, finely granulate area. Wings hyaline, with fine brown pubescence, subcostal nervure and stigma brown, the latter basally white; other nervures yellow; radius shorter than stigma, straight, obtusely angled near the apex. Abdomen smooth and polished, about as long as the thorax.

Length, 2.1–2.25 mm. *Expanse*, 3.75–4.2 mm.

Described from three specimens from Hollyburn, 10–27 June, 1928.

One paratype given to Mr. Robert M. Fouts.

SERPHIDAE.

DISOGMUS, Foerster.

Disogmus torvus, new species.

Female.—Black, polished; antennae brown; legs yellow, the tarsi bronhish; ovipositor dark brown. Head transverse, wider than the thorax, viewed from above one and three-quarters times as wide as long, with scattered pale hairs; frons very feebly convex; ocelli in a triangle, lateral ocelli about as far apart as from the eyes and further apart than from anterior ocellus. Antennae coarsely pubescent, longer than head and thorax combined; scape robust; pedicel very short; joint 3 slightly more than twice as long as thick, somewhat longer than the following joint; joints 4–12 becoming gradually shorter and thicker; penultimate joint one and one-third times as long as thick, three-quarters as long as joint 3; apical joint three times as long as preceding joint, apex bluntly rounded. Thorax with the pronotal angles subacute; mesonotum convex; notauli distinct, posteriorly convergent; scutellum longer than wide, with a deep fovea at base; propodeum coarsely rugose, smooth basally, with three depressions at the extreme base, a distinct median carina running from the central depression and a lateral carina on each side connected posteriorly with the median carina by a transverse carina, the sides clothed with long, white, erect hairs. Longer spur of hind tibiae short, not more than one-quarter as long as the metatarsus. Wings faintly fumose; tegulae and venation brown; the stigma darker, elongate; radial cell as long as stigma; cubital, median, brachial, discoidal and basal nervures indicated by pale fuscous streaks. Abdomen polished, including the ovipositor about twice as long as thorax; beyond third tergite narrow and somewhat compressed; petiole a little wider than long, dorsally rugulose, laterally longitudinally striate; second tergite longitudinally striate at base, except in the centre, the striae shorter than the petiole, with a few hairs on the sides at the base. Ovipositor, cylindrical, very slightly curved, one and one-half times as long as hind metatarsus.

Length, 3.8 mm. (including ovipositor). *Expanse*, 4.5mm.

Male.—Antennae and legs darker than in the female; antennae with the scape black, the flagellum dark brown; legs brownish-yellow, the tibiae paler. Antennae more slender than in the female; joint 3 longer than the scape, three times as long as thick, very slightly longer than joint 4; joints 4–12 subequal, penultimate joint very slightly shorter than joint 3; joints 6–8 with a slight, laminate, lateral expansion. Abdomen as long as thorax. In other respects agrees with the female.

Length, 3.0 mm. *Expanse*, 4.0 mm.

Described from two females and a single male taken at Chilliwack, B. C., 10, 14 and 31 May, 1927.

Paratype given to Mr. Robert M. Fouts.

SCELIONIDAE.

AMITUS Foerster.

Amitus arcturus, new species.

Female.—Black; scape dull yellow; flagellum brown, the club a little darker; forelegs pale brownish-yellow, the tarsi paler; middle and hind legs brown, the tarsi yellowish, apical joint of all tarsi dusky. Head with the frons delicately reticulate, vertex and occiput shagreened; viewed from above, two and one-quarter times as wide as long, front margin convex; rounded behind the eyes; the occiput emarginate, not distinctly separated from the vertex; ocelli in an almost straight line; lateral ocelli further apart than from the eyes.

Antennae with the scape two and three-quarters times as long as pedicel; pedicel three times as long as thick; joint 3 longer than pedicel and five times as long as thick; joints 4–7 gradually shorter and thicker; joint 7 one and two-thirds times as long as thick, half as long as joint 3; club one and one-half times as long as joint 3 and about three times as long as thick, the joints subequal, the sutures indistinct, oblique. Thorax wider than the head; pronotum very short; mesonotum rounded in front of tegulae, the hind margin straight; notauli distinct, posteriorly slightly widened and convergent; median portion of mesonotum slightly depressed, except anteriorly, the depressed portion smooth and polished, the anterior portion and also the lateral lobes (except the extreme hinder part) with delicate sculpture. Scutellum wider than long, posteriorly rounded, the surface finely shagreened, laterally with a few pale hairs. Propodeum invisible from above, except at the sides, which are clothed with dense white hairs. Pleurae smooth. Tegulae pale brown. Wings subhyaline. Abdomen slightly wider than thorax and very nearly as wide as long. First tergite short, longitudinally striate; second tergite wider than thorax, about one and one-half times as wide as long, with two large, longitudinally striate areas at the base, the striae extending to about the apical third, about twice as long as first tergite and longer than following segments combined; remaining segments smooth.

Length, 0.82 mm. *Expanse*, 2.17 mm.

Male.—Similar to female but legs and antennae slightly darker. Antennae longer than entire body; scape about four times as long as pedicel; pedicel one and three-quarter times as long as thick; joint 3 three times as long as thick and one and one-third times as long as pedicel; joint 4 about three times as long as thick and one and one-third times as long as joint 3; joints 5–9 gradually shorter and thicker, joint 9 one and one-half times as long as thick and about as long as pedicel; apical joint very nearly three times as long as thick and one and one-half times as long as joint 3.

Length, 0.85 mm. *Expanse*, 2.3 mm.

Variations.—The length varies from 0.75 mm. to 0.87 mm. There is considerable variation in the color of the antennae, one female having them almost black. The sculpture of the head varies to a slight degree, one female having a smooth area external to the lateral ocelli.

Described from one female taken 16 June, 1928, and twenty-one females and four males taken on various dates from 30 June to 17 September, 1929; all from Hollyburn, B. C., by sweeping Wild Cherry; associated with an Aleyrodid.

Paratypes sent to U. S. N. M., Dr. Ogloblin and Mr. R. M. Fouts.

CALLICERATIDÆ.

CALLICERAS Nees (=Ceraphron Jurine).

Calliceras concinna, new species.

Male.—A slender species, black and shining; femora and tibiae dark brown, the extremities paler; metatarsi of all legs yellowish-brown, rest of tarsi dusky.

Head, viewed from above, very nearly twice as wide as long, slightly wider than thorax; vertex very finely sculptured, with a depression before the front ocellus and a shallow, lunate depression exterior to the lateral ocelli and a longitudinal groove between them; facial depression smooth, very finely, transversely wrinkled medially; eyes nearly half their width from the occiput; ocelli in a triangle, much nearer together than to the eyes and occiput; lateral ocelli in front of hind margin of eyes; occiput narrowly produced backward in a very short collar. Antennae pubescent, slightly longer than thorax and abdomen combined; scape thickest in the basal half, very nearly as long as pedicel and joints 3 and 4 combined; joint 3 slightly longer than joint 4 and nearly three times as long as thick; joints 4–10 subequal, joint 10 only slightly shorter than joint 4; apical joint about one and one-quarter times as long as joint 3, pointed at tip. Mesonotum and scutellum finely and indefinitely sculptured, the latter somewhat reticulate on anterior half. Median groove of mesonotum shallow; hind margin of mesonotum emarginate. Frenum distinct, the lines meeting at base of scutellum, which does not quite reach posterior face of propodeum. Head, mesonotum and scutellum with very short, scattered pale hairs. Propodeum with the posterior face oblique, smooth and polished, lateral angles scarcely produced. Wings subhyaline, venation brown, radius curved, long, three times as long as the marginal vein. Abdomen slightly more than one and one-half times as long as thorax, highly polished, slightly compressed apically, base striate, with long whitish hairs at the sides.

Length, 1.2 mm. *Expanse*, 2.1 mm.

Described from a single specimen taken at Hollyburn, 3 June, 1928.

Calliceras boreale, new species.

Female.—A robust species, black, smooth, without evident sculpture, scape blackish-brown, apically pale; legs brown, femora darker, apex of femora and extremities of tibiae paler; tarsi pale brown, metatarsi yellowish-brown. Head one and three-quarter times as wide as long, scarcely wider than the thorax; vertex with a shallow depression before front ocellus, facial depression deep, smooth; eyes nearly reaching occiput, which is straight; ocelli in a triangle, as far apart as distant from the eyes and nearer than this to the occiput; lateral ocelli slightly in front of hind margin of eyes. Antennae short and stout, subclavate, as long as head and thorax combined; scape obclavate, as long as pedicel and joints 3–6 combined; pedicel as long as joints 3 and 4 combined; joints 3 and 4 equal, subglobular; joints 5 and 6 slightly longer and thicker; joints 7–9 transverse, increasing slightly in length and considerably in width; apical joint conical, twice as long as thick, as long as three preceding joints combined; proximal joints of flagellum submoniliform, distal joints shortly petiolate. Mesonotum with the median groove fine. Scutellum convex, frenal lines distinct, fine, impunctate, uniting before reaching base of scutellum. Vertex, mesonotum and scutellum with regularly disposed, fine, whitish hairs which are denser on the sides of scutellum. Metanotum with a conspicuous, laminate process in the centre with dense pale hairs. Dorsum and sides of propodeum and hind coxae posteriorly with conspicuous long, pale hairs. Wings subhyaline, venation brown, radius strongly curved, one and one-half times as long as marginal vein. Abdomen as long as head and thorax combined, as wide as thorax and a little less than twice as long as wide, with a few, fine, very short, raised lines at the base.

Length, 1.0 mm. *Expanse*, 1.7 mm.

Described from two specimens from Hollyburn, 6 May and 17 September, 1928.

Paratype sent to Mr. R. M. Fouts.

LAGYNODES Foerster.

Lagynodes xanthus, new species.

Female.—Wingless, brownish-yellow, smooth and polished; eyes black; ocelli wanting; antennae yellow, the apical four joints brown; legs entirely yellow. Head subglobular, seen from above, about one and one-quarter times as wide as long; occiput emarginate; eyes their own length from occiput. Antennae about as long as abdomen; subclavate; scape half as long as rest of antenna, equal to joints 3–9 combined; pedicel twice as long as thick, nearly as long as joints 3–5 combined; joint 3 slightly longer than joint 4; joints 4–6 equal; joint 7 about one and one-half times as long as joint 6; joints 8–10 longer; apical joint nearly three times as long as preceding joint and nearly two and one-half times as long as thick; joints 3–6 increasing gradually in thickness; joint 7 considerably thicker than joint 6; joints 8–10 each thicker than the preceding joint; joints 3–6 submoniliform; joints 7–10 distinctly transverse, shortly petiolate, with the apical joint forming an elongate club. Pronotum a little more than two-thirds as wide as head, rounded in front, the sides almost straight, produced into a stout neck in front, hind margin very deeply emarginate. Mesonotum very short, not extending beyond the hind angles of the pronotum, hind margin emarginate. Metanotum very short, hind margin straight. Propodeum short, the sides straight, narrower than the mesonotum, about three times as wide as long, the hind margin sinnate. Pronotum about equal in length to the mesonotum and metanotum combined. Mesonotum and propodeum about equally long, the metanotum shorter. Petiole widely transverse, longitudinally striate. Abdomen large, conic-ovate, much wider than the head, about one and one-half times as long as head and thorax combined, second tergite constricted at base with short, indistinct striae. Head, thorax and abdomen with scattered, pale hairs.

Length, 1.2 mm.-1.4 mm.

Described from seven females taken at Hollyburn on various dates from 10 June to 17 September, 1928–29.

Paratypes sent to Mr. Robert M. Fouts and Dr. A. A. Ogloblin.

TRICHOSTERESIS Foerster.

Trichosteresis vitripennis, new species.

Female.—Black, smooth; legs with the coxae and trochanters black; femora brownish-black, except the extremities, which are paler; fore tibiae and tarsi brownish-yellow; middle and hind tibiae brownish-black, paler at the extremities; middle and hind tarsi brownish-yellow; apical joint of all tarsi dusky.

Head, pronotum, mesonotum and scutellum finely alutaceous, with a few, remote, shallow punctures, the head with short, scattered, white hairs; frons depressed above the base of antennae; ocelli in an obtuse-angled triangle, the lateral ocelli about as far apart as distant from the eyes; occiput with a fine, longitudinal, impressed line. Antennae black, third joint about one and one-half times as long as pedicel; joints 4–10 subequal, about three-quarters as long as joint 3 and slightly longer than thick; apical joint conical, slightly shorter than joint 3. Median longitudinal impressed line of the mesonotum deep, percurrent. Frenal lines punctate, meeting at base of scutellum. Wings hyaline, devoid of any pubescence and cilia; venation brown, the stigma darker; radius straight, shorter than the stigma. Abdomen polished, longitudinally striate at the base.

Length, 2.0 mm.–2.5 mm.

Described from three specimens taken at Chilliwack, May, 1926, and June, 1927.

Paratype sent to Mr. Robert M. Fouts.

This species differs from *T. floridanus* Ashmead in having the median line on the mesonotum complete, deeply impressed and in the darker color of the legs. In *T. floridanus* the median line on the mesonotum is not so deeply impressed and is entirely lacking on the posterior two-sevenths of the sclerite. In the original description of *floridanus* no mention is made of the extent of the median mesonotal line and for information on this point I am greatly indebted to Mr. R. M. Fouts, who kindly examined the type for me.

DIAPRIIDÆ.

PARATELOPSILUS, new genus.

Female.—Antennae 12-jointed; in other characters agreeing with *Atelopsilus* Kieffer.

Male.—Unknown.

Type, the following species:

Paratelopsilus canadensis, new species.

Female.—Head and thorax black; propodeum dark brown; antennae, legs and abdomen brown; wings faintly tinged with brown; venation brown, the marginal vein darker. Head, viewed from above, one and one-quarter times as wide as long; ocelli in a triangle, the lateral ocelli slightly in front of hind margin of eyes, about as far apart as distant from eyes and nearly twice this distance from occiput. Antennae somewhat longer than head and thorax combined; scape cylindrical; flagellar joints becoming moniliform distally; scape as long as joints 2–4 combined; pedicel and joint 3 equally long, two-fifths as long as scape, the pedicel thicker; joints 4–11 equal, about one-half times as long as joint 3; apical joint conic-ovate, a little less than three times as long as thick, and three times as long as penultimate joint and very slightly thicker. Mesonotum with distinct, deep, percurrent notauli; scutellum with a deep basal fovea; propodeum with a straight median carina, a lateral, obtuse-angled one, and a posterior transverse carina. Head and thorax smooth and polished, with scattered, long, pale hairs, denser on the sides of propodeum. Forewings with the first abscissa of radius very short, not longer than its own width; cubitus indicated by an almost obsolete fuscous streak directed towards the brachial nervure; second abscissa of radius also almost obsolete, extending to margin of wing, enclosing a long narrow area; discoidal and brachial nervures present as very faint fuscous streaks. Abdomen fusiform, highly polished, with very long, scattered, pale hairs at the base and apex; petiole slightly wider than long, without carinae, front and hind margins, seen from above, feebly emarginate, the sides convex; second tergite with a few very short, longitudinal striae at the base; one and three quarters times as long as rest of abdomen. Third tergite one and one-half times as long as the fourth tergite, which is slightly longer than the fifth; sixth tergite as long as the third; seventh (last) tergite nearly three times as long as the third, conical, curved downwards.

Length, 2.0 mm.–2.5 mm. *Expanse*, 3.5 mm.–4.5 mm.

Described from six specimens taken at Chilliwack; one 9 Sept., 1926, the rest 30 May, to 10 June, 1927.

Paratypes sent to U. S. N. M. and Mr. Robert M. Fouts.

DIPHORA Foerster.

Diphora nearctica, new species.

Female.—Black; scape and pedicel yellowish-brown; flagellum brown; legs, including coxae, yellowish-brown; wings subfuscous, venation and tegulae brown. Head, viewed from above, about one and one-half times as wide as long; ocelli in a triangle, lateral ocelli as far apart as distant from eyes. Antennae with scattered, long, suberect pubescence, beyond joint 3 submoniliform; scape a little thicker than flagellum, as long as joints 3 and 4 combined; pedicel one-quarter as long as scape; joint 3 as long as following six and a half joints combined; following joints subequal, gradually a little longer and thicker; joints 13 and 14 about one and one-half times as long as joints 4–6; apical joint conic-ovate, one and one-half times as long as penultimate joint. Notauli deep, percurrent; scutellum with a deep basal fovea. Propodeum with some irregular punctures and carinae dorsally and with a distinct median, longitudinal carina. Head and thorax smooth and shining, with scattered pale hairs. Wings with the marginal nervure very short, first abscissa of radius oblique, marginal cell closed, large. Petiole longitudinally carinate, one and one-quarter times as long as wide. Abdomen polished, as long as head and thorax combined; second tergite one and three-fifths times as long as wide, more than twice as long as rest of abdomen, basally shortly striate, the median groove deeper and longer than the others, extending one-quarter the length of the tergite; third tergite about one-quarter as long as second tergite and nearly twice as long as the following segments combined.

Length, 2.0 mm. –2.5 mm. *Expanse*, 4.0 mm. –4.3 mm.

Male.—Similar to female.

Described from eight males and two females taken at Hollyburn on various dates between 11 June and 2 October, 1928–29.

Paratypes sent to U. S. N. M., Mr. Robert M. Fouts and Dr. A. A. Ogloblin.

ACROPIESTA Foerster.

Acropiesta pulchella, new species.

Female.—Head, thorax and petiole black, shining; antennae pale brown, darker distally; legs, including coxae, pale brown; abdomen reddish-brown; wings faintly tinged with brown, venation and tegulae brown. Head transverse; ocelli in an obtuse-angled triangle, lateral ocelli somewhat nearer together than to the eyes. Antennae slender, about three-fifths the length of the entire body; scape a little thicker than the basal flagellar joints, slightly thickened at apex, six times as long as its apical width, nearly three times as long as joint 3; pedicel oval, one and one-half times as long as thick; joint 3 three times as long as thick; joints 4-14 very gradually shorter and thicker, joint 14 twice as long as thick; apical joint one and three-quarters times as long as the penultimate joint. Pronotum invisible from above except at the humeral angles. Mesonotum with deep, percurrent notauli, the median lobe narrowed posteriorly. Scutellum convex, the basal fovea shallow in front, deeper behind. Propodeum with the hind angles produced, the hind margin emarginate and carinate, with a lateral carina and a distinct median carina which consists of two fine carinae (vide variation infra), the surface polished but slightly uneven. Pleurae smooth. Wings with the marginal nervure about two-fifths as long as the radial cell, the cubitus straight, directed towards the basal nervure. Petiole as wide as long, the front margin feebly emarginate, the front angles acute, hind margin straight, wider than the front margin, sides strongly convex, at the extreme base concave, the surface smooth but uneven, with two longitidunal carinae visible from above. Head, thorax, propodeum and petiole with scattered pale hairs, longer and denser on the sides of propodeum and petiole. Abdomen elongate-fusiform, highly polished; second tergite with a long, deep, median groove at the base, longer than the rest of the abdomen, twice as long as wide, widest about one-quarter its length from the hind margin; third to sixth tergites gradually longer, seventh tergite (last) one and one-third times as long as preceding four combined, somewhat compressed, the dorsum arcuate, three times as long as its basal width.

Length, 5.0 mm. *Expanse*, 7.5 mm.

Male.—Antennae slender, filiform, nearly as long as the entire body; scape four times as long as thick; pedicel globular; joint 3 as long as scape, the basal third deeply excised; joint 4 three-quarters as long as joint 3, four times as long as thick; following joints to joint 13 gradually shorter; joint 13 two-thirds as long as joint four; apical joint as long as joint four. Petiole about twice as long as wide. Abdomen elongate-oval, one and three-quarter times as long as wide; second tergite three and one-half times as long as rest of abdomen. In other respects similar to female.

Length, 4.0 mm. *Expanse*, 7.4 mm.

Described from five females and twelve males, taken at Hollyburn on various dates from 28 April to 8 September, 1928-29.

Paratypes sent to U. S. N. M., Dr. A. A. Ogloblin and Mr. Robert M. Fouts.

Variation.—One female measures only 4.3 mm. and has the last abdominal segment proportionately shorter, the petiole a little longer than wide. The male varies in length from 3.5 mm.–4.25 mm., and in one specimen the petiole is blackish-brown. In both sexes the median carina varies considerably and it may consist of two straight parallel carinae, two sinuous subparallel carinae, two strongly posteriorly divergent carinae, or two carinae that diverge from the base of propodeum. In life the color is brighter than described, the abdomen being a beautiful red. The species is very variable in color, the following well-marked forms occurring:

a. Var. melanocephala.—Differs from the typical form in having the entire body reddish-brown, only the head being black.

Hollyburn; one female and three males, 5–13 September, 1928–29.

b. Var. rufifrons.—Entirely reddish-brown, except the vertex and occiput which are black.

Hollyburn, one female and ten males, 2–16 September, 1928–29.

c. Var. rufa.—Entirely reddish-brown, only the eyes and ocelli black, and only the distal four or five antennal joints brown.

Hollyburn, two males, September, 1928–29.

A NEW BITING LOUSE (MALLOPHAGA) FROM WHITE-TAILED DEER.

By Harold S. Peters, *Bureau of Entomology, U. S. Department of Agriculture.*

Tricholipeurus virginianus,[1] n. sp.

A new species of Mallophaga of the family Trichodectidae has been taken from two white-tailed deer of the United States. It is described herein from three lots of specimens from the Virginia white-tailed deer, *Odocoileus virginianus virginianus* (Boddaert) as follows: 3 males and 2 females collected in Center County, Pennsylvania, on March 28, 1930, by Vernon Bailey (Bishopp No. 13806); 4 males and 13 females collected in Pike County, Pennsylvania, on March 30, 1930, by Vernon Bailey (Bishopp No. 13805); and 28 males and 7 females collected at State College, Pennsylvania, on April 28, 1930, by E. B. Forbes (Bishopp No. 13870). Three lots of specimens of this species were also at hand from the Texas white-tailed deer, *Odocoileus virginianus texanus* (Mearns), as follows: 13 males and 11 females collected in Maverick County, Texas, on December 29, 1915, by J. D. Mitchell (Bishopp No. 5446); 21 males and 29 females collected in Maverick County, Texas, on December 30, 1915, by J. D. Mitchell (Bishopp No. 5447); and

[1]The genus *Tricholipeurus* was established by G. A. H. Bedford (in 15th Ann. Rept. of Dir. Vet. Services, Union of South Africa, Pretoria, October, 1929) for those lice on antelopes and deer as differentiated from those on porcupines, formerly all being included in *Eutrichophilus* Mjöberg (Arkiv. f. Zool. Band 6, No. 13, 1910).

6 males and 7 females collected at Sonora, Texas, on November 27, 1922, by O. G. Babcock (Bishopp No. 10677).

This new species is closely related to *Tricholipeurus mazama* (Stobbe) which was described from "Cervus mexicana," now known as Coues' white-tailed deer, *Odocoileus couesi* (Gmelin), from Mexico. However, *mazama* is a more slender species than *virgininianus* and evidently has the sensory pits on the third segment of the antennae distinctly separated whereas they overlap in *virginianus*. This species is also close to *T. tibialis* (Piaget) and *T. odocoilei* (McGregor). The former species was described from a "black-tailed deer" and is much smaller, has different male genitalia and antennae, and has a dark spot before each abdominal spiracle. The latter species was described from a white-tailed deer, *Odocoileus virginianus macrourus* (Rafinesque), from Montana and is much smaller than *T. virginianus*. *T. parallelus* (Osborn) is very much smaller and has prominent dark spots before the abdominal spiracles and very different male genitalia and antennae.

Description of MALE. *Head* (Fig. 1) wider than long, much wider across forehead than across temples, truncate anteriorly with a wide shallow emargination and produced laterally into the trabecula-like process just before the antennae. True trabeculae not present. Antennal sinuses deep, for attachment of greatly enlarged first antennal segment. Ocular projections rather large, extending to extreme margin of temples which are smoothly rounded and meet the slightly concave occipital margin without an angle. Antennal bands narrow, widening at the front of the head into two plates separated by a narrow median clear space. Occipital bands elongate, almost parallel, being only

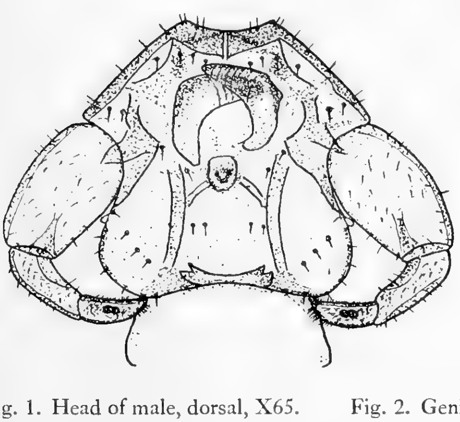

Fig. 1. Head of male, dorsal, X65.

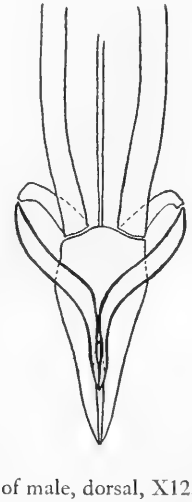

Fig. 2. Genitalia of male, dorsal, X125.

slightly curved. Occiput with a paired forked chitinization on posterior border. Esophageal sclerite present. Two short hairs occur on each side of concave front, two just posterior to each frontal angle, three along outer margin of antennal bands, two very close together just anterior to the trabecula-like process, five on temple, eight in irregular row anterior to mandibles, two before base of antennae, two between base of antennae and esophageal sclerite, a row of four (in two pairs) between esophageal sclerite and occipital margin, and a diagonal row of four from a position anterior to base of ocular projection toward the occipital margin. Antennae large and backward pointing, reaching, if extended, to well beyond the prothorax. First segment greatly enlarged and practically as long as the second and third combined. Second segment longer than the third, both being slightly curved. All three segments have numerous short, hair-like spines; the third segment has three spine-like tubercles at the distal end and a mass of short spines on the opposite side, and has two sensory pits which are somewhat triangular in shape, the distal one overlapping the other.

Thorax one and one-half times as wide as long. Prothorax roughly rectangular in shape with straight posterior margin and with a conspicuous spiracle projecting from each lateral margin. There is a weak spine just before each spiracle, a similar one at each posterior lateral angle, two small hairs near the middle of the segment, and a transverse row of about twelve near the posterior margin. Pterothorax roughly trapezoidal in shape, wider than the prothorax, a group of several spines near each posterior lateral angle and an irregular row of about twenty small hairs near the straight posterior margin. Legs normal, with numerous short spines.

Abdomen elongate oval in shape, widest across the third segment although the fourth segment is almost as wide. Segments one to seven inclusive with a brown transverse band and a transverse row of short hairs on both the dorsal and ventral surfaces. Sutures uncolored. The spiracles on segments two to seven inclusive are situated in the golden brown lateral margin, there being no dark spot anterior to them. Segment eight has a row of rather long pustulated hairs along the dorsal posterior margin and the apical segment has a number of short spines. Genitalia conspicuous (Fig. 2), the basal plate consisting of two chitinous bars reaching into the fifth segment; the parameres are long, tapered and free distally, being fused at their base, and overlaid with a two-pronged dorsal chitinization.

Description of FEMALE. *Head* as in the male except that the hind head is wider, the ocular projection larger, extending slightly beyond the margin of the temples, and the antennal sinus is much more shallow. Trabeculae present but not movable. First segment of the antennae only slightly swollen and shorter than either the second or third, the second segment being slightly longer than the third. Sensory pits on the third segment overlap as on the male antennae.

Thorax and legs as in the male except that the thorax is shorter and wider.

Abdomen oval in shape, slightly longer and wider than in the male. Segment eight with transverse row of six pustplated hairs, the outer ones three times as long as the inner four. Apical segment bilobed with three hairs on each lobe. Venter (Fig. 3) very distinct. Gonapods with combs of long spines and attached to the movable tergites. A characteristic bilobed (with sharp points) chitinized plate in the center of the apical segment.

Measurements of specimens in mm.

	From *O. v. virginianus*		From *O. v. texanus*	
	Average of 35 ♂	Average of 22 ♀	Average of 25 ♂	Average of 30 ♀
Head				
Length	.514	.512	.532	.529
Width across Trabeculae	.561	.546	.570	.547
Width across Temples	.481	.524	.480	.515
Thorax				
Length	.307	.289	.298	.271
Prothorax, width	.377	.393	.373	.378
Pterothorax, width	.459	.487	.465	.481
Abdomen				
Length	1.483	1.546	1.571	1.642
Width, Segment III	.651	.771	.638	.739
Total length	2.306	2.347	2.401	2.443

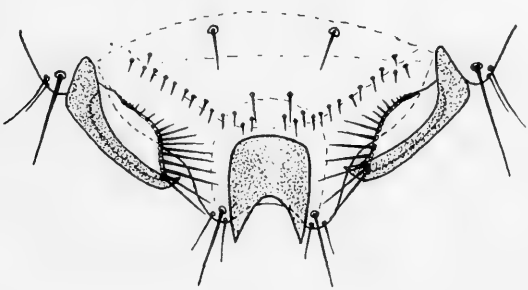

Fig. 3. Apical segment of female, ventral, X65.

It will be noticed that the specimens from *O. v. texanus* are longer and more slender (except head at trabeculae), but since there are no other evident differences between these and the specimens from *O. v. virginianus* I do not desire at this time to distinguish between them.

Type Host.—*Odocoileus virginianus virginianus* (Boddaert).

Type Locality.—Pike County, Pennsylvania.

Type Slide.—Cat. No. 43089, U. S. N. M.

The holotype male and allotype female on the type slide were collected from the type host at the type locality on March 30, 1930, by Vernon Bailey (Bishopp No. 13805). The paratypes are in the collection of the Bureau of Entomology and in my personal collection.

NOTES ON SOME LOCAL BUTTERFLIES.

By Austin H. Clark.

As would be expected, most of the local butterflies make their first appearance in the spring earlier than they do in Massachusetts. This is particularly true of all the species which hibernate as adults or as pupæ, and of the larger species generally. But among the smaller butterflies that hibernate as caterpillars there are some curious exceptions.

The most extraordinary of these exceptions is found in the case of the silvered bog fritillary (*Brenthis myrina*) which first appears at Beltsville a full month later than it does at Boston —and even at Ottawa much further north—and nearly six weeks later than it does at Albany. Furthermore, in this region it has only a single brood flying in midsummer instead of three broods as about Boston.

While the hovering skipper (*Poanes massasoit*) does not appear at Beltsville until about the first of July, in New England it is on the wing in the first half of June. Similarly, Leonard's skipper (*Hesperia leonardus*) also appears in Massachusetts more than two weeks in advance of its earliest appearance in the District area in early September.

The goggle-eye (*Cercyonis alope*) is first seen, as casual individuals, somewhat earlier here than about Boston, but the main emergence takes place here about a week later than at Boston.

The grass-nymph (*Satyrodes eurydice*) first appears at Beltsville a month earlier than it does in the vicinity of Boston, but its period of maximum abundance is approximately the same in both places—possibly slightly later here.

The season of both this butterfly and the wood-nymph (*Megisto cymela*) is much longer here than at Boston, occasional individuals being met with until nearly the end of September.

The late appearance of many District butterflies and the long season of others, as for instance the satyrids, possibly is correlated with the curious and unusual irregularities in the temperature in the spring, particularly the occurrence of hot spells during which the caterpillars, or a greater or lesser proportion of them, become lethargic and do not feed.

This conclusion is suggested by the curious fact that the two widely distributed satyrids (*Megisto cymela* and *Cercyonis alope*) always make their first appearance in low wet woods near cold streams and are not seen until later in the warmer and drier areas.

Another curious thing about certain District butterflies is that they first appear earlier if the spring is cold than they do if the spring is warm or is marked by severe hot spells. Thus in the unusually cool spring of 1930 *Dryas cybele*, *Euphydryas phaëton* and *Poanes zabulon* were on the wing at least a week earlier than their usual first appearance as indicated by the earliest previous records, and all three were common before the time the first individuals had emerged in the year preceding.

The habits of quite a number of the butterflies in this region differ more or less from the habits of the same species further north. For instance in this area the two sexes of *Poanes hobomok* and of *P. zabulon* inhabit quite different localities. The males are found in damp glades in the woods and especially along grassy banks of woodland streams, while the females range widely over open fields. Both sexes are found together only along the borders of damp woods. Such a selective distribution of the sexes is frequent among butterflies in tropical regions. In New England, according to my experience, both sexes of these butterflies are found in the same territory, in open fields and meadows.

The males of *Poanes zabulon* in this area have the further peculiarity of usually keeping well above the ground, and they may sometimes be seen darting about in open woods as much as ten or fifteen feet above the ground. But they prefer to rest and sun themselves on leaves from two to five feet above the soil.

The species of *Erynnis* (*Thanaos*) are more generally distributed here than in New England. While occurring in the woods, the males of most of them are also common in open fields, and I have taken the females of *E. juvenalis* and *E. icelus* far from any woods. Summer and autumn individuals of *E. juvenalis* I have found only in fields, and it may be that this insect is one brooded in the woods, and partially two brooded in open country. In the late spring *E. icelus* is very common in, and quite characteristic of, the damp meadows west of Cabin John.

In very early spring before the trees have put forth leaves *Erynnis juvenalis* may frequently be seen flying in moth-like fashion about the upper branches of trees twenty feet or more above the ground, a habit which seems not to have been recorded.

The rapid increase in abundance of the orange clover butterfly (*Eurymus eurytheme*) within the past few years is very interesting.

It was mentioned as having been seen in the Department of Agriculture grounds on November 11, 1886, and this is the only early record. There is a single broken male from the District without date in the Schönborn collection. In view of the fact that Mr. Schönborn kept only very small series of perfect specimens this is excellent evidence that he considered it rare.

Previous to 1926 the earliest date of capture is September 6 (C. R. Ely), most of the captures being in the last half of September, and the greatest number of individuals reported in any one day being three.

In 1926 it was taken on August 27, and was frequent from early September until the middle of October. Fifteen or more could be seen in a day.

In 1927 it was exceedingly abundant from the middle of July until the end of the season.

In 1928 it was first taken on June 24, and was very common from the first of July onward.

In 1929 it appeared on May 12, and was seen constantly until the last week in May when it disappeared, reappearing early in the second week of June and flying until the end of the season. Its numbers were equal to those of common *E. philodice.*

In 1930 it was first noticed on April 27, and by May 4 both sexes were more numerous than the corresponding sexes of *E. philodice.*

From the available evidence, *Eurymus eurytheme* up to 1926 seems to have been an annual visitor to the District, a few individuals arriving in the late summer, and a few of the young of these reaching maturity in September. In the years succeeding, the visitors reached the District in larger numbers, and progressively earlier; but until 1929 this butterfly appears not to have passed the winter here. In 1929 for the first time individuals of the spring brood were taken which undoubtedly had passed the winter locally, and the butterfly has now become—though possibly only temporarily—an abundant permanent resident.

Three examples of white females slightly flushed with pink on the discal area of the fore wings and with yellow on the hind wings have been taken here. So far as I know no such females have been taken elsewhere. Considering the relative infrequency of white females, this represents a considerable proportion of them. It will be interesting to see whether this form persists or disappears.

A female of *Atrytonopsis hianna*, a butterfly hitherto not known from the District, was taken on June 2, 1929.

Experiments have been undertaken to determine the nature of the emanations from butterflies' wings which affect photographic plates in complete darkness. Twenty-six different species were investigated. It was found that the wings of butterflies which had been dead for thirty years would affect the plates. Films showed the same color values as plates, but were not so strongly affected. Thin cover glasses interposed between the wings and the plates completely obliterated the portion of the wings covered. Strips of a substance especially transparent to light of short wave lengths rendered the portion of the wing beneath them somewhat fainter than the uncovered portions, but all the details of the color pattern beneath the strips were clear and distinct as elsewhere. Therefore the phenomenon appears to be due to a faint luminosity consisting of light of very short wave length.

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SOME ANATOMICAL DETAILS OF THE PUPA OF THE ARCHAIC TANYDERID DIPTERON PROTOPLASA FITCHII, O. S.

By G. C. CRAMPTON, Ph. D.

Massachusetts Agricultural College, Amherst, Mass.

In June, 1929, Dr. C. P. Alexander accompanied me to the Gaspé Peninsula, Quebec, where I had formerly encountered a swarm of males of the rare and primitive Tanyderid Dipteron, *Protoplasa fitchii*, O. S. (Can. Ent., 61, 1929, p. 70) and a few larvae of this interesting insect were captured in the sand at the bottom of the shallow water at the edge of the West Pabos River. Two of the mature larvae, placed in wet sand by Dr. Alexander, pupated; and one of these was allowed to emerge as an adult (female), while the other, which had transformed to a pupa (male) was killed and preserved in alcohol for study. Dr. Alexander has published a general account of the immature stages of *Protoplasa* (Proc. Linn. Soc. New South Wales, Vol. 55 for 1930); but the following discussion presents the more detailed features of the pupae, which were kindly turned over to me by Dr. Alexander for this purpose, before depositing them in the extensive collection of the immature stages of Dipterous insects in the possession of Dr. J. Speed Rogers. The anatomical details of the larvae of *Protoplasa* will be discussed in a later paper dealing with the larvae in my possession; and the immature stages of *Protoplasa* will be compared with those of other Holometabola, from the standpoint of phylogeny.

The anatomical details of the pupa of *Protoplasa* are best seen in the cast skin of the female pupa shown in Figs. 1, 3, 6, 10, 17, etc., since the pupal skin, being free of the concealing structures formerly contained within it, readily permits the tracing of the course of the fore and hind gut linings (*fg* of Fig. 6 and *h* of Fig. 10), the tracheal linings (*i* of Figs. 6, 10 and 17), the tentorial arms extending inward from the frontal pits labelled *fp* in Fig. 1, the basalar apodeme *bap* of Fig. 1, the posterior phragma *phr* of Fig. 6, and other internal structures; furthermore, the parts are readily moved about to uncover the underlying structures in the cast skin; and the dorsal splitting of the pupal skin likewise gives a hint of the meaning of the median dorsal sutures found in the head and thoracic region of an adult insect. Thus, the mid-dorsal cleft labelled *mds* in Fig. 6, extending from the end of the phragma *phr* forward into the head region, evidently forms the coronal suture of the head region (*co* of Fig. 6) and the arms of the cleft labelled *fs* in Fig. 6, evidently form the frontal sutures—or at least the weakened areas of the integument along which the pupal skin splits cause the formation of the coronal and frontal sutures in the integument of adult insects.

Head Structures of the Pupa.—The fact that the cleavage of the pupal skin along the splits labelled *co* and *fs* in Fig. 6, corresponds to the coronal and frontal sutures of the adult head has already been mentioned. The structure labelled *fg* in Fig. 6, is the cut-off portion of the fore-gut lining, which is cast off when the adult emerges. The internal invaginations extending inward from the frontal pits labelled *fp* in Figs. 1 and 3, are the shed linings of the anterior tentorial arms. There are weakly developed internal strands of citin attached to the skull near the label *m* in Fig. 16, or the depressions mesad of the label *c* in Fig. 3, and it is possible that these may represent the anterior arms of the tentorium, while the internal structures attached to the pits labelled *fp* in Figs. 1 and 3 may represent the dorsal arms of the tentorium but the former are so feebly developed, that it is more probable that they are some secondary internal structures of the head, and the real anterior arms of the tentorium are the invaginations extending inward from the frontal pits *fp* of Figs. 1 and 3, as was mentioned above.

The head of a *Protoplasa* pupa bears a pair of well-developed frontal horns, or frontocornua labelled *fc* in Figs. 1, 3, 6, etc., which evidently correspond to the frontal horns *fc* of the *Eriocera* pupa (a Tipulid) shown in Fig. 2, which occurs in the same situations in which *Protoplasa* was found, and these horns may serve to protect the pupae in some way from the sand and small rocks of their habitat. Similarly, the three epistomal processes, or epistomacornua *esp* of *Protoplasa* (Figs. 1, 3, etc.) probably correspond to the pair of epistomal processes of *Eriocera esp* of Fig. 2). *Eriocera*, however, has another pair of frontal projections, the prefrontal horns, or prefrontocornua *pfc* of Fig. 2, which are not developed in *Protoplasa*, although there are some slight prominences in the head of the pupa of *Protoplasa* in this general region. Lateral epistomal setae are borne at the bases of the lateral epistomal processes *esp* of Fig. 1 of *Protoplasa* and frontocornual setae are borne on the frontal horns labelled *fc* in Figs. 1, 3, 6, etc., of *Protoplasa*.

Among the other seta-bearing protuberances of the head region may be mentioned the chalaza-like anterior and posterior parietal papilla or processes *apa* and *ppa* of Figs. 1 and 6, each of which bears a seta, the anterior and posterior parietal setae. The preorbital seta *po* of Fig. 3 is also borne on a slight protuberance, but the prefrontal seta *pf* of Fig. 1 is not borne on a protuberance. The sub-genal or genal process *c* of Figs. 1 and 3, which corresponds to the genal process of adult Mecoptera and certain Trichoptera, bears a pair of subgenal setae in the pupa of *Protoplasa.* The subgenal process *c* of Fig. 1 projects over a protuberance of the propleuron bearing the label *c* in Fig. 1 (i. e. the anterior protuberance of the propleural region *pl* of Fig. 1), and is situated near the angle of the maxillary palpus *mp* of Fig. 3, which lies over it normally, as in Fig. 16.

The postorbital process *r* of Figs. 1 and 6 does not bear a seta. It projects above the anterior pronotal process *x* of Figs. 1 and 6, and was apparently developed in connection with this process of the pronotum for aiding in the interlocking of the head and pronotal regions to prevent twisting of the head. The sur and subscapal processes above and below the scape of the antenna *ant* of Figs. 1 and 3, apparently serve the same purpose for the base of the antenna.

The antennae *ant* of Figs. 1, 3, and 6 are laid back over the orbital or occular areas *e*, and the tips of the maxillary palpi lie upon them, although in such pupae as *Eriocera* (Fig. 2) the antennae *ant* lie over the maxillary palpi *mp*. The dotted area mesad of the scape *sca* in Fig. 3 is the region of the antennal socket in the adult insect. Below these areas are the prefrontal sutures indicated by dotted lines (to indicate that they are very faint) upon which are located the frontal pits *fp* or pits of the anterior arms of the tentorium. A study of other insects would indicate that the real frontal sutures are the weak areas along which the splitting labelled *fs* in Fig. 6 occurs, and the faint lines on which the frontal pits *fp* of Fig. 3 are situated would therefore represent the prefrontal rather than the frontal sutures. As was mentioned above, the pits labelled *fp* in Figs. 1 and 2 may not represent the pits of the anterior arms of the tentorium, but may represent the pits of the dorsal arms of the tentorium, while the slight depressions just below the tips of the lateral epistomal processes *esp* of Fig. 3 may represent the pits of the anterior arms of the tentorium, but the latter depressions are so very faint, and the internal protuberances which they mark, are so slightly developed, that it is more probable that the better developed internal processes marked by the frontal pits *fp* of Figs. 1 and 2, are the true anterior arms of the tentorium, since these are always better developed than the dorsal arms, which are frequently atrophied.

The parietal region *pa* of Fig. 6 extends forward to the frontal clefts *fs*, and the frontal region extends from the clefts *fs* of Fig. 6, either to the frontal pits *fp* of Fig. 3, or to the dotted line just above the label *esp* in Fig. 3, if the location of the frontal pits *fp* are not accepted as the anterior limits of the frontal region. The postclypeal or epistomal region is probably the region which bears the label *esp* in Fig. 3, although this region may represent a prefrontal region, since these areas are not clearly defined by sutures in the Diptera, and there is no general agreement as to the exact boundaries of the regions in question. The anteclypeal region is probably fused with the labrum labelled *l* in Fig. 3, since there is no well demarked suture between the labium and the clypeal region (comprising the ante and postclypeus or epistoma).

The small and rather indistinct processes labelled *m* in Figs. 1 and 3 are probably the mandibles, which are visible only when the pupal skin is viewed from the side, and the lighting is just right, since the processes are colorless and transparent in the pupal skin. The processes labelled *g* in Figs. 1 and 3 are the galeae of the maxillae. These are usually but poorly developed in Dipterous pupae, but are quite readily seen in the pupa of *Protoplasa*. The maxillary palpi *mp* are porrect or bent upward in *Protoplasa*, while in other pupae (Fig. 2) they may be more "horizontal," and in still others they may be pendant, or "drooping" (i.e. directed downward).

The labial palpi *lp* of Figs. 1, 3, and 16, are worthy of special mention, since they have been the subject of much speculation and discussion in the Diptera. Most recent entomologists regard these as the paraglossae, but comparative anatomy clearly demonstrates that these are the true labial palpi in adult Diptera (Proc. Ent. Soc. Washington, 27, 1925, p. 68), and a comparison of the pupa of *Protoplasa* with a typical Lepidopterous pupa, such as the one shown in Fig. 4, leaves no possible cause for doubting that the labial palpi *lp* of *Protoplasa* (Fig. 3) could be anything else than the true labial palpi. Thus, the labial palpi *lp* of Fig. 4 (which have never been interpreted as anything else in Lepidoptera) are situated immediately below the labrum *l*, with the galeae *g* and mandibles *m* occupying exactly the same relative positions in Fig. 4 that they do in *Protoplasa* (Fig. 3), and if any one will compare the pupa of such a primitive Dipteron as *Protoplasa* (Fig. 3) with a typical Lepidopteron such as the one shown in Fig. 4, the homologies will be so self-evident that it will seem almost incredible that the labial palpi of Diptera could ever have been interpreted as anything else! The labial palpi *lp* of *Eriocera* (Fig. 2) are rather widely separated, and a prosternal process *psp* projects forward between the palpi, as is shown in Fig. 2.

THORACIC STRUCTURES OF THE PUPA.—In the prothoracic region, the pronotum is apparently divided into an antepronotum *apn* and postpronotum *ppn* (Figs. 1 and 6), as described in the adult Nematocera in a paper published in Vol. 18, p. 49, of the Annals of the Ent. Soc. of America for 1925. The anterior pronotal region *apn* of Fig. 1, is separated from the posterior region *ppn* by such a pronounced cleft in the pupa of *Protoplasa* (Fig. 1), and the anterior region is so closely associated with the propleuron *pl*, that it is quite possible that the anterior region *apn* alone represents the pronotum, and the posterior region *ppn* would then represent an anterior region of the mesonotum; but until the matter has been investigated more thoroughly, the postpronotum *ppn* may be treated as the posterior region of the pronotum. The lateral lobe of the antepronotum *apn* (Fig. 1) bears an anterior process *x*, which projects under the postorbital process of the head labelled *r* in Fig. 1, and a posterior projection *v* of Figs. 1 and 6, which extends toward the breathing horns *t*. The breathing horns or trumpets *t* of Figs. 1 and 6 are usually spoken of as the pronotal breathing horns, and they are quite closely associated with the postpronotum *ppn* of Fig. 6, but I am inclined to consider that these breathing horns are mesothoracic in origin, because the first spiracle is mesothoracic in origin (embryologically), and forms just behind the base of the breathing horn *t*, as is shown in Fig. 6, where the intima of the trachea is labelled *i*.

The propleural region *pl* of Fig. 1 sends forward a projection, as does the prothoracic coxa *cx*, and the maxillary palpus (which is cut off in Fig. 1, but is shown in Fig. 3 where it bears the label *mp*) is laid back between these two processes. It was not possible to make out any details of the prosternal region of the pupa without damaging the specimens, which did not belong to me, so that this region has not been figured here. From a superficial examination, however, it would appear that there is no region in the pupa of *Protoplasa* corresponding to the raised prosternal region *psp* projecting upward between the labial palpi *lp* of the pupa of *Eriocera* shown in Fig. 2.

The fore legs of the pupa of *Protoplasa* are shown in a figure which has been used to illustrate another paper, but the fore leg of the cast skin of the pupa of *Protoplasa* is figured in Fig. 3, and illustrates the process of telescoping which occurs when the leg is withdrawn from the pupal skin at the time of the emergence of the adult insect. When the leg is withdrawn from the pupal skin, the trochanter and base of the femur *fe* of Fig. 3, are telescoped into the coxa *cx*, the base of the tibia *ti* is telescoped into the femur *fe* and the base of the basitarsus *bt* (or basal segment of the tarsus) is telescoped into the tibia *ti*. The other tarsal segments do not become telescoped when the leg is withdrawn.

The fact that the region *ppn* of Figs. 1 and 6 may belong to the mesonotum instead of to the pronotum, has already been mentioned, and since the region *ppn* is somewhat more closely associated with the mesonotum than with the pronotum this lends weight to the view that the region *ppn* may be an anterior mesonotal area. In any case, it may be possible to regard the breathing horns *t* of Figs. 1 and 6, as mesothoracic structures which have migrated forward and have become secondarily associated with the posterior region of the pronotum. The region behind the area *ppn* of Figs. 1 and 6 is separated from the postpronotum *ppn* by a poorly defined transverse suture, and if the area *ppn* does not represent the true prescutum of the mesothorax, the mesothoracic prescutum is included in the area just back of the region *ppn* of Figs. 1 and 6, At any rate, the region called the mesothoracic prescutum in the adult, is included in the area behind the region *ppn* of Figs. 1 and 6, but there is no line of demarcation between this prescutal region and the scutal region in the pupa, nor is the scutellum demarked in the pupa; but the postscutellar region *psl* of Figs. 1 and 6 is faintly demarked in the pupal skin, and bears the inward-projecting phragmal region *phr* of Fig. 6. It is possible that the anterior phragmal region is just behind the label *ppn* in Figs. 1 and 6 (i. e. the more clearly marked portion of the transverse line), but there is no indication of the anterior phragma in the median region of the back, since the mid-dorsal cleft *mds* (corresponding to the mid-dorsal suture of adult insects) extending forward from the hinder margin of the posterior phragma *phr* of Fig. 6 exposes no median shelf until the anterior region of the pronotum is reached (See Fig. 6). Laterally, however, the anterior phragma may be represented by the internal prominence just behind the label *ppn* of Fig. 6, if this really represents the anterior margin of the mesonotum, or it may be represented by the infolding just behind the label *v* in Fig. 6, if this represents the real anterior limits of the mesonotum. It is quite impossible to determine this point with the material at my disposal, and the decision in the matter must await further investigation.

The scutal region of the mesothorax of the pupa of *Protoplasa* bears the scutal setae labelled *sc* in Figs. 1, 5, and 6. In the pupa of the male, shown in Fig. 5, there are two anterior scutals and one posterior scutal on each side of the thorax, but in the cast skin of the female pupa shown in Fig. 6, and Fig. 1, one of the setae had either been broken off of or was not developed. The tegular area *tg* of Fig. 1 bears three tegular setae in the cast skin of the female, but in the pupa of the male (Fig. 5) only two tegular setae *tg* were observed. The basalar or prealar lobe *ba* of Figs. 1, 5 and 6, bears three basalar setae *ba* in Fig. 6, but the anterior two basalar setae were so close together that they could be distinguished only with difficulty. A postpronotal seta borne on the region *ppn* just in front of the breathing trumpet *t* of Fig. 1 was observed in the pupal skin, but the dorsal regions of the pro- and mesothorax were remarkably free of setae, in the pupa of *Protoplasa* and other Nematocerous pupae which I examined.

The mesothoracic wing-cases *f* of Figs. 1, 5, 6, etc., overlap the cases of the hind wings *ha* which enclose the halteres. The venation of the mesothoracic wing-cases has been figured by Dr. Alexander (l. c.), but at the time that this study was made, the venation had become practically invisible in the wing cases, due to the deterioration of the specimens. The structures at the base of the wings, however, could still be made out quite readily in the specimens, and are shown in Figs. 1 and 16. The tegular sclerite *tg* is fairly clearly demarked in the cast skin of the female (Fig. 1) and in the intact pupa of the male (Fig. 16); but the adanal sclerite *ad* of Fig. 16 was best seen in the male pupa, since the pupal skin had not been cast in this specimen, and the sclerotized adanal sclerite showed through quite clearly. The basalar apodeme did not show through the pupal skin of the male insect, but in the cast skin of the female pupa, the basalar apodeme *bap* of Fig. 1 showed through the transparent pupal skin very clearly. This basalar apodeme is an internal protuberance projecting inward from the basalar pit described in the adult of *Protoplasa* in Vol. 37, p. 35, of the Ent. News for 1926.

Just in front of the mesothoracic wing case is a flattened elevated prealar or basalar lobe labelled *ba* in Figs. 1, 2, 5 and 16. This lobe is well developed in many Dipterous pupae, but is not noticeably developed in the adults. It may serve to prevent a forward displacement of the wing case in the pupa, while the posterior process labelled *ph* in Fig. 6 may serve to prevent a dorsal displacement of the wing case.

The prehalteral lobe *ph* of Figs. 6, 5 and 16 may possibly be serially homologous with the basalar lobe of the mesothorax, labelled *ba* in figures. It bears a pair of prehalteral bristles labelled *ph* in Fig. 16, and Fig. 1. The metanotum *mn* of Fig. 16, Fig. 1, Fig. 5 and Fig. 6 likewise bears another pair of metanotal setae (i. e. the setae just below the label *mn* in Fig. 5). The metanotum *mn* of Fig. 1 is quite well developed in the pupa of *Protoplasa*, and is fairly well developed in many Tipulid pupae, but in the adults of most Nematocera except the Tanyderidae and Psychodidae it is usually greatly reduced.

Abdominal Structures of the Pupa.—The areas of a typical abdominal segment are not easily seen in the male pupa, but in the pliant cast skin of the female shown in Fig. 17 the parts were more readily spread out to show the anterior areas of the tergite and sternite or dorsal and ventral region of the abdominal segment. The greater part of the ventral region of the fifth segment, its pleural region, and about one half (the dextral half) of its tergal region are depicted in Fig. 17. The anterior tergal region labelled *at* in Figs. 17 and 10 apparently corresponds to the area termed the antetergite, and the anterior sternal region labelled *as* in Figs. 17 and 10 apparently corresponds to the area termed the antesternite in the abdomen of the roach described in Vol. 32, p. 195 of Psyche for 1925. In the first abdominal tergite shown in Fig. 6 an anterior region which is proportionately wider than the anterior region labelled *at* in Fig. 16, is demarked, but these two anterior tergal regions are not strictly homologous, since the anterior tergal region in Fig. 6 bears the two anterior tergal setae labelled *atg* in Fig. 6, while the antetergite *at* of Figs. 17 and 10 does not bear the anterior tergal setae, which apparently occur just behind the antetergite *at* in Figs. 17 and 10. At any rate, the anterior tergal setae labelled *atg* in Fig. 11 have been homologized with the anterior tergal setae labelled *atg* in Fig. 6 and 16 while the posterior tergomarginal setae labelled *pt* in Fig. 6 have been homologized with the posterior tergomarginal setae labelled *pt* in Figs. 17, 16, and 11. The anterior tergal setae are borne on small chalaza-like prominences, while the posterior tergomarginal setae are borne on a series of papilla-like protuberances. Processes of this description also occur in the pupae of *Eriocera*, *Ptychoptera* and other Nematocerous Diptera.

In the sternal region the posterosternal setae labelled *ps* in Figs. 17 and 11 are the best developed, and are likewise borne on chalaza-like or papilla-like protuberances, which are somewhat better developed in the sternal region of the seventh abdominal segment (i. e. *ps* of Fig. 9) which also bears a few weakly anterosternal setae labelled *ast* in Fig. 9.

The lateral or pleural region labelled *p* in Fig. 17 of the shed pupal skin of the female insect is better demarked in the pupa of the male shown in Fig. 11, where the pleural region *p* is indicated by a stippled area to show that the pleural region is slightly more "membranous" than the tergal or sternal regions, and the pleural region is also more projecting in the male pupa shown in Fig. 11 than it is in the pupal skin of the female shown in Figs. 10 and 17. The pleural region labelled *p* bears one anterior lateral and three posterior lateral setae in segments seven and five, shown in Figs. 17, 11, 9, etc., where the anterior lateral setae are labelled *al* and the posterior lateral setae are labelled *pl*. The anterior lateral setae are apparently more numerous in the first abdominal segment shown in Fig. 6, where the setae in question are labelled *al*.

The spiracles (which are apparently not functional in the pupal stages) are indicated by the labels *s* in Figs. 17, 10, etc., and are usually located in the anterior region of the pleurite, but the eighth abdominal spiracle labelled *s* in Figs. 10 and 11 is located in the posterior region of the eighth segment, just

Section of lead telephone cable showing eggs of *M. stigma* and holes made by larvae.

above the base of the lateral process labelled *lp* in Figs. 10 and 11. The shed chitinous intima of the tracheae is labelled *i* in Figs. 10 and 17 of the pupal skin of the female, and these shed linings of the tracheae which remain attached to the region of the spiracle (labelled *s* in the figures) help to identify the location of these structures which are very small and difficult to detect.

The eighth and ninth abdominal segments in both male and female pupae, bear lateral processes labelled *lp* in Figs. 10, 11, 12, 9, 8 and 7; and the tenth segment bears the cerci, which are composed of a basal region or basicercus labelled *bc* and a distal region or disticercus labelled *dc* in Figs. 7 to 12 inclusive. This is of some interest, since the cerci appear to be borne on an eleventh (instead of the tenth) abdominal segment in some adult Diptera; but there appear to be only ten segments in the larval and pupal stages of these Diptera (the eleventh being a vestigial anus-bearing region) so that if ontogeny has any significance, it would appear to indicate that the cerci are appendages of the tenth segment, and not of the eleventh segment, as is the case also in adult Orthopteroids, etc.; but the embryologists claim that the cerci are appendages of the eleventh segment, and the question is still in dispute. In the pupa of the Mecopteron *Bittacus*, shown in Fig. 15, it would appear that the cerci (bearing the labels *bc* and *dc*) are appendages of the tenth segment, while the eleventh segment is represented by the anus-bearing terminal region *an*; but I have been unable to examine a pupa of *Panorpa*, which is a more primitive Mecopteron than *Bittacus*, to determine if the cerci are borne on the tenth abdominal segment in the more primitive representatives of the Mecoptera, which belong to an order of insects extremely like the ancestors of the Diptera. The shed lining of the hind-gut is labelled *h* in Fig. 10, and the lining of the hind-gut apparently extends to the region of the anus labelled *a* in Fig. 8, although it was impossible to determine the point of attachment of the of the hind-gut lining without injuring the delicate pupal skin. If the label *a* in Fig. 8 indicates the actual position of the anal opening, it is dorsal in position, as is also apparently the case in the pupal Mecopteron shown in Fig. 15, where the anus-bearing region is labelled *an*.

In the cast skin of the female pupa shown in Fig. 7, the papilla-like lobes labelled *v* lie on each side of what appears to be the location of the genital opening of the female. The lobes labelled *v* in Fig. 7 apparently lie in the ninth sternite, while the ventral vales labelled *vv* in Fig. 15 of a female pupa of the Mecopteron *Bittacus* seem to belong to the eighth abdominal segment, and project backward beneath the ninth segment. This suggests that the papillae labelled *v* in Fig. 7 might possibly represent the ventral valves *vv* of Fig. 15 which have migrated into the region of the ninth segment in Fig. 7, but this explanation is not very convincing, and the valves of the female insects are not very similar in the pupae of *Protoplasa* and the Mecopteron shown in Fig. 15, although the cerci are quite similar in the two types of insects (i. e. they are composed of a basicercus *bc* and disticercus *dc*, as is shown by comparing Figs. 10 and 15) thus indicating that the Diptera and Mecoptera are more closely related than the genital lobes of the female pupae would indicate.

The genital claspers of the male of *Protoplasa* are represented by the pupal structures labelled *bs* and *ds* in Figs. 11 and 12, which are called the basistyles (*bs*) and diststyles (*ds*) in adult Diptera. The basistyles *bs* had long been interpreted as "pleurites" in Tipulidae, etc., but in his review of Alexander's "Craneflies of New York," Walker, 1920 (Canadian Entomologist, Vol. 52, p. 190) states that morphologically the basistyles *bs* are "undoubtedly coxites," and some Dipterists, such as Edwards and others, accept this view. From a comparison of the parts in male Diptera with those of lower Holometabola such as Tenthredinidae, Mecoptera, etc., the writer (Crampton, 1920, Psyche, Vol. 27, p. 34, and Crampton, 1923, Trans. Amer. Ent. Soc., Vol. 48, p. 207) concluded that the basistyle *bs* and diststyle *ds* represent the basal and distal segments of the genital stylus, while the coxite becomes reduced and united with the other parts in higher insects, such as the Diptera and other specialized forms. This interpretation was found to be the more probable one by Cole, 1927 (Proc. California Acad. Sciences, Vol. 16, p. 397) in his studies of the male genitalia throughout the order Diptera, and is the view accepted by most American Entomologists, but since the question is still a disputed one, the condition exhibited by the pupa of *Protoplasa*, which is one of the most primitive Diptera known, should be of some interest in this connection. As is shown in Figs. 11 and 12, there occurs at the base of each basistyle *bs* a rather poorly demarked area labelled *o* in Figs. 11 and 12, which apparently represents the reduced coxite bearing the two-segmented stylus (composed of the segments *bs* and *ds*). The areas labelled *o* in Figs. 11 and 12 correspond to the regions of the male genitalia interpreted as the coxites in adult mosquitos by Freeborn, 1924 (Amer. Jour. of Hygiene, Vol. 4, No. 3, p. 188); and a comparison with the genitalia of male Tenthredinid Hymenoptera, in which the sclerite representing the united coxites is distinctly separated from the two-segmented genital styli (whose segments correspond to the areas labelled *bs* and *ds* in Figs. 11 and 12) would indicate that the parts labelled *bs* and *ds* in Figs. 11 and 12 represent the basal and distal segments of the genital styli in *Protoplasa* also. The united coxites of the male genitalia are represented by a sclerite which tends to become greatly reduced even in such primitive insects as the Ephemerida, while in practically all Orthopteroid insects, which are extremely closely related to the ancestors of the Holometabola, the coxites of the male genitalia become reduced and fuse with the ninth sternite, so that unless we discard the fairly well established principle of the irreversibility of evolution (in which it is claimed that an organ once lost or reduced never becomes enlarged and well developed again), it hardly seems probable that the coxites which become reduced and fused with the ninth sternite in the forms like the ancestors of the Holometabola, would become hugely developed in the highest Holometabola (i. e. the Diptera) to form such large structure as those labelled *bs* in Figs. 11 and 12, which are interpreted as the coxites by some entomologists. It is therefore much more in harmony with the facts of comparative anatomy, and the observed evolutionary trends toward the reduction of the coxites in the forms nearest the ancestors of the Holometabola, to interpret the reduced areas labelled *o* in Figs. 11 and 12 as the coxites, and to interpret the parts labelled *bs* and *ds* in Figs. 11 and 12, as the segments of the genital styli, which are composed of several segments in most Ephemerida, and are composed of two segments in the sawflies, which have retained the genitalia in as primitive a condition as any known Holometabola. This subject will be further discussed in a later paper treating of the pupal structures of the Holometabola in general.

ABBREVIATIONS.

a..........Location of anus.
ad..........Adanal sclerite or area.
al..........Anterior lateral or pleural setae and seta-bearing processes.
an..........Anal lobes or proctiger.
ant..........Antennae or their cut-off basal portions.
apa..........Anterior parietal setae and their processes.
apn..........Antepronotum.
as..........Antesternite.
ast..........Anterior sternal setae.
at..........Antetergite.
atg..........Anterior tergal setae.
ba..........Raised basalar or prealar area and setae.
bc..........Basicercus (basal segment of cercus).
bs..........Basistyle (coxite of some investigators).
bt..........Basitarsus.
c..........Genal or subgenal process and setae.
co..........Coronal cleft marking position of coronal suture.
cx..........Coxa.

dc..........Disticercus (distal segment of cercus).
ds..........Diststyle (entire stylus of some investigators).
e..........Occular area.
esp..........Epistomal processes and setae.
f..........Fore wing cases.
fc..........Frontocornua and setae.
fe..........Femur.
fg..........Fore-gut lining.
fp..........Frontal pits.
fs..........Frontal clefts corresponding to frontal sutures.
g..........Galea.
h..........Lining of hind-gut.
ha..........Cases of hind wings or halteres.
i..........Intima of tracheae.
l..........Labrum.
lp..........Labial palpi (in head region).
lp..........Lateral processes in terminal abdominal region.
m..........Mandibles.
mds..........Middorsal cleft corresponding to middorsal suture.
mn..........Metanotum and metanotal setae.
mp..........Maxillary palpi.
c..........Area representing coxites.
p..........Pleural region (pleurite) of abdominal segments.
pa..........Parietalia.
pf..........Prefrontal setae.
pfc..........Prefrontal processes (Prefrontocornua).
ph..........Prehalteral setae.
phr..........Postphragma.
pl..........Posterior lateral or pleural setae.
po..........Preorbital or preoccular setae.
ppa..........Posterior parietal processes and setae.
ppn..........Postpronotum.
ps..........Posterior sternal processes and setae.
psl..........Region of postscutellum.
psp..........Prosternal prominence.
pt..........Posterior tergal setae and processes.
r..........Postorbital process.
s..........Spiracle.
sc..........Scutal setae and processes.
sca..........Scape of antenna.
t..........Breathing horns (spirotubae).
tg..........Tegular region and setae.
ti..........Tibia.
v..........Ventral papillae (in abdomen).
v..........Process of pronotum (in thorax).
vv..........Ventrovalvulae.
x..........Process of pronotum.

EXPLANATION OF PLATES

Fig. 1. Lateral view of anterior region of the cast skin of the female pupa of Protoplasa.

Fig. 2. Lateral view of anterior region of a pupa of *Eriocera*.

Fig. 3. Frontal view of head, fore leg, etc., of the cast skin of the female pupa of Protoplasa.

Fig. 4. Frontal view of head and fore leg of the pupa of a Lepidopteron, Tinea redrawn from Mosher.

Fig. 5. Lateral view of the thoracic region of the male pupa of Protoplasa.

Fig. 6. Dorsal view of the anterior region of the cast skin of the female pupa of Protoplasa.

Fig. 7. Ventral view of the terminal abdominal structures of the cast skin of the female pupa of Protoplasa.

Fig. 8. Dorsal view of the last abdominal segments of the cast skin of the female pupa of Protoplasa.

Fig. 9. Dorsal view of the terminal abdominal structures of the male pupa of Protoplasa.

Fig. 10. Lateral view of the terminal abdominal structures of the cast skin of the female pupa of Protoplasa.

Fig. 11. Lateral view of the terminal abdominal structures of the male pupa of Protoplasa.

Fig. 12. Ventral view of the terminal abdominal structures of the male pupa of Protoplasa.

Fig. 13. Dorsal view of the fourth abdominal tergite of the pupa of the Mecopteron Bittacus.

Fig. 14. Ventral view of the sixth abdominal sternite of the pupa of the Mecopteron Bittacus.

Fig. 15. Lateral view of the terminal abdominal structures of the pupa of the Mecopteron Bittacus.

Fig. 16. Lateral view of the anterior region of the male pupa of Protoplasa.

Fig. 17. The right half of the fifth abdominal tergite, together with the pleurite and sternite of the female pupa of Protoplasa spread out in one plane.

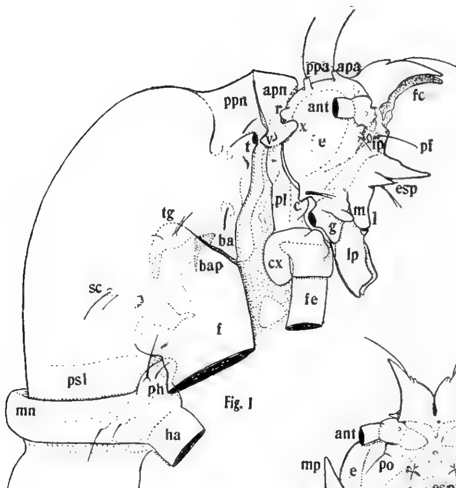


Fig. 1

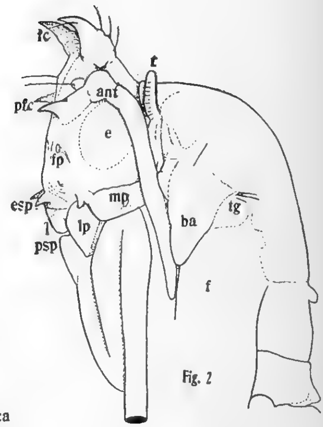
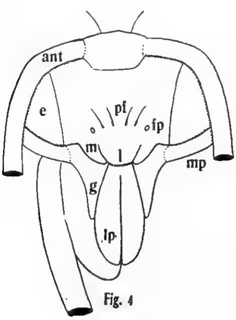


Fig. 2

Fig. 3



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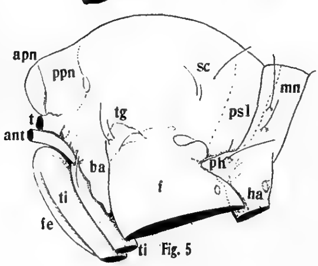

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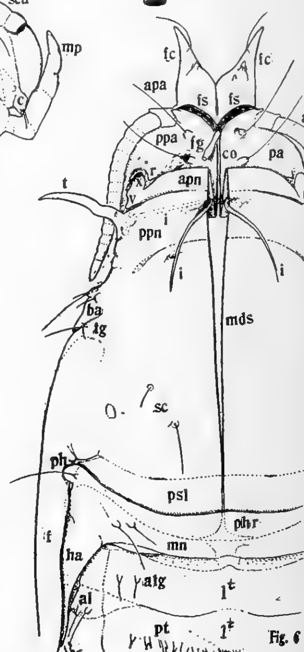

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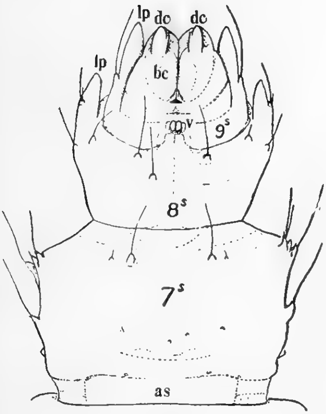


Fig. 7

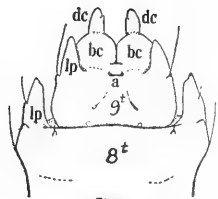


Fig. 8

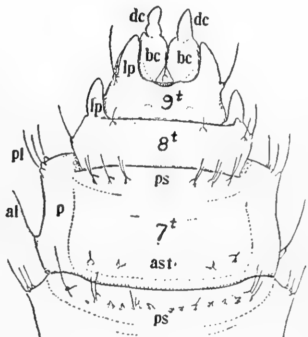


Fig. 9

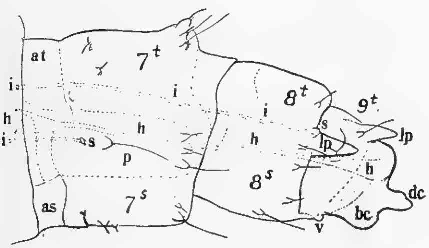


Fig. 10

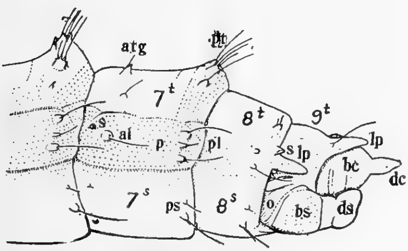
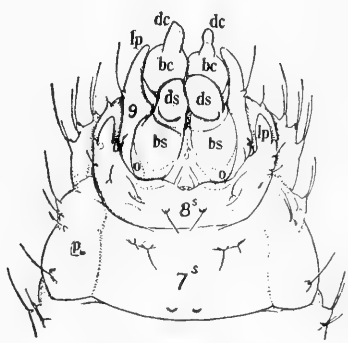


Fig. 11



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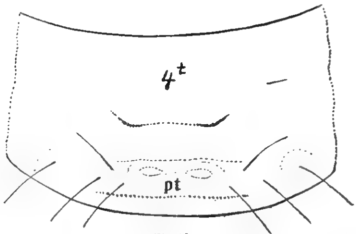


Fig. 13

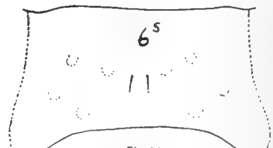


Fig. 14

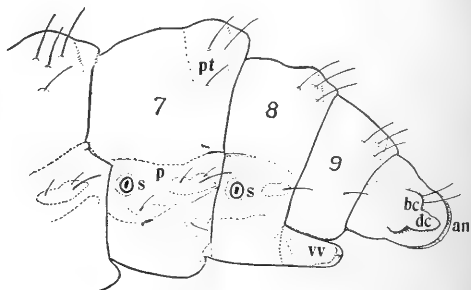


Fig. 15

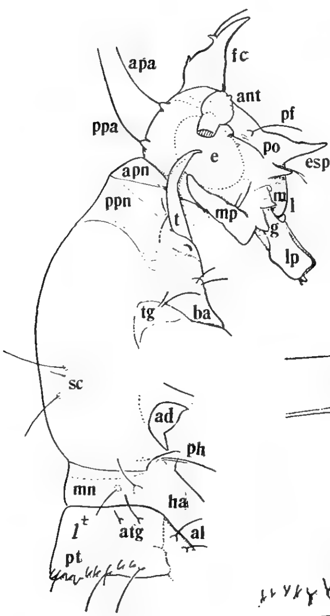


Fig. 16

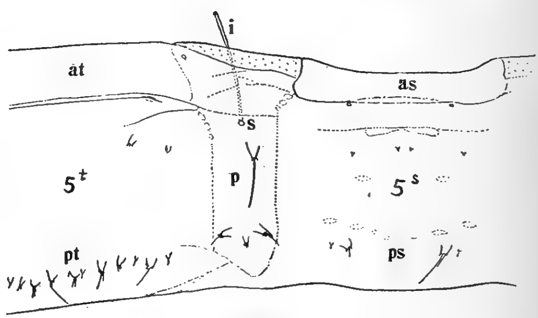


Fig. 17

THE SUGAR CANE INSECT PROBLEM IN NEGROS.

By W. Dwight Pierce, Ph. D.

For the past two and a half years the writer has been engaged in a study of the sugar cane insects of Occidental Negros, for the Victorias Milling Co., and the North Negros Sugar Company. These two companies operate in the northern sector of the Island of Negros, one of the Visayan group of the Philippine Islands.

The problem was of peculiar interest ecologically because of the evenness of the climate, which permitted the all-year continuation of all processes of sugar cane culture, and harvesting.

The mean temperature of the months November to March ranges from 78 to 80 degrees Fahrenheit, and for the months April to October ranges from 81 to 83 degrees. The total range of mean temperature is 5½ degrees.

The mean humidity for March to June ranged 82 to 83%, July to October 84 to 87%, and November to February 87 to 88%. The total range of mean humidity was 6%.

Rain falls on an average of 200 days a year at Victorias, and the average fall is from 120 to 140 inches. This is so distributed that no month has a mean of less than ten rainy days, April having the least, and November the most. The rainfall is very irregular, but possible any day in the year. It is distributed differently from north to south, 20% falling at Fabrica in the northeast by the end of March, 40% by the middle of July, 60% by the middle of October, and 80% by the middle of November: but at Maao in the south, 20% has not fallen until the end of May, 40% by the middle of July, 60% by the tenth of August, and 80% by the end of September.

The sunshine varies from 90 to 230 hours per month, with the least in July and the most in May.

A large mass of data was collected and will be correlated with the climatic data in the hopes of finding definite growth correlations, even under conditions of as little variance as are shown here. With temperature and humidity more or less steady, sunshine and rainfall were the two principal variants.

As the problem was essentially economic, with time rather than money as the dominant control, it was necessary to so arrange the work as to arrive at essential economic steps at the earliest possible moment, subordinating the technical results to more deliberate after-study. Consequently many notes were made which will require considerable study as future time permits.

In order to properly gauge the progress of the work from month to month and obtain criteria for continuation, certain field data were collected every month over the entire milling territory of the two companies, and frequently over the rest of the island. These were charted monthly and acted as business barometers. Thus we charted the percentage of dead heart infestation, the mean number of live and dead shoots per stool, the ratio of good to dead shoots, the difference in infestation in four parts of the territory, the percentage of top borer injury, the percentage of weevil borer injury in mature cane received at the mill, the percentages of parasitism of eggs and larvae of each species concerned, and from these points the probable saving due to parasitism. Two other ratios served a useful purpose. One was the average number of parasites per parasitized egg; the other, the ratio of total number of parasites to total host eggs. As the second ratio reached the first we were approaching maximum possible control.

These charts showed that if there had been no egg parasitism, the borers causing dead heart would have practically destroyed the entire crop in April, 1928, and October, 1929.

The average number of dead shoots per stool in January, 1928, was 2.4, and the ratio of good to dead 1.28. This rapidly diminished and after May, 1928, was always under 1.0 dead shoot per stool, with the ratio of good to dead always over 3.6. From February, 1929, the average dead shoots per stool remained under 0.65, and in August and September reached the low point of 0.25. The ratio stood over 5, and ran as high as 15, good shoots per dead.

The parasite distribution theory followed, was that a redistribution of parasites native to the country can effectively increase mean parasitism; that tiny parasites acting in the midst of a sufficiency of hosts do not normally spread far or rapidly, but by redistribution can be put to work in a far greater number of foci; that small numbers of parasites released at each focus will have the greatest opportunities for rapid development of numbers, because of unrestricted host supply; that a few parasites can be spared from fields where they are common and taken to fields where they are less common; that a larger number of planters can be satisfied that parasites are established and at work on their places by the starting of small colonies, and later returns with additional supplies; that a high mean parasitism can be built up by means of redistribution, drawing from the highest percentage zones and placing in the lowest percentage zones; that bringing parasites into newly planted fields at the very beginning of attack results in less damage than when the parasites are expected to find their way into the new fields. Naturally the various points in this theory developed as the work progressed, but all are thoroughly justified by the results, which we hope to publish in detailed studies later. Just as an example let us take the mean parasitism of the eggs of the principal borer causing dead heart, *Olethreutes schistaceana*, for six month periods. For the six months September, 1927, to February, 1928, it was 19%, the same six months 1928–1929 it was 43% and the same six months 1929–1930, 79.5%

While this parasite redistribution was progressing it was also necessary to establish the idea of the importance of cultural measures to be taken by the planters themselves, and so in March, 1928, a Clean Culture System for sugar cane culture was announced, and in July, 1929, this was elaborated in a bulletin, the first in a series of six.

The main features of this system are as follows:

1. Sugar cane should not be ratooned when diseased with mosaic, Fiji disease, leaf scald, or root rot; or when the roots are badly attacked by root grubs or other serious root pests.
2. Planting stock should be selected from healthy fields, and points showing injuries should be discarded.
3. There should be inter-island regulation of the shipment of seed cane.
4. The cane should be stripped in the field, and the trash burned. This burning should be followed up with the collection of all unburned sticks, for a second complete burning.
5. Thorough cultivation is necessary for control of soil insects.
6. When a field is to be fallowed it should first be plowed, and should never be abandoned and left unplowed, for then the soil grubs can complete development.
7. Rotation of crops with legumes is desirable.
8. Choice of variety is important. The factors which govern susceptibility and immunity include rapidity of stooling, root growth, rapidity of stalk growth, hairiness of stalk, hardness of rind, fiber content, sweetness, and succulence of leaf.
9. The highest percentage of dead heart comes on cane that is young in February, and the least on young cane in May to July.
10. Points should be husked in one spot and the trash burned.
11. Rectification of soil conditions toward neutral, will reduce root grub attack.
12. Addition of potassium sulphate or lime will assist plants that have yellowed from root rot, nematodes, and other troubles, when low potash ratio is shown.

13. All weeds have a bearing upon the cane insect problem, and the grasses are the contributors of many diseases and pests. Consequently these should be eliminated as far as possible. Where grass is used to prevent erosion it sometimes brings about increase of mosaic. Substitution of sweet potatoes for grass as the binding crop is recommended. Certain plants serve as honey plants for the wasp parasites of the root grubs, and some of these should be encouraged, especially where they are useful as well.
14. In case of heavy dead heart infestation the shoots should be cut at base and burned.
15. Weevil damage can be reduced by removal of all waste pieces of stalk, and removal by burning of all banana and palm stumps. The weevils can be trapped by cut pieces of cane.
16. Turning of chickens and hogs into newly harvested fields will help control the root grubs. In bad infestations the laborers should be paid for collection of grubs and adults.
17. Traplights are very valuable for the control of the cane moths, which usually oviposit on the night they are found at the lights.

The main types of injury are dead heart of young cane, borers in mature cane, root grubs, juice suckers.

In January and February, 1928, over 30% of the stalks arriving at the mill were weevil infested. After May, 1929, this damage averaged under 15%. The mean calculated loss of sugar from an uninfested crop varied by variety from 10.8% to 21.8%.

The principal sugar cane insects on Negros are as follows:

Injuring seed cane in ground.

The Weevil—*Trochorhopalus strangulatus* Gyllenhal.

The shot hole borer—*Xyleborus perforans* Woll.

Termites—*Macrotermes gilvus* Hagen.

Rind girdler larvae and beetles—*Eutochia lateralis* Heller.

Darkling beetles—*Opatrum acutangulum* Fairm. and *O. depressum* Fabr.

Injuring roots.

Mole cricket—*Gryllotalpa africana* Palis de Beauv.

Soil grubs, or "buc-an": *Leucopholis irrorata* Chevr., *Anomala anoguttata* Burmeister, *Anomala humeralis* Burmeister, *Holotrichia vidua* Sharp.

Root louse—*Tetraneura lucifuga* Zehnt.

Mealy bug—*Trionymus sacchari* (Cockerell).

Root stink bugs—*Macroscytus transversus* Burm., and *Stibaropus molginus* Schiödte.

Nematodes—*Heterodera radicicola* Greef Muller, and *Tylenchus similis.*

A Cicada larva, numerous Collembola, Lepismids, slugs, etc.

Causing abnormality of growth.

Topborer—*Topeutis intacta* Snell.

Breakage of leaves caused by *Perkinsiella vastatrix* Breddin, egg punctures; *Cosmopteryx dulcivora* Meyrick, midrib mines.

Tip tie caused by leaf rolling *Thrips*, leaf roller larvae of *Marasmia trapezalis* Gn., and *Padraona dara* Koll., nests of the ant *Polyrhachis diver* sewed in the leaves, and attack of the mite *Paratetranychus exsiccatos* Zehnt.

Injury to young cane.

Topborers—*Topeutis intacta* Snell, and *Topeutis auriflua* Zell. Dead heart or "tamasoc"—

Termites—*Coptotermes vastator* Light and *Microcerotermes los-banosensis* Oshima.

Millipedes.

Adult beetles boring in—*Heteronychus morator* F. and *Eutochia lateralis* Boh.

Beetle larvae of *Eutochia lateralis* Boh.

Fly larvae of an Anthomyiad.

Moth larvae of *Olethreutes schistaceana* Snell., *Diatraea infuscatella* Snell., *Diatraea striatalis* Snell., *Sesamia inferens* Walker, *Sesamia uniformis* Dudgeon, *Siboga falsella* Snell., *Homona* sp., *Amata deflocca* Swinhoe.

Bud injury.

Bud worms—*Opogona dimidiatella* Zeller, *Ereunitis* spp.

Rind girdler—*Eutochia lateralis* Heller.

Stalk borers, both moth and weevil.

Stalk borers.

Moth borers—*Olethreutes schistaceana* Snell. *Diatraea striatalis* Snell., *Sesamia inferens* Walker, *Sesamia uniformis* Dudgeon, *Diatraea infuscatellus* Snell.

Top borers—*Topeutis intacta* Snell, *Topeutis auriflua* Zell.

Weevil borer—*Trochorhopalus strangulatus* Gyll.

Shot hole borer—*Xyleborus perforans* Woll.

Stalk juice suckers.

Mealy bug—*Trionymus sacchari* (Cockerell).

Scale—*Aulacaspis tegalensis* (Zehnt.).

Leaf suckers.

Leaf hoppers—*Perkinsiella vastatrix* Breddin, *Proutista moesta* Westwood, *Lophops carinatus* Kirby, *Ricania taeniata*, *Ricania proxima* Mel.

White flies—*Aleurolobus barodensis* Maskell, *Aleurodes lactea* Zehnt., *Neomaskellia bergii* Sign.

Wooly aphis—*Oregma lanigera* Zehnt.

Aphids—*Aphis maidis* Fitch, *Aphis sacchari* Zehnt.

Scales—*Chionaspis depressa* Zehnt., *Chionaspis saccharifolii* Zehnt.

Thrips—*Thrips serrata* Zehnt., etc.

Mites—*Tetranychus exsiccator* Zehnt.

Leaf miners—
- Topborer first larvae—*Topeutis intacta* Snell.
- Midrib miner—*Cosmopteryx dulcivora* Meyrick.
- Moth blade miner—*Cosmopteryx pallifasciella* Sn.
- Beetle blade miner—*Monochirus callicanthus* Bates.

Leaf eaters—
- Army worms—*Spodoptera mauritia* Boisd., *Cirphis loreyi* Dup.
- Leaf rollers—*Marasmia trapezalis* Gn., *Padraona dara* Koll.
- Leaf worms—*Cyllo leda* L., *Dinara combusta* Moore, *Laelia suffusa* Walker, *Mycalesis mineus* L., *Parnara matthias* Fabricius, *Prodenia litura* Fabricius, *Utetheisa pulchella* L.
- Many grasshoppers.

This list is only partial, as many injurious species are as yet undetermined. The majority of the determined species are recorded from Java, some from India, Australia, and other oriental countries. I have omitted the long list of beneficial insects.

DEPREDATIONS TO LEAD-COVERED AERIAL CABLES BY BEETLES IN BRAZIL.

By E. J. P. Rendell,
Emprezas Electricas Brasileiras, S. A., Rio de Janeiro.[1]

Cases of damage to aerial telephone cables by lead boring insects have been reported from such varied parts of the world, as China, Australia and California—these matters have been

[1]The present paper presents a unique case of insect damage to metal. The species studied in this country, a Bostrichid, *Scobicia declivis* Lec., attacks lead sheathed aerial cables in the adult stage, apparently stimulated in its attack by the contact stimulus, since most of the attack is at the point of contact of the cable and the ring which supports it. Injury has been prevented by changing the character of the ring cable and thus preventing the insect from propping itself in order to facilitate boring. Soft beef tallow placed on the cable will also prevent attack.

Apparently all damage to metal by insects is accidental. The insects either emerge from wood and continue to bore through metal which is in contact with the wood or haphazardly attack metal, being stimulated by some tropism. We believe that in the present case it can be likened to that of a female moth in captivity, laying her eggs by necessity on whatever object chances to be nearby, and it might be that the female beetle being full of eggs lays a few on the lead sheath cables, preserving the greater supply for the normal wood host plant.

Dr. L. O. Howard has handed me the first reference to a larva boring in lead which is as follows: Schirch, P. F., Un insecto que fura canos de chumbo, Bul. Nat. Mus. Brazil, vol. V, no. 3, p. 97–8, figs. 6, September, 1929. Rio de Janerio.

May 16, '30. Thos. E. Snyder.

investigated by Government scientists whose findings are set forth in a bulletin issued by the Department of Agriculture, Washington, D. C.[1]

Lead boring trouble exists in Brazil, and recognizing the extent and importance of the work already done by Dr. Thomas E. Snyder and his associates in Washington, Mr. Paul B. McKee, General Manager Emprezas Electricas Brasileiras, S. A., commissioned the writer to co-ordinate all information which could be collected from the associated telephone companies operating in Brazil, for report to Dr. Snyder.

Amongst others—the operating engineers in the States of Pernambuco, Bahia and Espirito Santo, all report lead boring trouble, but as information to date is complete only in respect of Pernambuco, this history will deal principally with the investigations made on the Pernambuco beetle, *Megaderus stigma* L. Cerambycidae.

The Telephone Company of Pernambuco serving the automatic system of Recife has an aerial cable network of approximately 100 kilometers. The cables, varying in size from 10 to 200 pairs, are of standard dry core specification, plain lead sheath composed of 99% pure lead and 1% antimony. The cables are supported over the network with "Bonita" rings on steel suspender attached to steel poles.

The cables in the affected area, with a length of approximately 18.6 kilometers, were erected July–December, 1927. They were tested O. K. on air pressure and for insulation in January, 1928. In February, 1928, reports of low insulation were received, and the attempt to dry out by pumping dessicated air into the cables, disclosed the existence of small broadly oval shaped holes, approximately 1 mm. long, penetrating the upper half of the lead cable sheath;—the trouble recurred continuously in this area until June, 1928, when the reports ceased for that year. In February, 1929, however, more cases of cable breakdown were reported, and these continued until the month of July, 1929, after which no further trouble was experienced up to March, 1930.

Sometimes the cable breakdown would be caused by one hole only, but as many as 100 holes have been located in one 88-meter length of cable—80 of these holes were discovered in one 40-meter span—in all cases the dessicating pump proved to be invaluable in speedily locating the presence and position of the holes in the lead sheath.

It was observed that the holes appeared over the whole length of cable, irrespective of the position in the span or of

[1]1923. Burke, H. E., Hartman, R. D., and Snyder, T. E., The lead-cable borer or "short-circuit beetle" in California, U. S. Dept. Agric. Bul. 1107. (Professional paper.)

cable rings or other supports;—the holes are always in a 45° sector on either side of the center in the upper half of the sheath—the boring is however generally not radial, indicating an attempt at tunnelling.

Close examination of other materials adjacent to the cable was made by the Lines Engineer, Mr. Seeley, who eventually discovered identical holes in cross arms of "Sucupira" wood. He also observed several small shell-like objects in clusters on the wood cross-arms, which could be removed by a slight touch—in some instances disclosing a white substance. Mr. Seeley afterwards observed similar objects on the cable sheath and after much patient watching he was rewarded by the capture of a beetle on the cable. It was subsequently found that these shell-like objects were really eggs, deposited by the beetle "*Megaderus stigma*," known colloquially in Recife as the "Carocha," a wood-boring beetle about one inch to 1½ inches long. The matter had been fully reported to Mr. Berry, Chief Engineer, and he, together with Mr. Seeley, commenced a series of observations on the bad habits of the "*Megaderus stigma*" family. It will of course be appreciated that the activities of "*Madame Meg*" during the egg season made it difficult for the observers to maintain 100% observations—which consequently were of necessity extended over a considerable period.

Several of the beetles were collected and placed inside a metal box with a glass top—pieces of lead cable were put inside the box and very soon eggs were deposited thereon.

In the first observation the box and contents was left on a table in a room, but after several weeks as no result was obtained the observation was abandoned.

Later more beetles were placed in the same box—but in this instance the conductors were withdrawn from the sheath and the ends sealed. Eggs were again deposited on the sheath which was then placed outside in similar conditions to the cable in the network.

In six days holes were found in the lead, empty shells noticed over some holes and around others minute lead borings were visible. Some of the eggs were lying on the sheath, having the same appearance as when deposited.

After a further period of 14 days more holes were discovered in the lead sheath, and the sheath was then opened.

No trace of any object of any description was discovered inside the sealed sheath. These observations extended to July, 1929—and by that date the beetles having disappeared no more eggs could be obtained. Summarizing the results of these observations Mr. Berry states:

(a) The insect is the *Megaderus stigma*, L. (Cerambycidae),

(b) The hole is bored by the larvae and not by the full grown insect,
(c) The egg can develop and a hole be bored in the lead sheath in 6 days,
(d) Apparently the limit of damage directly accomplished by the borer is the boring of the lead sheath. The insulation of the cable is not damaged by the insect but by the moisture which passes through the hole,
(e) There is a tendency to tunnel on the part of the insect.

It was felt that some confirmation of Mr. Berry's conclusions was desirable, particularly as the larvae had not been seen by the observers and the writer arranged for a consignment of live male and female beetles to be despatched by airmail to Dr. Raymond C. Shannon, who is at present residing in Bahia.

A full report of the observations made in Pernambuco, and a consignment of live beetles were also sent to Doctor Carlos Moreira, Director of the Instituto Biologico, Rio de Janeiro. Dr. Moreira is keenly interested in the lead-boring problem and he is taking steps to advance these investigations, the result of which will undoubtedly take the form of a separate and most interesting report. In the meantime, Doctor Shannon has arrived at some conclusions and the following is a verbatim account of his report on his findings:

Some observations on the Lead Boring Beetles, March 4th to March 13th, 1930.

A shipment of beetles, received from Recife March 4th, consisted of a wooden box, the top being sealed with a fine mesh copper screening, and contained 10 living male and female beetles *Megaderus stigma*, L. (Cerambycidae), and an eight-inch piece of lead pipe.

The following observations were made:

1. Incubation period of the eggs—minimum, 4 days; maximum, more than 9 days.
2. Of the 27 eggs which had been deposited on the lead, 7 of the larvae upon hatching succeeded in boring through the lead; 12 attempted to do so but gave it up and crawled out of a hole made on the free side of the egg and fell to the bottom of the container; the rest apparently died before hatching.
3. The boring is accomplished by chewing the hole with the jaws, i.e., it is a mechanical and not a chemical action.
4. Little if any of the lead is ingested (therefore the boring larvae are not poisoned by the metal).
5. Free larvae (those lying loose on the bottom of the container) when placed in a damp cardboard box were unable to bore into the cardboard.
6. Larvae hatching from the eggs laid on the fine mesh copper screening of the top of the box, made little or no attempt to bore; possibly the copper is too resistant.

7. Larvae succeeding in boring through the lead cable doubtlessly die shortly afterwards owing to lack of food and water.
8. The larvae upon hatching are small (about 2 mm. in length) grub-like, creamy yellow in color and entirely soft, save for their strongly sclerotized cutting jaws.
9. The mandible is flat, the basal attachment being very broad, while the anterior or outer edge is developed into a sharp blade-like structure, which resembles the curved edge of a circular blade. Below the blade-like structure is a more or less distinctly separated gouge-like organ, pointed at the apex and with a hollow between two lateral sharp edges. Presumably the blade-like structure of the main part of the mandible is pressed into the lead, forming a groove, while the attached gouge-shaped structure is used in chipping off the lead along the sides of the groove.
10. The lead is ejected from the boring by a twisting, backward movement of the larva. As a piece of the lead is removed by the mandibles, the labium holds it in position, while the larva twists its body so as to free its head in order to carry the bit of metal to the opening of the boring. This is piled into the egg case, and as it is filled, the shavings begin to fall out of the (sometimes two) opening which has been previously made on the free side of the egg shell.
11. The various dimensions are:

    Egg: 1½ mm.

    Larva (first stage) approximately 2 mm.

    Adult beetle from 30 to 40 mm.

    The appearance of the larva and adult beetle *Megaderus stigma* is illustrated in attached drawing.

The following life story is also from the pen of Dr. Shannon:

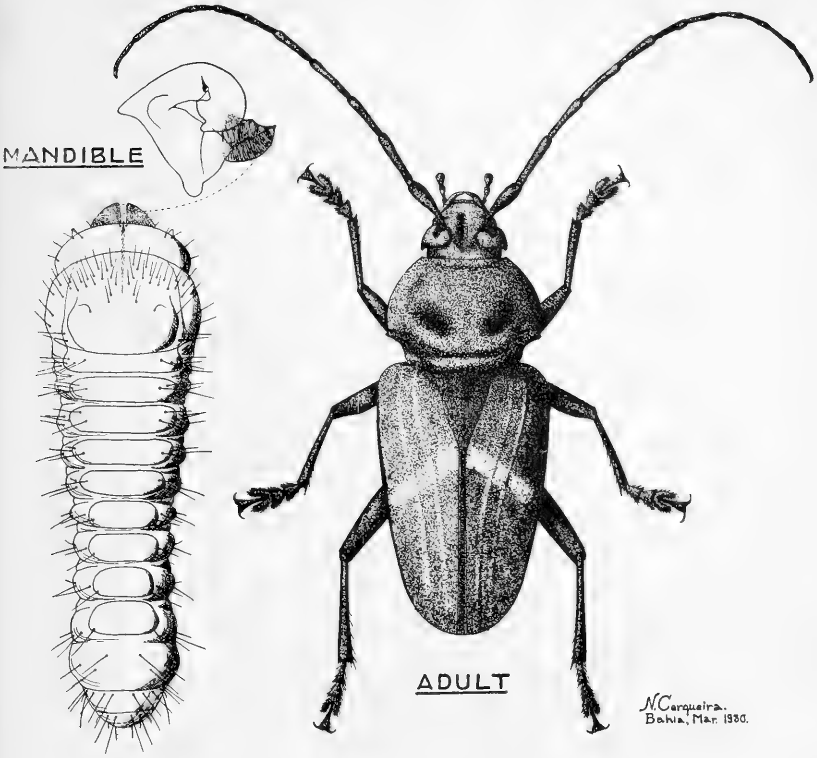
The Probable Life-History of the Beetle in its Normal Habitat.

The proper food material of the larvae undoubtedly is wood. The fact that the beetles sometimes lay their eggs on metal surfaces, indicates nothing more than a mere accident (as far as the beetle is concerned). It would be of interest and probably of importance to ascertain the preferred type of wood, especially whether it is a living tree or dead and dry timber (very probably the latter).

The egg requires at least four days to hatch but may remain unhatched for more than nine days.

The larva upon hatching immediately bores into the surface to which the egg is attached, using the egg shell as a support or brace until it is well within its gallery. In its natural habitat (wood) it probably retains the larvae stage for six months to nearly a year. After the larvae attains its growth, it transforms into the pupa (probably only one or two weeks is required for this stage) and finally, upon the arrival of the proper season for the adults, they, the adults, make their exit from the wood.

The proper season for the adults probably corresponds more or less to the summer season. The length of life of an individual adult may be from one to three months.



MEGADERUS STIGMA L
CERAMBYCIDAE

The length of life per individual (all stages, egg, larva, pupa and adult) probably approximates a year's time, therefore there should be but one brood per year. No estimate can be given as to the number of eggs produced by a single female, but possibly it is between 100 and 200.

Recently (March, 1930), in Pernambuco, in company with Messrs. Seeley and Kelly, I found old lumber in one of the lumber yards (evidently which had been stored there for a year or more) with numerous holes, very similar in appearance to those made by larvae in wood and lead kept under laboratory conditions.

Time did not permit a more thorough examination of the wood, but it would thus appear that possibly the lumber yards may be suspected as a source of the beetles.

It should be understood, however, that another, but very much smaller species of beetle is to be found in great abundance in lumber yards, and they too make holes very similar in size and shape to those made by the larva the "*Megaderus stigma.*"

This small insect is commonly known as the Powder-Post beetle and its presence may be surmised by the presence of fine flour-like wood dust resulting from their borings.

Mr. Seeley showed me a nearby section of the city, wherein damage to the cables was particularly severe, and suggested that the odor arising from several sugar factories located here, attracted the beetles to this immediate vicinity.

(*Signed*) RAYMOND C. SHANNON.

From my own personal observations and also from reports received from other States in Brazil—namely Bahia, Alagôas and São Paulo—I can confirm that the areas affected by the depredations of the beetles, generally contain armazens for sugar, wine or spirit, or some odorous food which attract the beetles to those locations.

On March 31st, 1930, with Dr. Shannon and Mr. G. Lopes, the writer visited the lumber yard "Xixi" Rua Pilar in the affected area Bahia. Much of the timber had the small holes but usually they were accompanied by the presence of the wood dust made by the borings of the powder-post beetles. However, below one plank there were found several small cone-shaped piles of sawdust and this was examined. Three large size galleries were found and in each of them was found the larva[1] of a Cerambycid beetle. One of the larvae was well over an inch in length, the other two were little more than half an inch long. It can not here be stated that they are actually the *Megaderus stigma*, but the presence of larvae belonging to this group of beetles in the timber yards is of sufficient importance to place the yards under suspicion.

It appears that the lumber arrives from the interior with the larvae already in the wood, as the plank in question had been in the yard approximately two months and owing to shipping delays it had taken about three months to arrive from Caravellas (south of the State of Bahia) to the Port of Bahia (São Salvador). Similar entrance holes were found in wine casks stored in a wine shop and from the statement of the dealer it appears these borings occur with frequency in this district, his attention being drawn to these holes by the leakage of wine. Again, there is a possibility that these holes are made by the powder-post beetle. No adult beetles of *Megaderus stigma* have been found in Bahia during the course of this investigation.

It may be of interest to state that in one area, outside the sphere of operations of the Emprezas Electricas Brasileiras,

[1]Subsequent examination of these larvae by Dr. F. C. Craighead proved that they are not even closely related to *Megaderus* and therefore not concerned in the lead cable injury.

it is reported that a cure has been effected by wrapping the plain lead sheath with white cotton tape—the tape being afterwards painted with a red oxide paint. It is probable that a serving of tarred jute over the lead sheath would also afford protection from the larvae and in addition would doubtless make the cable distasteful to the female beetle. On the other hand, if the misguided females could all be tempted to lay their eggs on lead instead of wood, the race would become extinct.

In view of the extended use of aerial lead-covered cable all over the world it is hoped that these notes will stimulate further interest in the problem before us. Much can be done by cooperation and interchange of experiences and by pooling our ideas it may yet be possible to restrict the destructiveness of the *Megaderus stigma* to their natural wood-boring habits.

WILLIAM BARNES.[1]

On May first, after a protracted illness, Dr. William Barnes died. His passing closes an important chapter in American Entomology and ends a varied and interesting career. William Barnes was a rare man, distinguished as a surgeon, eminent as a citizen and public benefactor, first among American Lepidopterists and unsurpassed as a host and friend. His entire life—except for the time passed at college and in traveling—was spent in Decatur, Illinois. There he was born on September 3, 1860. There he was graduated in 1877 from the Decatur High School. There, after graduation from Harvard University (1883) and Harvard Medical School (1886) and after a postgraduate medical study in Germany, he returned to begin his career as a surgeon, to carry on his researches in American Lepidoptera and to bring together the great collection that bears his name and that is generally conceded to be the largest, finest, most complete, and most accurately determined collection of American Lepidoptera in the world.[2] If Dr. Barnes had done nothing but assemble this collection, he would have done a great work, but he did much more. He employed specialists to work on his collection and made it free of access to any responsible worker. During his lifetime Decatur was an Entomological center, a rallying point for Lepidopterists, where hospitality was open and "indoor collecting" of the best. He gave material freely to other Museums and collectors. He published extensively. The copiously illustrated "Contributions to the Natural History of the North American Lepidoptera," embodying the researches of himself and his collaborators and consisting of extensive descriptive and revisionary papers, is an important addition to Entomological literature. He was active in civic affairs and a tireless worker for any project, institution, or cause that would benefit his community. He was one of the founders and supporters of the Decatur and Macon County Hospital at Decatur, and a guiding spirit in that institution until his death. He enjoyed good living, appreciated good books, and despised hypocrites and frauds. Working under him was, as Foster H. Benjamin once remarked, "like taking a postgraduate course. You really began to make fewer mistakes." With his passing, Entomology loses a master worker and a princely patron, our society a valued member, and we, who knew him intimately, a rare and steadfast friend.

[1]Prepared at the request of the Society by William Schaus, August Busck, and Carl Heinrich.

[2]As this goes to press, we learn that this magnificent collection has been secured through act of Congress by the U. S. Bureau of Entomology and will be deposited in the U. S. National Museum.

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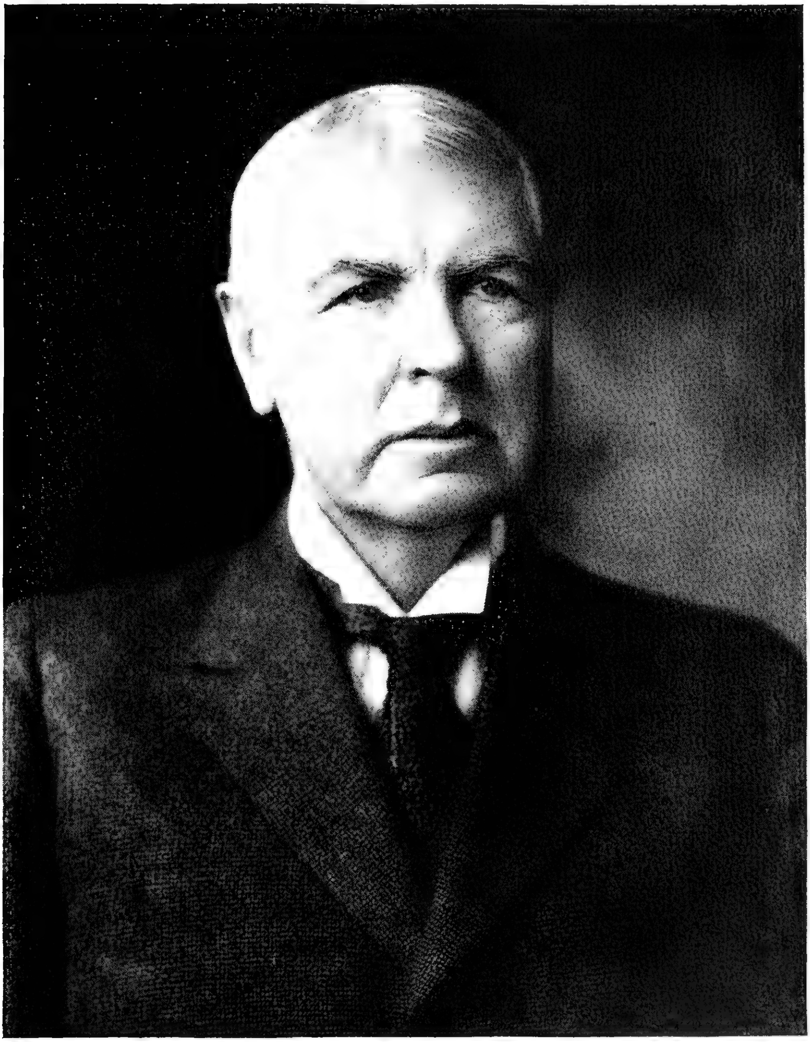

William Barnes.

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SIX NEW SPECIES OF MALLOPHAGA.

By H. E. Ewing, *United States Bureau of Entomology.*

Here are given the descriptions of six new species of biting lice. Eachof these species is somewhat unusual in certain anatomical structures. The descriptions are in a way preliminary ones, as further studies are contemplated.

Colpocephalum menoponoides, new species.

Head of the *Menopon* type; ocular emarginations slight; expansions of head above antennal fossae, each with transverse suture. Eyes double, corneas degenerate, pigment spot pronounced; labrum greatly reduced; ventral clypeal region without sclerite; gular area about two-thirds as broad as long, gular setae very long, six in each row, first somewhat smaller than the rest.

Thorax somewhat longer than head; prothorax with strongly developed lateral lobes, each bearing a small anterior spine and a very long posterior seta; setae in posterior transverse row of prothorax eight, long, equally spaced. Mesothorax scarcely half as big as metathorax but separated from the latter by a somewhat indistinct dorsal suture. Metathorax not as broad as first abdominal segment, with about a dozen long subequal setae in transverse row.

Abdomen broad, broadest near the middle, with all its nine segments unreduced. Tergites poorly sclerotized, each typically with two transverse rows of dorsal setae. Spiracles minute, subequal and each situated laterally in a tergite. Last segment of abdomen with a marginal fringe of equally spaced, slender setae. Abdomen with only two pairs of ventral combs, which are on the third sternite. On one side of fourth sternite in one specimen there is an incomplete comb.

Legs typical, last pair longest. Third femora each with three complete ventral combs. Claws sharp but curved chiefly near the tip.

Length of female, 1.80 mm.; width, 0.78 mm.

Type host and type locality.—From *Fulica* sp., National Zoological Park, Washington, District of Columbia.

Type slide.—Cat. No. 42852, U. S. N. M.

Described from three females taken from a coot, *Fulica* sp., at the National Zoological Park. This species is so decidedly *Menopon*-like that it would be placed in the genus *Menopon* but for the ventral combs.

Colpocephalum africana, new species.

Head with large, protruding, rounded temporal lobes and well developed temporal bands (occipital bands), the latter being densely pigmented at the ends. Each expansion of head over antennal fossa pigmented, scaled above and with only lateral notch. Eyes wanting. Anterior margin of clypeus with about six setae and a pair of erect peg-like spines; last seta in lateral marginal row of forehead very long, next to last short.

Thorax about as long as head; prothorax angulate laterally and with a spine at lateral apex; prothoracic marginal setae stout, twelve in number; prosternite a small tubercle; mesothorax small, about twice as broad as long, almost completely overlapped dorsally by metathorax, separated from the latter dorsally by a line. Metathorax as large as pro-, and mesothorax taken together, broadest at posterior margin and studded above with setae arranged into irregular transverse and longitudinal rows.

Abdomen long and narrow, none of its nine segments reduced; tergites fused with pleurites and studded with many small, spinelike setae, also each bearing along its posterior margin a row of large, long setae; spiracles minute, subequal, dorso-lateral. Sternite III with three combs on each side.

Rodlike basal plate of male genital armature extending forward to anterior margin of segment III; parameres greatly reduced, almost straight and not reaching the end of endomeral plate; dorsal chitinizations resembling a spearhead with two large, lateral, recurved teeth near the base at each side and two converging rows of short, sharp, recurved teeth on ventral side.

Legs well sclerotized; first coxae platelike, contiguous at their posterior ends and divergent anteriorly; claws rather weak, sharp, slightly curved.

Length of male, 2.20 mm.; width, 0.66 mm.

Type host and type locality.—Alopochen aegyptiacus, from Tana River, British East Africa.

Type (*holotype*).—Cat. No. 42853, U. S. N. M.

A single male specimen from type host, a goose, at type locality, August 24, 1912.

Colpocephalum echinatum, new species.

Head much broader than long; temporal lobes large, subquadrate; labrum small, not extending laterally to bases of mandibles; anteclypeus (ventral clypeal region) almost obliterated; temporal bands (occipital bands) almost interrupted but expanded and heavily pigmented at the ends; anterior margin of clypeus with six short setae, the inner pair being dark and spinelike; last seta on lateral margin of forehead stout, about equal in length to last segment of palpus, next to last seta short, spinelike; eyes wanting.

Thorax slightly longer than head; prothorax fitting into and filling up occipital emargination, strongly lobed laterally; prosternite a flattened, spinelike tubercle; mesothorax subquadrate, broader than long, so completely overlapped dorsally by metathorax as to be seen from above only as a strongly sclerotized neck uniting rest of body to prothorax; metathorax not as broad as segment I of abdomen, above sparsely clothed with setae of varying length.

Abdomen of male broad and stout; segment I longer than II; segment VIII about one and a half times as long as VII; segment IX broadly rounded both in front and behind and with about ten long setae on the posterior margin. Abdomen of female beyond segment II drawn out into a long flat cone. Tergites completely fused with pleurites, provided with but few setae except near their lateral margins; last tergite with straight converging sides and angulate posterior margin. Posterior margin of this tergite with a fringe of setae, some of which are grouped into a tuft at the apex. Each pleurite typically with a very long seta and several short ones. Spiracles minute, subequal, dorso-lateral.

Rodlike basal plate of male genital armature extending to base of abdomen; parameres straight, blunt pointed, as long as endomeral plate; dorsal chitinizations (inner chitinizations) spear-head shape, with two pairs of large, hooklike, lateral teeth, but without smaller ventral teeth.

Legs stout; first coxae platelike, remarkably developed, anterior half of each quandrangular, well sclerotized, posterior half attenuated, semi-hyaline and overlapping the mesothorax for half of the latter's length; femur of each leg of posterior pair with 4–5 ventral combs.

Length of female, 2.15 mm.; width, 0.78 mm.; length of male, 1.35 mm.; width, 0.65 mm.

Type host and type locality.—*Pavo muticus* from Trong, Lower Siam.

Type slide.—Cat. No. 42854, U. S. N. M.

Description based on five females and one male taken from skin of type host, obtained at type locality. Specimens collected and mounted by Dr. E. A. Chapin. Kellogg and Paine have described a *Colpocephalum*, *C. thoracicum* taken from *Pavo muticus* in Burma. Their species is of a type different from *echinatum*. In it the abdomen of the female is not drawn out so as to be cone shaped; also the pterothorax of *thoracicum* is of a shape entirely different from that of *echinatum*.

Lipeurus volsellus, new species.

Head about one and two-thirds times as long as wide; forehead broadest at posterior aspect; trabeculae short, triangular, as broad as long. Labrum much reduced, membranous area in front of labrum very large. Temples very broadly rounded, not protruding, each with a single large seta and several minute ones. Eyes degenerate; corneas not evenly rounded; ocular seta small.

Thorax about as long as head; prothorax twice as broad as long, without any large setae; mesothorax completely fused with metathorax; pterothorax twice as long as prothorax and broader than either head or first abdominal segment, with about eight posterior marginal setae.

First segment of abdomen reduced, quadrangular, not as broad as second; segments VIII and IX fused in female but separated in male; segment VIII of male with a lateral, ventral pair of long, curved, hooklike appendages, equal in length to the segment that bears them; segment IX of male formed into two conspicuous lobes that curve backward, downward and inward; fused segments

VIII and IX of female ending in a stout pair of forceps and bearing a pair of poorly developed gonapods. Each typical pleurite of abdomen articulates with pleurite in front of it by means of an inner, capitate condyle.

Genital armature of male small, degenerate; basal plate extending forward only to about the middle of seventh abdominal segment; parameres minute, immovable, vestigal; endomeral sclerotization diamond-shape.

Legs rather long, last pair much the longest; each tibia of each pair of legs provided with an enlarged distal spine that is used to appose tarsal claws. First coxae contiguous, last coxae broadly separated.

Length of male, 1.90 mm.; width, 0.41 mm.; length of female, 2.25 mm.; width, 0.60 mm.

Type host and type locality.—*Aramides cajaneus chiricote* from Gatun, Canal Zone, Panama.

Type (holotype).—Cat. No. 42855, U. S. N. M.

Described from a male and female. Female from type host and type locality, May 4, 1911, by Biological Survey; male (straggler) from a quail, Canal Zone, Panama, by Biological Survey. An unusual species, particularly on account of the reduction in size of the first segment of the abdomen, and in the shape of last abdominal segment.

Trichodectes brachycephalus, new species.

Head much flattened, being almost twice as broad as long. Forehead reduced, triangular, sides about straight; trabeculae fixed, medium, tuberclelike; ventral cephalic groove deep, narrow, flanked by a pair of recurved, hooklike tubercles. Fronto-clypeal apodomes situated about midway between the trabeculae and apex of head, each continued dorsally and posteriorly into a free, projecting spinelike tubercle. True eyes wanting, each eye being represented by a corrugated tubercle; ocular seta wanting. Antennae of male large; first segment much enlarged, about as long as other two taken together; last segment somewhat uncinate and terminating in two short, stout, sharp spines.

Thorax broad and short; prothorax about twice as broad as long but not as broad as head; mesothorax completely fused with metathorax; pterothorax about four times as broad as long, expanded laterally into winglike lobes, and bearing a posterior, submarginal row of about six, subequal, dorsal setae; sternal plates wanting.

Abdomen short and broad, being the broadest part of the body. Pleural plates well developed and all present. Spiracles subequal, very large, situated in pleural plates. Segments VIII and IX fused in male; sternite of VIII forming the large genital plate which is about half as long as abdomen and three-fourths as broad as long.

Genital plate of male genital armature represented by two divergent rods; parameres large, flat, somewhat platelike, slightly curved and each terminating in a small knob; endomeral plate represented by two large semi-circular strips of chitin that unite to produce the pseudopenis; pseudopenis extending almost to tips of parameres and ending in a trefoil.

Legs short; coxae close together, third pair contiguous; trochanters and tarsi very short.

Length of male, 1.15 mm.; width, 0.76 mm.

Type host and type locality.—*Nycticebus coucang*, from Johor Lama, Malay Peninsula.

Type.—Cat. No. 42856, U. S. N. M.

Described from a male specimen taken from a skin (U. S. N. M. 114151) of the type host, a flying lemur. This species is unusual in having such a large genital plate and in the extreme width relative to length of the pterothorax.

Trichodectes abnormis, new species.

Head somewhat asymmetrical, the right lateral margin of forehead being very broadly rounded, almost straight; while the left lateral margin is produced into more or less of an angle at the base of the marginal thickening of ventral cephalic groove. Temporal lobes rounded, not protruding; eyes reduced, without pigment, ocular seta about twice as long as diameter of eye; trabeculae very large, as broad as long, not reaching the end of first antennal segment; fronto-clypeal apodeme at the base of trabeculae, not showing line of closure.

Thorax much shorter than the head but equal in width to the latter; prothorax about three times as broad as long, but not as broad as the pterothorax; prothoracic spiracles very large, in diameter equal to about one-half the length of prothorax, situated ventrally in pleural regions. Pterothorax with very short, strongly divergent sides and broadly rounded, outwardly curved posterior margin.

Abdomen stout, broadest at third segment; pleurites all present but poorly sclerotized; spiracles wanting; eighth abdominal segment almost as broad as long, subcylindrical; ninth segment very small, broader than long, cone-shape.

Basal plate of male genital armature with lateral margins thickened; parameres very unusual, each being a straight rodlike structure arising proximal to endormeral plate and extending along side of its fellow to tip of eighth abdominal segment; endomeral plate represented by a crescent of chitin, hinged at each end to the thickened margin of the basal plate.

Coxae ventral, anterior pair almost contiguous, second pair farthest apart; leg I short, with tibia bearing a stout distal spine functioning as a thumb.

Length of male, 1.10 mm.; width, 0.50 mm.

Type host and type locality.—*Lemur rufus* from east coast of Madagascar.

Type (holotype).—Cat. No. 42879, U. S. N. M.

A single male from skin (U. S. N. M. 63338) of type host, taken at type locality, June 12, 1895. An unusual species in several respects. The asymmetry of the head is not pronounced and possibly may be due to individual variation.

THE DISCOVERY OF WHAT IS POSSIBLY THE LARVA OF AN INTRODUCED TENEBRIONID, LEICHENUM VARIEGATUM KÜST.

By R. A. St. George,
Bureau of Entomology, United States Department of Agriculture.

In a recent study of the larvae of the Tenebrionid sub-family Opatrinæ, as represented in the U. S. National Museum collection, an undetermined specimen was found which appears to be of considerable taxonomic interest. An examination of the characters of this larva revealed its relationship to the Opatrinae. In the collection only one North American genus, *Ephalus*, and species, *latimanus* Lec., are represented in this subfamily. Two larvae and an adult of this latter species were taken at Wareham, Massachusetts, by S. Henshaw in May, 1895.

The foregoing undetermined specimen differed from the larvae of *Ephalus* sufficiently to indicate that it belonged to another genus. This specimen was collected around the roots of Bermuda grass that was found along the shore of Mobile Bay in Alabama.

An examination of Leng's catalogue to determine the distribution of other forms in this subfamily indicated that none of the genera of the tribe Opatrumini, to which *Ephalus* belongs, were indigenous to the Gulf-Coast region and only one genus in the remaining tribe Leichenini. This genus, *Leichenum*, possesses the single species *L. variegatum* Küst. It is a species introduced from Madagascar and the only locality from which it is known in this country, according to Leng, is Alabama.

In view of this it seemed to the writer that this larva might quite possibly be that of *Leichenum variegatum* and that it could easily have become established either by adults escaping while goods were being unloaded from a ship, or through the dropping or throwing out of infested material which contained nearly mature larvae, the latter completing their development and then becoming associated with the roots of the Bermuda grass. The specimen was collected by Mr. H. P. Loding along the bay shore. The date of collection was not given.

The following characters define the larvae of Opatrinae and are common to the specimen tentatively determined as *Leichenum variegatum* Küst.:

Back of the mandible opposite the cutting edge slightly sharp, and opposite the molar part with a membranous elevation bearing anteriorly one or two setae and posteriorly as many short, thick spines, apex of both mandibles bifid with an additional dorsal tooth between apex and molar part.

Ninth abdominal segment shorter than eighth, usually wider than long, subconically produced, obtusely pointed, apex not mucronate; side margins posteriorly set with from two to eleven spines on each side, tergum otherwise without spines, paramedianly with one anterior and one posterior pair of setae; sternum with a few setae, often arranged in a transverse row.

Tenth segment with a pair of subconical, setiferous anal pseudopods, which sometimes bear two to three spines.

Clypeus usually armed with two spines and two setae, one of each on each side. In *Opatrum depressum*, a form from Java, there are only the two setae.

Labrum armed, the disc bearing either two spines, one on each side, or six spines, three on each side.

First article of antenna usually slightly shorter than second, except in *Phylax littoralis* Muls. (an European species), which has the first article twice as long as second.

Dorsal half of head capsule not setose but sides and ventral half sometimes slightly setose.

Ocelli arranged in a single transverse group on each side of head.

Epipharynx bearing three spine-like setae along the anterolateral margin, two hooks medianly; usually without two large teeth posteriorly, but sometimes with numerous minute ones.

Hypopharyngeal sclerite tricuspidate, with the median portion slightly produced but not bifid.

Prothoracic legs larger than the two other pairs; claw incurved, slender and tapering.

Abdominal spiracles annular, with circular mouth piece.

Explanation of Plate.

Leichenum variegatum Küst.? Details of larva.

(Drawings by the author.)

Fig. 1. Dorsal view of head showing the clypeus (*cl*), labrum (*lab*), and articles of antenna (*1*, *2*, *3*).

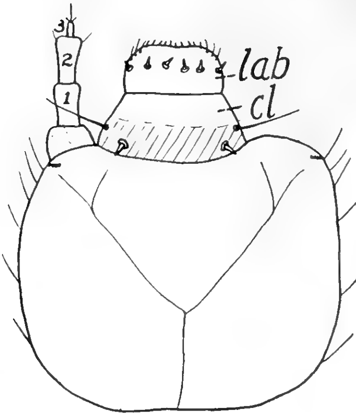
Fig. 2. Ephipharynx and anterior margin of labrum; *eph*, epipharynx; *h*, median paired hooks.

Fig. 3. Hypopharyngeal region, portion of oesophagus and hypopharyngeal bracon; *hsc*, hypopharyngeal sclerite; *hbr*, hypopharyngeal bracon; *oes*, oesophagus.

Fig. 4. Dorsal side of right mandible; a^1 and a^2, bicuspidate apex; *t*, additional dorsal tooth of cutting edge between apex (a^1) and molar part (*m*); *sm*, sharp margin on back opposite the cutting edge; *s*, membranous swelling on back opposite the molar part (*m*), bearing a seta anteriorly and a spine posteriorly.

Figs. 5, 6. Left prothoracic and metathoracic legs, respectively, showing anterior face; *cox*, coxa; *tr*, trochanter; *fe*, femur; *ti*, tibia; *ta*, tarsus.

Fig. 7. Dorsal view of eighth (VIII) and ninth (IX) abdominal ("pygidial") segments.



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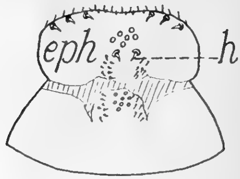

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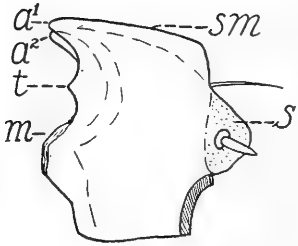

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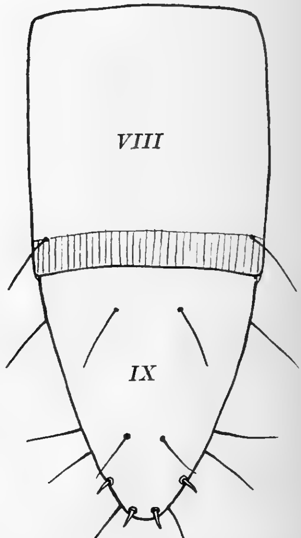

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NEW WEST INDIAN BUPRESTIDAE (COLEOPTERA).

By W. S. Fisher,
Bureau of Entomology, United States Department of Agriculture.

In working over the West Indian material in the family Buprestidae which has accumulated during the past year the writer found the new species herein described.

Polycesta insulana, new species.

Female.—Broadly elongate, two and three-fourths times as long as wide, broadly, equally rounded in front and behind, moderately convex above, and uniformly piceous, with a vague reddish-brown tinge on the dorsal surface.

Head flat, and feebly, transversely depressed between the antennal cavities; occiput without longitudinal carina; surface coarsely, deeply, irregularly punctate, the punctures variable in size and more or less confluent, and sparsely clothed with long, erect, inconspicuous hairs; intervals irregular in shape, convex, smooth, and shining; epistoma broad, and feebly, arcuately emarginate in front.

Pronotum strongly transverse, two times as wide as long, slightly narrower in front than behind, and widest at basal third; sides strongly obliquely expanded from apical angles to basal third, where they are obtusely angulated or rounded, then strongly narrowed to the posterior angles, which are nearly rectangular; anterior margin deeply, arcuately emarginate, with a broadly, vaguely rounded median lobe, and the margin smooth and feebly elevated; base feebly, obliquely arcuate on each side, with the median lobe broad, slightly produced, and narrowly truncate in front of scutellum; disk with a broad, angular, moderately deep median depression; surface coarsely, deeply, irregularly punctate, the punctures well separated on the median part, but becoming more or less confluent toward the sides of the pronotum, and with a few short, inconspicuous hairs arising from the punctures; intervals finely, densely granulose, and subopaque. Scutellum subquadrate, wider behind than in front, and slightly elevated.

Elytra feebly convex, and about as wide as pronotum at base; humeral angles broadly rounded; sides feebly expanded behind the humeral angles, nearly parallel to apical third, where they are slightly wider than at base, then arcuately narrowed to the tips which are conjointly broadly rounded, the lateral margins coarsely, irregularly serrate posteriorly; each elytron with five smooth, longitudinal costae including the scutellar one, which is distinct and extends nearly to middle of elytron, the two discal costae extending from base to apex of elytron, and the third costa interrupted near the humerus; there are also ten rows of deep, round punctures on each elytron, which are arranged in double rows between the costae, and the rows separated from each other by straight, longitudinal intercostae, which are subequal in height to the costae, the punctures rather uniform in size and shape, usually well separated from each other on the disk, but becoming more or less confluent toward the lateral margins; surface of costae, sutural and lateral margins sparsely, vaguely punctate, and clothed with a few very short, inconspicuous hairs.

Abdomen beneath coarsely, densely punctate, and rather densely clothed with moderately long, semierect, cinereous hairs; intervals smooth and shining; first segment moderately convex, sparsely punctate at middle, and without a densely punctured and pubescent median spot; last segment broadly rounded at apex. Prosternum moderately convex, coarsely, densely punctate, and sparsely clothed with long, erect, inconspicuous hairs; anterior margin feebly elevated, nearly truncate at middle, and with a broad, vaguely indicated lobe on each side; prosternal process short, very broad, nearly flat, and without marginal grooves, the sides obliquely narrowed to middle of anterior coxal cavities, where they are emarginate and abruptly narrowed, then obliquely narrowed to the apex, which is broadly rounded.

Length, 21.5 mm.; width, 8 mm.

Type locality.—Bath, Jamaica.

Type.—Cat. No. 43136, U. S. National Museum.

Described from a unique female collected at the type locality by Wirt Robinson during July, 1902.

In my table of the species of *Polycesta*[1] known from the West Indies, this species runs to No. 7, but it differs from *chevrolati* Thomson in having the punctures on the elytra round and arranged in regular rows, and the pronotum broadly and deeply depressed at the middle. According to the description of *perfecta* Kerremans, *insulana* differs from that species in coloration, and in having small, round punctures on the elytra. This species also resembles *thomae* Chevrolat, but differs from that species in having very distinct scutellar costae, the intercostae on the elytra straight, subequal in height to the costae, and the punctures between the costae are round, nearly equal in size and shape, and arranged in double rows. The writer has not examined specimens of *perfecta* Kerremans or *gossei* Waterhouse, both described from Jamaica, but *insulana* does not agree with the description given for either of these species.

Psiloptera (Lampetis) aurata var. domingoensis, new variety.

Similar in shape and structure to *aurata* Saunders, but differs from it in color. Elytra brownish black, with distinct greenish and purplish reflections when viewed in certain lights, and the lateral margins broadly reddish cupreous behind the middle. In the typical *aurata* the elytra are of a uniform aeneo-cupreous or aureo- cupreous color.

Length, 17–23 mm.; width, 6.5–9.5 mm.

Type locality.—Romana, Santo Domingo.

Type and paratype.—Cat. No. 43137, U. S. National Museum.

Described from two specimens collected at the type locality during July, 1925, by H. E. Box.

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[1]Proc. U. S. Nat. Mus., vol. 65, No. 2522, Art. 9, 1925, p. 8.

Actenodes nobilis (Linnaeus).

Buprestis nobilis Linnaeus, Syst. Nat., 10 ed., 1758, p. 410.

A single example of this species was collected at Port-au-Prince, Haiti, during 1899, by R. J. Crew, and it is identical with specimens of this species from Brazil. This species was originally described by Linnaeus from "Indiis." It has been recorded in the literature from various parts of Mexico, Central America, and South America, but this is the first time it has been recorded from a definite locality in the West Indies.

Peronaemis elegans, new species.

Broadly agriliform, broadly rounded in front, strongly acuminate behind, glabrous, and rather strongly shining; head green, with the entire median part purplish red, margined golden yellow; pronotum purplish red, base and anterior margin narrowly green, with a large bluish green spot becoming golden yellow internally at the posterior angles; scutellum violaceous; elytra purplish or brownish red, the bases and lateral and sutural margins narrowly bluish green or violaceous, more or less margined golden yellow internally, and each elytron with a large inconspicuous purplish spot at middle, behind which is a small inconspicuous golden yellow spot; beneath bluish green, with a distinct cupreous tinge when viewed in certain lights, and the legs violaceous.

Head feebly and evenly convex, nearly flat between the eyes, with a short longitudinal carina on the occiput, and without any distinct depressions; surface coarsely, densely, deeply, regularly punctate; intervals smooth on the front, but becoming finely granulose on the occiput; epistoma wide between the antennal cavities (about four times as wide as the cavities), vaguely, broadly, arcuately emarginate in front, with the sides strongly angulated.

Pronotum strongly convex, one and one-half times as wide as long, slightly wider at base than at apex, and widest along basal half; sides arcuately expanded from apical angles to apical third, then nearly parallel to the posterior angles, which are rectangular; anterior margin with a vague, broadly rounded median lobe; base nearly transversely truncate, with a vaguely rounded median lobe; lateral margins when viewed from the side sharply defined, arcuate, and extending from base to anterior margin; surface with three large basal depressions extending to middle of pronotum, the median one broader than the lateral ones, densely and coarsely punctate, the punctures deep and irregularly distributed; intervals finely granulose toward base, and with a more or less distinct longitudinal smooth space in the median depression. Scutellum nearly twice as wide as long, obliquely narrowed anteriorly, broadly rounded posteriorly and the surface transversely depressed and finely reticulate.

Elytra slightly wider than pronotum at base; sides nearly parallel to behind the middle, where they are slightly arcuately expanded, then obliquely narrowed to the tips, which are acute, and the lateral margins finely and irregularly serrate; humeral angles rectangular; basal depressions broad, transverse, and shallow; surface more or less irregularly rugose in the basal regions, and punctate-striate, the punctures irregular in the striae, coarse in the basal regions but becoming finer toward the apices; intervals finely, densely granulose, and sparsely, irregularly punctate.

Abdomen beneath strongly convex, rather densely punctate, the punctures well separated and becoming finer toward the apex of the abdomen, and from each puncture arises a moderately long, semierect, inconspicuous hair; intervals finely, densely granulose; last segment strongly attenuate, and feebly, arcuately emarginate at apex. Prosternum very coarsely punctate, the punctures deep and well separated; anterior margin transversely truncate; prosternal process nearly flat, sides nearly parallel to behind the coxae, then obliquely narrowed to the apex, which is broadly rounded. Posterior coxae strongly concave, and the surface irregularly punctate, the punctures coarse internally but becoming finer externally.

Length, 10 mm.; width, 3.2 mm.

Type locality.—Loma del Gato Mountains, Oriente Province, Cuba.

Type.—Cat. No. 43138, U. S. National Museum.

Described from a single example (sex not determined) received from S. C. Bruner, and collected by Brother Hermano Norberto, of La Salle College, Havana, at the type locality during July, 1925, at an elevation of approximately 900 meters.

This is the second species to be described in the genus *Peronaemis*, and it differs from the genotype, *thoracicus*, described by Waterhouse from Jamaica, in coloration, and in having the sides of the pronotum nearly parallel along the basal two-thirds, the lateral margins of the pronotum when viewed from the side sharply defined for their entire length, and the elytra more rugose and more strongly punctured.

Neotrachys hoffmani, new species.

Rather broadly elongate, moderately convex, broadly rounded in front, more narrowly rounded posteriorly, slightly narrower behind than in front, glabrous, subopaque, and uniformly dark bronzy green above; beneath piceous, with a vague aeneous tinge.

Head broad, nearly flat, feebly, longitudinally depressed on the front, broadly, deeply, transversely depressed behind the epistoma, and with a deep postoral pore on each side situated at the margin of the antennal cavity; surface finely, densely granulose, and coarsely, irregularly punctate, the punctures shallow, well separated, and becoming obsolete toward the epistoma; epistoma wide between the antennal cavities (about three times as wide as the cavities), and the anterior margin broadly, deeply emarginate, and strongly elevated; antennae short and uniformly piceous.

Pronotum feebly convex, nearly two and one-half times as wide as long at middle, distinctly narrower in front than behind, and widest at base; sides arcuately narrowed from base to anterior angles, and narrowly margined; anterior angles obtuse; posterior angles nearly rectangular and feebly projecting; anterior margin broadly, arcuately emarginate, with the median lobe only vaguely indicated; base transversely truncate to near middle of each elytron where it is arcuately sinuate, then turning obliquely backward to the scutellum, in front of which it is broadly rounded; surface feebly, broadly depressed along the lateral margins, and the base toward posterior angles finely, densely granulose, and coarsely, sparsely, and irregularly punctate. Scutellum very small and triangular.

Elytra moderately convex, and distinctly wider than pronotum at base; humeral angles broadly rounded; sides nearly parallel to behind middle, then arcuately narrowed to the tips, which are conjointly broadly rounded, with the lateral margins entire; each elytron with a broad, shallow depression along lateral margin, the depression interrupted at the middle by a broad elevation, but without a distinct basal depression; surface somewhat uneven, vaguely rugose, without lateral carinae, and rather densely, coarsely, irregularly punctate, the punctures shallow, and becoming more obsolete toward the apices.

Abdomen beneath coarsely, sparsely, ocellate-punctate, and very sparsely clothed with short, inconspicuous hairs; intervals finely, densely granulose; last segment broadly rounded at apex. Prosternum sparsely, coarsely punctate; anterior margin broadly rounded and feebly declivous; prosternal process broad, slightly expanded behind the coxal cavities, and broadly rounded at apex.

Length, 3 mm.; width, 1.5 mm.

Type locality.—Porto Rico.

Type.—Cat. No. 43139, U. S. National Museum.

Described from a unique specimen collected by W. A. Hoffman and labelled "Porto Rico," without any definite locality.

This species is allied to *guadeloupensis* described by Fleutiaux and Sallé, but differs from that species in being subopaque, uniformly dark bronzy green above, broadly elongate, and not so strongly narrowed posteriorly.

EIGHT NEW SPECIES OF SERPHOIDEA (HYMENOPTERA) FROM BRITISH COLUMBIA.

By Oscar Whittaker.

The following species are all described from specimens taken in western British Columbia by the writer, in whose collection, except where stated otherwise, all type material remains.

CALLICERATIDAE.

CALLICERAS Nees (=*Ceraphron* Jurine).

Calliceras pacifica, new species.

Female.—Head and thorax black; abdomen brown, basally yellow; antennae with the scape basally brownish-yellow, apically dark brown; pedicel dark brown, apically paler; flagellum brown becoming darker towards apex, the apical three joints black; legs yellow, apex of front femora dorsally brown; apical joints of tarsi sometimes slightly dusky; wings faintly tinged with brown, tegulae and venation brown, the radius paler. Head transverse, as wide as thorax, one and one-half times as wide as long viewed from above; eyes large, hairy, reaching the occiput which is nearly straight; ocelli in an equilateral triangle, lateral ocelli about as far apart as from the eyes and occiput; vertex and frons shagreened, the latter with a deep depression in front of anterior ocellus which extends as a deep groove to the clypeus; vertex with a groove extending from just behind the anterior ocellus to the occiput and a shallow depression external to the lateral ocelli; facial depression large and deep, smoother than vertex, very finely and somewhat transversely rugulose. Antennae with scape one-half as long as flagellum; pedicel about one and one-half times as long as joint 3; joints 4–6 equally long but becoming distinctly thicker, two-thirds as long as joint 3; joint 7 slightly longer than joint 6; joints 7–9 each slightly longer and considerably thicker than the preceding joint; joint 9 slightly thicker than long; apical joint conic-ovate, twice as long as thick and about as long as joints 3–5 combined. Pronotum very short; mesonotum and scutellum shagreened, the former with a distinct median groove; scutellum elongate, frenal grooves punctate, meeting a short distance from the posterior margin of mesonotum. Head and thorax with short, scattered, pale hairs; propodeum with the posterior angles produced; pleurae smooth. Wings with the radius long, curved. Abdomen polished, longer than the thorax, acutely pointed at the apex, the base emarginate and shortly striate; second tergite somewhat more than twice as long as rest of abdomen.

Length, 1.2–1.3 mm. *Expanse*, 2.1–2.3 mm.

Described from ten specimens taken at Chilliwack on various dates from April to October, 1926-7.

Paratypes sent to U. S. N. M. and Mr. Robert M. Fouts.

Variation.—The basal abdominal band varies a little in brightness and extent and in one example is absent.

APHANOGMUS Thomson.

Aphanogmus subapterus, new species.

Female.—Head and thorax black; scape and pedicel dull yellow, flagellar joints becoming darker from the base, distal joints dark brown; legs, except coxae, yellow; apical joint of front tarsi dusky; abdomen brownish-black. Head very nearly twice as wide as long, wider than the thorax, front and hind margins straight; eyes large, nearly reaching the occiput; ocelli conspicuous, in a triangle, the lateral ocelli about as far apart as from the eyes and further than this from occiput. Vertex regulose, with a depression before front ocellus; facial depression almost smooth. Antennae subclavate, shorter than the body; scape robust, thickest near base, four times as long as pedicel or about as long as pedicel and joints 3–5 combined; joint 3 slightly longer than pedicel; joints 4 and 5 slightly shorter than pedicel; joints 7 and 8 equal in length to pedicel; joint 9 equal to joint 3, as thick as long; apical joint very nearly twice as long as preceding joint, conic-ovate; basal joints of flagellum basally narrowed, subpedunculate, the apical four joints with a short, distinct, sublateral peduncle. Mesonotum longitudinally rugulose; scutellum rugulose, extending to posterior face of propodeum, frenum distinct, punctate; scutellum with scattered pale hairs along the side margins. Wings much abbreviated, barely reaching the middle of second tergite. Abdomen highly polished, longer than thorax, basally with short, fine striae and a few pale hairs on the sides, apically acute.

Length, 1.15 mm.

Described from a single female taken at Chilliwack, 13 September, 1927.

Aphanogmus canadensis, new species.

Male.—Black, antennae and legs piceous, scape apically paler; hind coxae, except dorsally, base of all tibiae and all metatarsi sordid yellow, rest of tarsi dusky brown. Head about one and three-quarters as wide as long viewed from above, slightly wider than the thorax. Eyes large, nearly reaching the occiput, which is feebly emarginate. Ocelli conspicuous, in a triangle, the lateral ocelli further apart than from front ocellus or eyes, much nearer to the occiput. Vertex finely reticulate, depressed before front ocellus; frons more finely sculptured; facial depression smooth, with a broad raised area above the base of mandibles, extending upwards toward front ocellus, above this a small, slightly raised tubercle. Antennae slightly longer than the entire body; scape obclavate, as long as joints 3 and 4 combined; pedicel subglobular, about one-third as long as joint 3; joints 3–10 elongate, laterally constricted at base, apically obliquely truncate; joints 4–10 subequal, slightly shorter than joint 3 which is about three times as long as thick; apical joint equal to joint 3, cylindrical, conically pointed at tip; all flagellar joints with sparse, long hairs. Pronotum invisible from above. Mesonotum and scutellum with similar, but coarser, sculpture to the vertex; posterior margin of mesonotum slightly emarginate; scutellum longer than mesonotum, reaching posterior face of propodeum; frenal grooves uniting a considerable distance from base of scuttellum. Propodeum with the posterior angles shortly, acutely produced. Wings subhyaline, venation brown, radius almost straight, as long as marginal vein. Abdomen highly polished, shorter than thorax.

Length, 0.97 mm. *Expanse*, 1.8 mm.

Described from two specimens taken at Hollvburn, 8 June, 1928, and 3 July, 1929.

Paratype sent to Mr. Robert M. Fouts.

Aphanogmus obsoletus, new species.

Female.—Black; antennae piceous brown, apex of scape paler; legs piceous brown, apex of front femora, front tibiae and extremities of middle and hind tibiae paler; front tarsi pale brown; middle and hind tarsi yellowish-brown, apical joint of all tarsi dusky. Head about one and one-half times as wide as long, slightly wider than the thorax; eyes large, not reaching the occiput, which is almost straight; ocelli conspicuous, in a triangle; lateral ocelli about as far apart as from the occiput and further than this from the eyes. Vertex shagreened; depressed before front ocellus; facial depression almost smooth, with a rounded ridge extending from the base of the mandibles almost entirely across the depression. Antennae robust; scape thickest near the base, as long as pedicel and joints 3–5 combined, one-third as long as entire flagellum; pedicel as long as joint 3; joint 3 two and one-half times as long as thick; joints 3–9 subequal in length, gradually becoming thicker, joint 9 only slightly shorter than joint 3, one and one-half times as long as thick; apical joint two and one half times as long as thick, twice as long as the preceding joint. Thorax one and one-half times as long as wide; pronotum invisible from above, mesonotum and scutellum with the sculpture slightly finer than that of the vertex; frenum distinct, anterior margin of basal lobes of scutellum concave; pleurae smooth; posterior angles of propodeum not produced. Wings subhyaline, with a very faint brownish band across the disc, venation brown, radius wanting. Abdomen highly polished, somewhat shorter than the thorax.

Length, 0.97 mm. *Expanse*, 1.95 mm.

Described from a single specimen taken at Hollyburn, 12 May, 1928.

Aphanogmus dorsalis, new species.

Female.—Head and thorax black; scape and pedicel pale yellow, flagellum grading from pale yellow to light brown in the last four joints; front coxae black, trochanters yellowish-brown; femora, except apically, brown; tibiae and tarsi pale yellow; middle coxae basally black, trochanters and coxae apically yellow; middle femora brown, the extremities paler; middle tibiae and tarsi pale yellow, the tibiae brownish in the middle; hind coxae, except the extreme base which is black, trochanters and femora pale yellow; hind tibiae brown, the extremities paler; hind tarsi pale yellow, the metatarsi pale brown; abdomen ventrally yellow, anterior face of second tergite and a large dorsal area, which reaches a little beyond the middle, also yellow, the rest black. Head and thorax smooth; head one and one-half times as wide as long, wider than thorax; eyes large, almost reaching the occiput, which is nearly straight; ocelli conspicuous, in a triangle, the lateral ocelli about as far apart as from the occiput and further than this from the eyes; facial depression smooth and polished. Antennae slender, subclavate; scape obclavate, as long as pedicel and joints 3 and 4 combined; pedicel and joints 3–9 equal in length but becoming gradually thicker; joint 9 twice as long as thick; apical joint one and one-half times as long as preceding joint. Thorax about one and two-thirds as long as wide; vertex, mesonotum and scutellum with microscopic, reticulate, incised sculpture and scattered pale hairs; scutellum very convex, longer than mesonotum, reaching posterior face of propodeum, with a distinct, punctate frenum and with a long, narrow, smooth field, almost reaching the apex, enclosed by two longitudinal, posteriorly convergent carinae; hind angles of propodeum subacute. Wings subhyaline, with a broad, faint, fumose band across the disc, the apex beyond the radius also faintly fumose; costal and marginal nervures brown; radius pale, straight, longer than marginal nervure. Abdomen highly polished, shorter than thorax, base of second tergite without distinct striae.

Length, 0.9 mm. *Expanse*, 1.8 mm.

Described from three specimens from Hollyburn, 18 June and 3 July, 1928.

Paratype sent to Mr. Robert M. Fouts.

CONOSTIGMUS Dahlbom.

Conostigmus pulchellus, new species.

Male.—Black; scape basally brownish yellow, becoming darker on the apical half; pedicel and flagellum black; legs yellowish brown; front tarsi and apical joints of middle and hind tarsi dusky brown; wings fumose, with a darker cloud on disc below radius; venation and stigma dark brown. Head, viewed from above, twice as wide as long, very slightly wider than thorax, obliquely narrowed behind the eyes, which are remote from the occiput; occiput separated from vertex by a carina which is adjoined by a row of punctures; ocelli in a triangle, the lateral ocelli about as far apart as from the eyes and more than this distance from the occiput, considerably in front of hind margin of eyes; vertex and frons coarsely rugose; frons with a depression before front ocellus and with a median, vertical groove extending from this depression towards the clypeus; facial depression smooth, with a deep central pit. Antennae pubescent, slender, filiform, a little longer than the entire body; scape thicker then flagellum; pedicel short, subglobular; joint 3 the longest, longer than scape, six times as long as thick; joints 4–10 becoming shorter and slightly thinner; joint 10 slightly less than one-half as long as joint 3; apical joint slightly longer than preceding joint. Mesonotum and scutellum alutaceous, the lateral lobes of the former and scutellum less conspicuously so; scutellum as long as mesonotum, frenal lines punctate, meeting at anterior margin of scutellum. Propodeum rugose; pleurae smooth, each with a row of conspicuous punctures. Head and thorax with fairly dense, scattered pale hairs. Wings with the subcostal nervure somewhat swollen before reaching the stigma; stigma twice as long as wide; radius gently curved, one and one-half times as long as stigma. Abdomen elongate-oval, considerably longer than thorax, highly polished, constricted and with a few, longitudinal striae at base; second tergite nearly twice as long as rest of abdomen.

Length, 2.9–3.3 mm. *Expanse*, 4.7–5.6 mm.

Described from four specimens taken at Hollyburn, 18 June, 11 July, 1928; 3 and 30 September, 1929.

DIAPRIIDÆ.

MONELATA Foerster.

Monelata nigra, new species.

Female.—Black, polished; antennae with scape, pedicel and proximal flagellar joints reddish brown; flagellar joints becoming darker distally, the apical three or four joints black; legs pale brown, the swollen parts of femora and tibiae dark brown; coxae black; last joint of all tarsi dusky; wings very faintly fumose, venation brown. Head subglobular, viewed from above a little longer than wide; ocelli in an equilateral triangle, much nearer together than to the eyes and occiput; sides of occiput with brownish, woolly pubescence. Antennae slightly longer than head and thorax combined, two-thirds as long as entire body; scape as long as pedicel and five following joints combined; flagellum two and one-quarter times as long as scape; pedicel as long as joints 3 and 4 combined; joint 3 about as long as two following joints combined; joints 4–9 about as long as thick; joints 10–12 becoming thicker, joint 12 distinctly transverse; apical joint (club) very large, oval, a little more than twice as long as thick, as long as four preceding joints combined. Pronotum short, sides and dorsum, except in the middle, clothed with woolly pubescence; mesonotum with the hind margin feebly convex; scutellum basally broad, narrowed about one-third from base, beyond this with the sides straight and parallel; hind margin straight, posterior angles rounded; propodeum with a distinct, much raised, median carina, the sides clothed with dense woo'ly pubescence; propleurae and mesopleurae smooth; metapleurae hairy; petiole surrounded with dense woolly hairs. Abdomen as long as head and thorax combined; second tergite widest near the hind margin, about one and one-half times as long as wide, the base ventrally hairy; remaining abdominal segments very short.

Length, 1.5–1.65 mm. *Expanse*, 2.8–3.0 mm.

Described from twelve specimens taken at Hollyburn on various dates from 9 May to 18 September, 1928–30.

Paratypes sent to U. S. N. M., Dr. A. A. Ogloblin and Mr. Robert M. Fouts.

ACANOSEMA Kieffer.

Acanosema sylvana, new species.

Female (Type).—Head, thorax and petiole black; antennae brown, the three or four distal joints blackish; legs brown, base of hind coxae black; abdomen dark brown, wings strongly tinged with brown, venation and tegulae brown. Head smooth and polished; viewed from above about one and one-half times as wide as long, about as wide as thorax; ocelli in a triangle, lateral ocelli separated by slightly less than their distance from the eyes, much further than this from the occiput; occiput, except in the centre, with a ring of pale, tomentose pubescence. Antennae as long as head, thorax and petiole combined, scape terminating in two short, dentate processes, as long as following five joints combined, a little more than four times as long as pedicel; joint 3 one and one-quarter times as long as pedicel, two and one-half times as long as thick; joints 4–14 about equal to pedicel, gradually increasing in thickness; joint 14 as thick as long; apical joint twice as long as preceding joint, nearly twice as long as thick. Thorax smooth and shining; pronotum clothed with dense, pale, tomentose pubescence; mesonotum with deep, percurrent, posteriorly convergent notauli; scutellum with a very deep basal fovea, the sides and apex with long, pale hairs; propodeum with a broad, much raised median carina, having a fine groove down the centre; propleurae and mesopleurae smooth; metapleurae and base of hind coxae hairy. Petiole wider than long, widest in the middle, without striae, anterior margin straight, much narrowed posteriorly. Wings with first abscissa of radius very short, perpendicular to the marginal nervure which is three and one-half times as long as first abscissa of radius; second abscissa of radius, cubitus, discoidal, median and brachial nervures present as fuscous streaks; second abscissa of radius very long, enclosing an elongate area more than twice as long as marginal nervure; cubitus straight, directed towards the basal nervure, the extreme apex deflected towards the discoidal nervure. Abdomen highly polished, elongate-oval, apically acute, including petiole one and one-third times as long as head and thorax combined; second tergite one and one-half times as long as wide, about one and three-quarters times as long as remaining segments combined; sides and ventral surface of propodeum, petiole and base of second tergite, except narrowly in the centre of dorsum, with long, pale, woolly hairs.

Length, 4.5 mm. (including ovipositor 5.6 mm.). *Expanse*, 7.0 mm.

Male (Allotype).—Antennae with the scape and pedicel light brown, the flagellum very dark brown, slender, longer than head, thorax and petiole combined; scape twice as long as joint 3; pedicel subglobular; joint 3 excised on basal half, two and one-half times as long as pedicel and slightly longer than joint 4; joints 4–13 gradually shorter; joint 13 about half as long as joint 3 and about one and one-half times as long as thick; apical joint about as long as joint 3. Petiole nearly one and one-half times as long as wide, smooth, the sides convex, constricted at base, without distinct striations. Abdomen elongate-oval, including petiole as long as head and thorax combined; second tergite about one and one-half times as long as wide; following segments to the sixth successively shorter. In other characters agrees with the female. The proportions of the petiole vary to some extent, some examples having it nearly as wide as long. The color varies slightly in depth and one specimen has the petiole dark brown like the abdomen. The second abscissa of the radius sometimes fails to quite reach the costal margin of the forewing.

Length, 3.0–4.2 mm. *Expanse*, 6.0–8.0 mm.

Described from a single female taken on 27 August, 1930, and twelve males on various dates from 5 July to 2 October, 1928–9; all from Hollyburn.

Paratypes sent to U. S. N. M., Dr. A. A. Ogloblin and Mr. Robert M. Fouts.

EPIBLEMA STRENUANA WALK., THE HOST OF CERTAIN PARASITES OF THE ORIENTAL FRUIT MOTH, LASPEYRESIA MOLESTA BUSCK (LEPIDOPTERA).

By H. W. Allen and Earl Lott,
U. S. Bureau of Entomology, Moorestown, N. J.

One of the interesting new developments in the study of the parasites of the oriental fruit moth is the discovery that a common and widely distributed borer (*Epiblema strenuana* Walk.), the larvae of which occur in the stems of ragweed (*Ambrosia artemisiaefolia*), serves as an alternate host for several of the more important parasites of the oriental fruit moth.

The parasites of the oriental fruit moth which have been reared from *Epiblema strenuana* are *Macrocentrus ancylivora* Roh., *M. delicatus* Cress., *Glypta rufiscutellaris* Cress., *Pristomerus ocellatus* Cush., and *Cremastus minor* Cush. In New Jersey, the first three mentioned are the most important parasites of the larvae of the oriental fruit moth, and are also among the more abundant parasites of *E. strenuana*. The identity of the parasites reared from *E. strenuana* was established by Mr. R. A. Cushman from adults reared from field-collected larvae, and was corroborated in the case of two of the species, namely, *M. ancylivora* and *G. rufiscutellaris*, by the observation of mating of individuals of one sex reared from the oriental fruit moth with individuals of the opposite sex reared from *E. strenuana*. The host was determined by Mr. Carl Heinrich. In a total of 284 borers reared from the stems of Ambrosia collected near Moorestown, N. J., between August 13 and September 3, last, 10 per cent were parasitized by *M. ancylivora*, 23 per cent by *M. delicatus*, 18 per cent by *G. rufiscutellaris*, and 5 per cent by *P. ocellatus*. Only 17 per cent of the host adults emerged, the combined parasitism being 83 per cent. From several collections of the same brood of *E. strenuana* obtained from points in Pennsylvania, Ohio, and Indiana, no *M. ancylivora* was reared. However, numerous *G. rufiscutellaris* and *M. delicatus* were reared from the three States mentioned, and *P. ocellatus* from Pennsylvania and Ohio.

The host, *E. strenuana*, is very widely distributed in the United States westward to the Rocky Mountains. Like the oriental fruit moth, it belongs to the Eucosminae, and its larvae bore in the stems of the host plant as do the larvae of the earlier generations of the oriental fruit moth. It occurs in great abundance over thousands of acres of grain stubble, weedy crops, and field and roadside borders which are overgrown with ragweed in middle to late summer. *E. strenuana* apparently serves as a very important reservoir for parasites of the oriental fruit moth at certain periods of the year when the larger proportion of the larvae of this host are embedded in fruit and hence not accessible to attack by its larval parasites.

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PROCEEDINGS OF THE

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VOL. 32 NOVEMBER, 1930 No. 8

NOTES ON TYPES (HYMENOPTERA : CYNIPIDAE).

By Lewis H. Weld, *East Falls Church, Virginia.*

During the two decades or more that Professor J. J. Kieffer worked on the Cynipidae it appears that he never visited the leading entomological museums of Europe to study types but depended mainly on the literature for his understanding of the existing genera. This dependence on the literature alone led to a misunderstanding of some of the Ashmead genera. It led him into error also in the case of some of the genera established by Europeans so that in creating some 55 new genera himself he has made some synonyms especially in cases where the older authors had placed their genera in the wrong subfamilies. No student of the Cynipidae hitherto has attempted to locate and study the types of the genotype species. Recently the writer visited three of the European museums with this as a definite object and it seems desirable to place on record some of the information and conclusions which resulted from this incomplete preliminary study.

PARAMBLYNOTUS Cameron.

Allocynips Kieffer, 1914 Phil. Jour. Sci. D 9 : 185. Synonymy new.

Cameron placed his genus *Paramblynotus* in the Figitinae but the holotype female of the genotype species, *punctulatus*, in the British Museum has not the characteristic segmentation of the abdomen of a Figitid, tergite five and not tergite three being the largest and it is preceded by three (instead of one) shorter, non-liguliform tergites. The genus should be transferred to the Liopterinae. *Allocynips borneensis* Weld is a synonym of it and should be known as *Paramblynotus punctulatus* Cameron. (Synonymy new.) *Allocynips ruficeps* Kieffer, the genotype of *Allocynips*, is a synonym of *Paramblynotus ruficollis* Cameron. (Synonymy new.) All the other described species of *Allocynips* should be transferred to Cameron's genus and known as: *Paramblynotus clarus* (Weld); *P. dyak* (Weld); *P. malayensis* (Weld); *P. isosceles* (Weld); and *P. flaviceps* (Kieffer). (Combinations new.) The male which Cameron received later and subsequently described as the male of his *punctulatus* seems to me to be erroneously associated and to be an undescribed species.

PSEUDIBALIA Kieffer.

One of the characters given for this genus is that the metatarsus of the hind leg is prolonged "au côté interne" into a blunt spur reaching the end of the second segment. The holotype female of the genotype species, *fasciatipennis*, in the British Museum has this spur on the *outer* side as it is in *Ibalia* and not on the inner as described by Kieffer. The petiole is described as 3-4 times as long as broad but measured by a micrometer it is barely three times as long as broad when viewed from above. The relative lengths of the tergites along the dorsal curvature are as (petiole) 17 (width 5¾) : 6 : 9 : 23 : 9 : 7 : 9. Height of abdomen 33 and width 23. As both *Pseudibalia* Kieffer and *Paribalia* Weld have the tarsal spur on the outer side the latter genus may be distinguished by having a short petiole (not longer than broad) and having the fifth tergite (instead of the fourth) largest.

NERALSIA Cameron.

Xyalosema D T & K. 1910 Das Tierreich Lief. 24 : 94. Synonymy new.

Neralsia was based on *N. rufipes* from Guatemala and was described (1883, Biol. Cent.-Amer. Hym. 1:74, Pl. 4, fig. 9) as having a closed radial cell (although Cameron's figure shows it open) and thought to be intermediate between the Anacharitinae and Figitinae. Das Tierreich put it in the Aspicerinae. The type in the British Museum is one of the Figitinae. The abdomen is longer than head plus thorax, the second tergite striate at the base, not liguliform, shorter than the third. The wing is normally pubescent and ciliate and the radial cell is open on the margin. The eyes are sparsely hairy and not bare as stated. *Solenaspis* Ashmead 1887, preoccupied by Osten Sacken in Diptera in 1881 and renamed by Dalla Torre and Kieffer in 1910, is congeneric with this and the name *Xyalosema* should become a synonym of *Neralsia* in the Figitinae. *Solenaspis singularis* Ashmead is a *Xyalophora* (Comb. new). To the genus *Neralsia* should be transferred the following species:

Neralsia armata (Say) (Diplolepis) 1836 Boston Jour. Nat. Hist. 1 : 266. Comb. n.

Neralsia hyalinipennis (Ashmead) (Solenaspis) Genotype. 1887 Trans. Amer. Ent. Soc. 14: 155. Comb. n. = *dubiosa* Kieffer (Xyalosema) 1910 Boll. Laboro. Zool. Portici 4 : 338. Syn. n.

Neralsia ciliatinervis Kieffer (Xyalosema) 1910 Boll. Laboro. Zool. Portici 4 : 339. Comb. n.

Neralsia evanescens Kieffer (Xyalosema) 1907 Ent. Ztschr. Stuttgart 21 : 157. Comb. n.

ANACHAROIDES Cameron.

Coelonychia Kieffer, 1910 Wiss. Erg. Deutch. Zent.-Afr. Exp. 1907–8, 3 (2) : 19. Synonymy new.

Cameron's genus was based on *Anacharoides striaticeps* (Rec. Albany Mus. 1: 160, 1904) from Cape Colony and placed in the Anacharitinae. The type is in the British Museum and it belongs in the Aspicerinae for the second tergite is liguliform, the wings bare and the veins very pale. The type of *Coelonychia spinosipes* in the Berlin museum is congeneric with this. Therefore Kieffer's *Coelonychia*, correctly placed in the Aspicerinae, becomes a synonym of *Anacharoides* Cameron.

BOTHROCHACIS Cameron.

Stirencoela Cameron, 1910 Entomologist 43 : 180. Synonymy new.
Ditrupaspis Kieffer, 1910 Wiss. Erg. Deutch. Zent.-Afr. Exp. 1907–8, 3 (2) : 18, Synonymy new.

Cameron's *Bothrochacis* was founded on two males of *Bothrochacis erythropoda* from Cape Colony. Six years later he founded the genus *Stirencoela* on a male of *Stirencoela striaticollis*, also from Cape Colony. The types of both are in the British Museum and they seem to me to be not only congeneric but the same species (Synonymy new.) The type of *Ditrupaspis semirufa* Kieffer from N. Nyassa preserved in the Berlin museum is congeneric with the above. Hence I conclude that both *Stirencoela* and *Ditrupaspis* should become synonyms of *Bothrochacis* Cameron.

ANDRICUS Hartig.

Oncaspis Dettmer, 1925 Natuurhist. Maandb. Maastricht 14 : 123.
Euschmitzia Dettmer, 1925 Natuurhist. Maandb. Maastricht 14 : 122. Synonymy new.

Type material of *Oncaspis filigranata*, the genotype species, seen in Berlin in 1929, runs to *Andricus* and Professor Dettmer wrote me in April, 1927, that he had discovered that it is "almost certainly the long sought for sexual generation of *Andricus solitarius* (Fonsc.) and not a new genus." In 1928, he published a description of the gall and his evidence that it is the sexual generation of *Andricus solitarius* (Fonsc.) in Marcellia 24 : 142. His *Euschmitzia rara*, the genotype, was thought to be a guest-fly in a *Rhodites* gall but as his description was not that of an inquiline his attention was called to the possibility of error and under date of May 1, 1929, he writes me that this species is the sexual generation of *Andricus nudus* Adl. and requests that I publish it. Thus both of his new genera become synonyms of *Andricus*.

CALLIRHYTIS Förster.

In the original description of the genotype, *Callirhytis hartigi* Förster, it is not stated whether or not the tarsal claws are toothed. Mayr in 1902 considered them as simple and Ashmead in his key to genera in 1903 reversed Mayr's interpretation by putting species with simple claws in *Andricus* (whose genotype has toothed claws) and those with the claws toothed in *Callirhytis*, thus causing a confusion which has persisted to the present day. Das Tierreich has followed Mayr's interpretation but its authors seem to be unacquainted with the genotype species. The museum in Vienna has two specimens labelled "Aachen, *Call. Hartigi*, Förster's type. Collect. G. Mayr." They are males. Without having seen females I venture the guess that this is the sexual generation of a species whose agamic generation will be found to be in "stone galls" inside of acorns. From the above specimens the following notes are made to supplement Förster's original description:

Callirhytis hartigi Förster.

Male.—Amber-colored. Head coriaceous, from above transverse, occiput concave, wider than thorax, cheeks not broadened behind eyes. Malar space .17 eye without groove. Flagellum filiform with cylindrical segments, the first curved and enlarged distally and not quite as long as the second, the last only slightly longer than the penultimate. Mesoscutum with low sharp transverse ridges well separated from each other on a uniformly smooth surface. The parapsidal grooves not very distinct even posteriorly and obsolete in front. Scutellum with transverse groove at base and a suggestion of small narrow pits which open out behind on to disk which is transversely rugose. Mesopleura smooth below, coriaceous across middle, the first and second coxae far separated. Carinae on propodeum straight and parallel. Claws are simple. Wing seems to be normally pubescent and ciliate. First abscissa of radius arcuate, second straight. Abdomen shorter than thorax, longer than high, tergites along dorsal curvature as 30 : 9 : 1 : 0 : 6.

Callirhytis azteca (Cameron). Comb. new.

Andricus (*Aphilothrix*) *aztecus* Cameron, 1897 Ann. & Mag. Nat. Hist. (6) 19 : 261.

The holotype female in the British Museum from Sonora, Mexico, proves to be a *Callirhytis* with hyaline, non-ciliate wings and running to couplet 23 in Section B of my key in Proc. U. S. N. M. 61, Art. 19: 11. It is evidently from a "stone gall" in an acorn.

Callirhytis defecta Kieffer.

This American species whose types are in Berlin is also one of the "stone gall" in acorn group and runs to couplet 21 on p. 11 in the above mentioned key.

Amphibolips arcuata (Kieffer). Comb. new.

Callirhytis arcuata Kieffer 1910 Boll. Laboro. Zool. Portici. 4 : 341.

Of the three specimens in the Berlin Museum all collected by Klug in Georgia and all labelled as types, and supposedly of Kieffer's species above, only one agrees with the description. It is the one numbered "8070" and is here transferred to the genus *Amphibolips*. The number 8037 is a *Callirhytis* and 8022 is a *Disholcaspis*.

HOLOCYNIPS Kieffer.

This genus was founded by Kieffer on a single captured specimen from Georgia described as *Holocynips emarginata* and the genus has hitherto remained unrecognized in our fauna by American students. A study of the holotype in the Berlin Museum shows that the first three species in the writer's key to the root gall forming species of *Callirhytis* in Proc. U. S. N. M. 59 : 213 (1921) are congeneric and should be transferred to this genus. Moreover, *corallosa* Weld (1921) proves to be the same species as *emarginata* Kieffer (1910). As this had been suspected, a paratype of *corallosa* had been taken along to Berlin and the above conclusion is the result of a direct comparison. But *corallosa* had previously been shown to be a synonym of *Amphibolips badius* Bassett (1922, Proc. U. S. N. M. 61, Art. 18 : 17). Thus recognizing the validity of Kieffer's genus the names of its three species are:

Holocynips badia (Bassett). Comb. new.

Amphibolips badius Bassett (= *Callirhytis corallosa* Weld). Synonymy published.
Holocynips emarginata Kieffer, 1910 Boll. Laboro. Zool. Portici 4 : 114. Synonymy new.

A further note on the biology of the species is here added. An adult was taken ovipositing in the buds at the summit of a thrifty shoot of *Quercus alba* L. at East Falls Church, Va., on April 13, 1924. The alternating generation is unknown. One was captured on the roof of the Education Building 125 feet above the sidewalk and a mile from any oak trees in Albany, N. Y., on April 15, 1927.

Holocynips hartmani (Weld). Comb. new

Holocynips maxima (Weld). Comb. new.

A fly of this species was taken ovipositing in the buds of *Quercus alba* L. at Washington, D. C., on March 27, 1921; another was taken April 15, 1924, and two more on April 20. At East Falls Church, Va., one was taken ovipositing in buds of white oak on April 18, 1927, and others on April 6, 13, 19, 20, 1928. The alternating generation is unknown. One was captured on the roof of the Education Building in Albany, N. Y., on April 20, 1927.

LIODORA Förster.

Förster's types of *Liodora sulcata*, the genotype species, were studied, two specimens in Berlin and four in Vienna. They do not seem to me to be congeneric with the sexual generation of *Diplolepis folii* (L.) and it is my present opinion that Das Tierreich has been in error in including *Liodora* in *Diplolepis* and that it would be better to maintain it as separate genus. Through the kindness of Dr. F. Maidl the U. S. National Museum has been able to acquire one of the Vienna specimens in exchange and from this the following notes have been made to supplement Förster's original description.

Liodora sulcata Förster.

Female.—Head from above transverse, as broad as thorax, not broadened behind eyes, occiput slightly concave. Malar space .4 eye without groove. Antennae 14-segmented, relative lengths as (scape) 15 (6) : 8 (6) : 15 (5) : 13 : 11 : 10 : 9 : 9 : 9 : 8 : 8 : 8 : 8 (6) : 11. Pronotum "narrow," pubescent on sides. Mesoscutum as broad as long, smooth and shining with a few scattered hairs anteriorly, parapsidal grooves deep, smooth, percurrent, separation at hind margin about three times the width of a groove. No median. Anterior and lateral lines scarcely visible. Scutellum rugose, pubescent, distinctly overhanging metanotum behind, with two deep, smooth, elliptical pits at base separated by a distinct septum. Mesopleura smooth and shining with a few scattered hairs below. Propodeum with two almost straight and parallel carinae enclosing a transverse smooth bare area with no median. Tarsal claws with a distinct tooth. Wing normally pubescent and ciliate, radial cell about four times as long as broad, first abscissa of radius arcuate and one-fifth as long as the second which is straight. Areolet small, reaching one-ninth and the cubitus about three-fourths way to basal. Abdomen sessile, the short rugose neck of propodeum not reaching as far back as the tip of the scutellum; length to height to width as 65 : 55 : 44. Lengths of tergites along dorsal curvature as 50 : 12 (rest hidden), the second with usual pubescent patches at base and hind margin in side view a straight line at angle of 45 degrees to longitudinal axis. Sheaths at same angle, the tips projecting slightly dorsally behind second tergite. Ventral spine in side view directed amost horizontally backward, slender, four times as long as broad at base, a few hairs on ventral surface of hypopygium but scarcely any on spine. Using the width of the head as a base the length of mesonotum ratio is 1.3, length of antenna 2.27, length of wing 4.0. Length of body 2.1 mm.

PANTELIELLA Kieffer.

Through the courtesy of Dr. F. Maidl of the Vienna Museum the U. S. National Museum was given a portion of the type gall cluster of *Panteliella fedtschenkoi* (Rübsaamen), genotype species, on leaf of *Phlomis tuberosa* L. from "Bijou-Onlar, Krim." After relaxing the galls I was able to cut out two adults from which the following notes are made to supplement the original description.

Panteliella fedtschenkoi (Rübsaamen).

Female.—Brown, the head and abdomen lighter, legs yellowish. Head from above transverse, wider than thorax, occiput slightly concave; from in front broader than high, interocular area 1.5 times as broad as high, malar space .6 eye without groove. Antennae 14-segmented, relative lengths of segments (in balsam mount) as (scape) 21 (14) : 24 (14) : 24 (11) : 24 : 24 : 23 (15) : 21 : 21 : 20 : 20 (15) : 20 : 20 : 20 : 30 (13). Pronotum "broad" in the median line as in the *Aylax* group. Mesoscutum under magnification of 75 coriaceous, aciculate behind, without distinct parapsidal grooves (their position however and that of a median is faintly indicated in the sculpture). Scutellum finely rugose with two distinct smooth pits at base separated by a septum from which fine ridges spread out fanwise on to disk. Mesopleura aciculate. Tarsal claws in balsam mount simple (not "weakly toothed"). Wing normally pubescent, first abscissa of radius heavy, straight, about one-sixth length of second which is straight also. Abdomen higher than long, relative lengths of tergites along dorsal curvature as 30 : 8 : 4 : 3 : 2 : 6, second occupying .68 length of abdomen. Ventral spine in side view about twice as long as broad. Using the width of the head as a base the length of mesonotum ratio is 1.0, length of antenna 2.0, length of wing 3.1. Length of body 1.15 mm.

Synergus filicornis Cameron.

Synergus furnessana Weld, 1913, Insecut. Insc. Menst. 1: 134, Pl. 4, figs. 8–13. Synonymy new.

The Cameron holotype female from Guatemala in the British Museum has the mesopleura all black. Except on this one point the description of my *furnessana* from Mexico agreed with it. I recalled however that there was some variation in color in the type material of *furnessana* and on my return I found among the paratypes a female with black mesopleura. This was sent to London where through the kindness of Dr. James Waterston and Mr. R. B. Benson a direct comparison was made with the Cameron type. "*Furnessana* is apparently the same as *filicornis*. Neither of us can see anything to distinguish them. The color is exactly similar." Hence I conclude that I have redescribed Cameron's species under the name of *furnessana* which should now go into synonymy.

Information is desired as to the location of the types of any of the following Kieffer species of Cynipidae: *Callirhytis marianii* (*meunieri*); *Holocynips nigra* (1916 from Philippines, not 1910); *Lambertonia abnormis; Liebelia cavarae; Lytoxysta brevipalpis; Parandricus mairei; Poncyia ferruginea; Salpictes rufiventris, Tavaresia carinatus;* and *Tylosema nigerrimus*.

THE OCCURRENCE OF THE CRICKETS ANAXIPHA PULICARIA BURM. AND CYCLOPTILUM TRIGONIPALPUM (RHEN AND HEBARD) IN THE VICINITY OF THE DISTRICT OF COLUMBIA, HITHERTO UNREPORTED HERE.

By H. A. Allard, *U. S. Department of Agriculture, Washington, D. C.*

Anaxipha pulicaria Burm.

For a number of years I have made field observations on a tiny cricket occurring in the deep ground debris of cold, wet swampy bogs around Clarendon and Barcroft, Virginia. This tiny cricket appears very early in May and usually becomes silent before July 1. Its stridulation is a continuous weak nemobious-like trill. The crickets are very difficult to capture and the small amount of material examined by Mr. A. N. Caudell of the U. S. National Museum and myself was tentatively pronounced a physiological form of *Anaxipha exigua*. A discussion of this cricket was made in my paper, "Physiological Differentiation in Overwintering Individuals of Certain Musical Orthoptera," *The Canadian Entomologist*, LXI, September, 1929, 195–198.

In 1929 further observations were made in a bog near Barcroft, Virginia, and additional material obtained. On the suggestion of Mr. B. B. Fulton that our material was perhaps identical with a cricket he had been studying in central North Carolina in similar habitats, and known as *Anaxipha pulicaria* Burmeister, careful comparisons of this additional material were made by Mr. Caudell with *Anaxipha exigua*.

This examination has led to a separation from *Anaxipha exigua* material on the basis of several characters. In both sexes all *exigua* material shows a more or less well-marked dark longitudinal stripe along the lower half of the outer face of the hind femora. This stripe may vary in intensity, sometimes being very faint, but it is never absent. Likewise in *exigua* material the ovipositor is fully ½ as long as the hind femora.

All material from the deep ground debris of the cold, wet bogs around Clarendon, and Barcroft, Virginia, consistently lacks this longitudinal dark stripe on the hind femora, and the ovipositor is distinctly less than ½ as long as the hind femora.

The color and morphological differences, together with its restricted bog habitat, its occurrence in the adult form many weeks before the adults of *A. exigua*, and the distinctiveness of its trill in comparison with the notes of *A. exigua*, make it fairly certain that the cricket is the more southern species *Anaxipha pulicaria*.

This cricket has heretofore not been reported farther north than Raleigh, North Carolina, its range extending southward into Florida, Texas, Mexico and Jamaica.

With the final separation of these crickets from *A. exigua* and their identification as *Anaxipha pulicaria*, we have added to the Orthopteran fauna of the District of Columbia a cricket hitherto unknown in this region.

Cycloptilum trigonipalpum (Rhen & Hebard).

Near sundown on the evening of June 30, 1930, while reading, I heard a few shrill ringing sounds which finally attracted my attention as insect music. Later in the evening I again heard the same chirping sounds, and with a flash light traced them to the kitchen. The "singer" was finally located in a strawberry basket filled with currant stems and unripe currants—the debris remaining from fruit recently picked in the garden. The tiny cricket was finally captured and kept in a screened jar in my bedroom for the night. Occasionally I heard its leisurely delivered, shrill chirps, *tiiiiiii*, reminding me of the chirps of the jumping tree cricket (*Orocharis saltator*) in pitch, but of finer quality and less trilling tone.

This cricket was identified by Caudell as *Cycloptilum trigonipalpum* Rehn & Hebard, being the first record of this southern species for the vicinity of the District of Columbia. The northern-most reported occurrence is Petersburg, Virginia, south of Richmond. No other individuals have been seen or heard since this solitary individual appeared at Lyon Park, Virginia.

While it is possible that this individual may have been inadvertently transported by some motor carrier or other agency from points farther southward, where it is of general occurrence, there is quite as good reason to infer that all the localities of its northern-most distribution have not yet been determined.

In this connection it may be said that in the case of the little southern cricket *Anaxipha pulicaria*, its occurrence around Washington, D. C., which at the present time seems to be its northern-most limit, is likewise extremely variable and irregular. As a matter of fact, slightly favorable or unfavorable conditions near the limits of the range of a creature, may determine its presence or absence in a locality.

THE NORWAY MAPLE NEPTICULA (LEPIDOPTERA).

By E. P. Felt,

Director and Chief Entomologist, Bartlett Tree Research Laboratories, Stamford, Conn.

This European insect, *Nepticula sericopeza* Zeller, determined by August Busck of the U. S. National Museum, first came under observation in America, June, 1928, through the persistent dropping of large numbers of Norway maple leaves.[1]

An examination of these leaves showed that at the very lower part of the leaf stem for a distance of about half an inch, there was a somewhat characteristic, variable, sooty black discoloration and at a point almost exactly half an inch from the base of the leaf stem there was a minute, white, elevated, oval object suggestive of a fungus fruiting body and presumably consisting of dried sap which had exuded from the point of oviposition. The interior of the leaf stem from this point nearly to the very base was traversed by a very minute channel or mine about three-eights of an inch long, and some at that time contained a nearly transparent, very slender larva about a sixteenth of an inch long and with a diameter of approximately one-fiftieth of an inch. The caterpillar has a light brown, semi-transparent head with strongly supporting chitinous rods and margins. The body segments are smooth, whitish, transparent and the posterior segment somewhat produced along the middle line and with sub-lateral, oblique, chitinous rods or spines and also a

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[1]*Nepticula sericopeza* Zeller, discovered by Dr. Felt in eastern United States and presumably a recent introduction from Europe, may be distinguished among the nearly three hundred described species of the genus by its coloration: Head reddish yellow; collar whitish; eyecape ochreous white; forewings blackish brown with base, an outwardly curved fascia before the middle and opposite costal and dorsal spots at apical third, white; underside of the forewing of the male with a large deep black sexscaling on basal half, containing a striking yellowish white, spoolshaped oblique spot. The genitalia of both sexes, typical of the genus, also present excellent specific characters.

August Busck.

sub-median, chitinous structure terminating in two curved rods.

The dropping of leaves continued till well toward the end of June and an examination of selected branches from a Norway maple some 60 feet high showed a somewhat general infestation throughout the tree, there being at that time approximately 10 per cent of the leaves infested. The earlier dropping was probably considerably in excess of this 10 per cent and it is believed that 25 per cent represents the minimum defoliation by the insect on the tree under observation. Attempts to rear the adult from these leaf stems and also from sod under the trees proved futile. Subsequent observations indicate that the insect is probably unable to complete its transformations in the leaf stems and that this habit is abnormal and occurs only when there are no seeds available for oviposition. The identification was made by collecting moths in June, 1929, and establishing them in cages on Norway maple. They produced the characteristic injury to the leaf stem and the correctness of this observation was confirmed by rearing large numbers from infested seeds or keys in 1930.

There was a heavy crop of Norway maple seeds in portions of the northeastern United States in 1930 and in mid-June large numbers of these dropped from the trees. An examination showed the same type of injury as had been observed in 1928 and 1929, on the leaf stems. These proved to be inhabited by a very similar larva to that observed two years earlier, except that it was larger. Infested seeds, when green, are easily recognized by the sooty discoloration, indicating galleries which usually start at one point, and upon breaking the seeds apart, there are usually burrows along the suture partly filled with somewhat characteristic reddish orange borings. Recently infested seeds generally have the minute white spot, presumably dried sap, as in the case of leaf stalks. The identity of the earlier found moths was confirmed by rearing from infested seeds. It is noteworthy that a very large proportion of the earlier dropping larger seeds, namely nearly 99 per cent, were infested, while of the smaller seeds falling at the same time, less than 14 per cent were infested. Moths were observed in greater or less numbers throughout July and into August, though none were found in September, indicating that possibly the dry weather the latter part of the year had caused the seeds to harden to such an extent as to make them unacceptable for oviposition. There were certainly two and possibly three generations. Tutt in British Lepidoptera (Vol. 1, page 344–45, 1899) states that the species is double or probably continuously brooded, adults appearing in April–May from hibernating larvae, again in June–July and a third in August. The moister climate of England might easily make possible another generation than occurs in this country. They were also taken in the Stamford area from late May until into August.

The small, dusky, white-marked moths are a trifle over an eighth of an inch long when in the characteristic resting position. They have two somewhat indistinct silvery or whitish transverse bands and are most easily recognized by the fact that they are usually the more abundant small moths resting in the crevices of the bark of Norway maples. They remain quiet during most of the day, and when disturbed readily jump into the open mouth of a vial placed over them. They appear to be somewhat local, since the spraying of even one tree gives a very considerable freedom from infestation. The moths occur not only commonly on the rougher portion of the trunk, but also throughout the tree to some extent and on the leaves and fruit in mid-summer.

Larva. The full grown larva occurring in the seeds is three-sixteenths of an inch long, moderately stout, mostly pale yellowish green, shaded by the brown contents of the alimentary canal. The head is about three-fourths the width of the body segment and with well-developed jaws. Dorsally the head case has two sublateral tapering processes posteriorly, the submedian margins thickened, the median sub-oval area membraneous. Ventrally there is a median chitinous rod, very suggestive of the breast bone of the gall midge larva. At the posterior extremity, there is a chitinous frame consisting of several lateral rods, united by a central approximately circular structure. The larva moves rather readily and in this stage has a series of rudimentary true or prolegs, all apparently membraneous.

Cocoon. The freshly made, pale orange yellow, oval cocoons have a major diameter of about three-sixteenths of an inch. The cocoons are flattened, the edges merging smoothly with the surface upon which it rests. There is usually a somewhat distinctly colored margin between the outer edge of the cocoon and the pupal case within. The older cocoons change in color gradually from a pale orange to a variable yellowish or whitish orange. There were found on one tree a few remnants of what appeared to be much older cocoons than any which could have been produced by the spring generation of larvae. These weathered to harmonize rather closely with the normal, somewhat variegated bark surface of the tree. The cocoons are spun commonly upon the bark, sometimes upon the seeds and even upon the leaves and may occur more or less throughout the tree. The insect hibernates in the cocoon. This habit makes a relatively wide distribution with nursery stock entirely probable and possible.

Distribution. The occurrence of this insect is most easily determined by examining the early fallen seeds. There is usually the minute white spot as on the leaf stems and the galleries contain somewhat characteristic reddish orange borings or castings. It is easy by this means to secure records of a hitherto unsuspected wide distribution. Infested seeds were seen or received from the following localities:

New Hampshire: Portsmouth.

Massachusetts: Amherst, Ipswich, Lenox, Martha's Vineyard Island, South Hadley and Vineyard Haven.

Rhode Island: Barrington and Warwick.

Connecticut: Bethel, Bridgeport, Danbury, Fairfield, Greenwich, Hamden, Hartford, New Canaan, New Haven, Noroton, Norwalk, Ridgefield, Stamford, Thompson and Westport.

New York: Albany, Amawalk, Amenia, Bedford, Bronxville, Chatham, Croton Falls, Glen Cove, Haverstraw, Katonah, Lake George, New Hamburg, Mount Vernon, North Salem, Nyack, Pauling, Peekskill, Riverhead, Scarsdale, Syracuse, Tarrytown, Westbury, White Plains and Yonkers.

New Jersey: Plainfield and Red Bank.

Pennsylvania: Downington, near Philadelphia.

We have yet to learn of the occurrence of this insect west of Syracuse, although it was looked for in several places, including Cleveland, Ohio. This is possibly due to the infestation having been distributed from some eastern center. Seeds of other maples, especially the sugar maple and sycamore maple, were repeatedly examined without finding any evidence of the insect.

The wintering of this insect in cocoons upon the trees makes it very probable that a dormant oil application would practically eliminate the infestation. Applications in late May with a spray consisting of half pint of nicotine, 3 pounds of soap and two quarts of molasses to 40 gallons of water, gave a very promising degree of control. It killed adults and very probably prevented the issuance of moths from the cocoons. A dormant spray is probably more satisfactory.

A NEW SPECIES OF CHRYSOBOTHRIS INFESTING STRAWBERRY PLANTS (COLEOPTERA : BUPRESTIDAE).

By W. S. Fisher, *Bureau of Entomology, United States Department of Agriculture.*

Chrysobothris fragariae, new species.

Chrysobothris sp. Riley, Insect Life, vol. 5, 1892, pp. 17–18.

Chrysobothris pubescens Fall,——U. S. Dept. Agric., Official Record, vol. 8, No. 24, 1929, p. 3 (misidentification).

Male.—Broadly elongate, subdepressed, moderately shining, uniformly dark brown, with a more or less distinct greenish bronze or coppery bronze tinge in certain lights, the elytra without or with only vaguely indicated longitudinal costae and greenish spots.

Head feebly convex, with the front rather broad and the sides obliquely narrowed to the vertex; occiput broad and longitudinally carinate; vertex and front flat, without impressions or carinae; surface rather densely, irregularly punctate, the punctures variable in size and well separated, sparsely clothed with long, very fine, semi-erect, cinereous hairs; intervals smooth; eyes large, narrow, moderately convex, equally rounded at bottom and top, and separated from each other on the occiput by about the same distance as between the antennal cavities; epistoma broadly, rather deeply, angularly emarginate in front, the lobe on each side broadly rounded; antenna extending to middle of pronotum, gradually narrowed toward apex, sparsely clothed with moderately long hairs, joints compact, transverse, and the third joint only slightly longer than the fourth.

Pronotum strongly transverse, one and three-fourths times as wide as long, widest near middle, and about equal in width at base and apex; sides rounded at apical angles, parallel along middle, and obliquely narrowed behind middle to posterior angles, which are obtuse; anterior margin strongly sinuate, the median lobe moderately produced and broadly rounded; base (visible part) broadly, arcuately emarginate at middle of each elytron, median lobe broadly rounded and subtruncate in front of scutellum; surface slightly uneven but without distinct depressions, rather densely, coarsely punctate, the punctures more or less confluent toward sides, and sparsely clothed with moderately long, erect, inconspicuous hairs; intervals finely, densely granulose. Scutellum very small, triangular, with the sides about equal in length.

Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to apical third, then arcuately narrowed to the tips, which are conjointly, broadly rounded; lateral margins not distinctly serrate; humeri not prominent; base broadly, arcuately rounded; surface with small, moderately deep, basal depressions, three very vague greenish spots on disk, one in front and two behind, finely, irregularly punctate, the punctures denser on basal half, more or less transversely rugose, and sparsely, irregularly clothed with long, erect, cinereous hairs; intervals obsoletely granulose.

Abdomen beneath sparsely, coarsely punctate, sparsely clothed with long, recumbent, cinereous hairs; intervals nearly smooth; first segment convex at middle; last segment with the lateral margins finely serrate, without a submarginal ridge, but deeply, arcuately emarginate at apex. Prosternum with a broadly rounded, strongly declivous, median lobe in front, the surface densely, coarsely punctate, and rather densely clothed with long, fine, cinereous hairs; prosternal process nearly flat, strongly expanded behind the coxal cavities, and with a very large triangular tooth at apex. Femora robust; anterior pair with a large obtuse tooth on inner margin near middle, the exterior margin of tooth vaguely serrate. Anterior tibiae arcuate, with a rounded dilatation at apices; middle and posterior tibiae straight and cylindrical.

Female.—Differs from the male in being more robust, eyes more widely separated from each other on the occiput, antennal joints not quite so compact, last abdominal segment vaguely emarginate at apex, and the anterior tibiae without dilatations at apices.

Length, 6.4–8.6 mm.; width, 2.8–4 mm.

Type locality.—Grand Mound, Washington.

Other localities.—Washington: Easton; White Salmon; Medical Lake. Idaho: Coer d'Alene; Moscow.

Type, allotype and paratypes.—Cat. No. 43175, United States National Museum. *Paratype.*—Collection H. C. Fall.

Described from thirteen examples, the type (male), allotype, and four paratypes from the type locality, reared from strawberry plants during March to July, 1930, by William W. Baker; two paratypes from White Salmon, Washington, reared from strawberry plants during July, 1930, by William W. Baker; two paratypes from Coeur d'Alene, Idaho (Bureau of Entomology No. 4765), reared from crowns of Sharpless strawberry plants sent to the Bureau by H. T. Back during 1890 and 1891; one paratype collected at Moscow, Idaho, by J. M. Aldrich; one paratype collected at Easton, Washington, by A. Koebele; one paratype collected at Medical Lake, Washington, July 14, 1920, by R. C. Shannon.

This species is closely allied to *pubescens* Fall, but differs from that species in being more uniformly bronzy brown, dorsal surface more densely punctured, foveae on elytra if present not impressed, and the costae on the elytra only feebly indicated.

The specimens examined show considerable variation in size, and in some of the examples the green spots and longitudinal costae are vaguely indicated, whereas in others these are not indicated. The specimens from the type locality are rather constant except in size, but some of the examples from the other localities show considerable variation from the type. In some examples the tips of the elytra are separately rounded, the sides of the pronotum slightly variable in shape, and in some of the females the sides of the elytra are slightly expanded behind the middle.

This species has been misidentified as *pubescens* and is probably confused in some collections under that name, but a specimen was sent to H. C. Fall, who has kindly compared it with his type and in a letter writes as follows: "It is not my *pubescens* and does not seem to be like anything else in my collection." It was first reported as boring into the crowns of Sharpless strawberry plants by H. T. Back, from Coeur d'Alene, Idaho, on September 1, 1890, and during that and the following year a considerable number of infested plants were sent to the Bureau of Entomology at Washington for rearing. In the Bureau file under number 4765 are the notes on this material made by L. O. Howard and Theo. Pergande, and these notes show that adults were reared as well as a lepidopteron, a tachinid, an anthomyiid, several small muscids, and a number of braconids, some of which were probably parasitic on the *Chrysobothris* larvae. Riley (1892) published a short note on this species from the above material. In the National Museum collection was an old specimen from Moscow, Idaho, labeled under the manuscript name *fragariae* by E. A. Schwarz, and this name has been retained for the species. Recently the species has been reported as damaging strawberry plants in Washington, and adults have been submitted for identification by William W. Baker. From all the records available it seems that this species is restricted in its larval habits to strawberry, but it probably also infests some closely allied wild plant.

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EUPHYLLURA ARCTOSTAPHYLI SCHWARZ AND EUPHYLLURA NEVEIPENNIS (SCHWARZ) (HOMOPTERA: CHERMIDAE).

A DIFFERENCE IN INTERPRETATION.

By F. D. KLYVER,
San Mateo Junior College, San Mateo, California.

The genus Euphyllura is represented in North America by four known species. One of these, *E. arbuti* Schwarz, occurs on madrone, *Arbutus menziesii* Pursh. apparently throughout the range of its host (1, 2, 4, 8). Another species, *E. arbuticola* Crawford, which is very closely related to the first named species, occurs on *Arbutus arizonica* Sargent in Arizona. Available records (1, 2, 8) indicate that it likewise is found ubiquitously with its host. A third species, *E. arctostaphyli* Schwarz, has been frequently taken from *Arctostaphylos pungens* H. B. K. (1, 8) and from various other species of manzanita (2) chiefly in California but also as far northward as Washington and eastward in Wyoming (1), Colorado and Arizona (1, 2, 8). The fourth representative of the genus, *E. neveipennis* (Schwarz) has hitherto been considered a variety of *E. arctostaphyli* Schwarz (1, 2, 8). However, it differs significantly from this species in many important characters and should, for the reasons stated below, be considered as a separate species. Following the original description of *E. arctostaphyli*, Schwarz (8) says with reference to this supposed variety, "a remarkable variety occurs in California which may be readily mistaken for a different species and which, for this reason, deserves especial mention and a distinct varietal name." Contrary to this opinion, the danger apparently lies not in mistaking it for a different species, but in failure to recognize it as being of specific rank. This is evident from an interpretation and diagnosis by the methods here described.

SPECIMENS.

Numerous specimens of *E. arctostaphyli* Schwarz, including both adults and nymphs, are at hand for study from Placerville, Eldorado County, Tesla, Alameda County, Clark's Canyon, San Mateo County, Black Mountain, Stanford University, Santa Clara County, Mount Hamilton, Santa Clara County, Pine Ridge, Fresno County, Coalinga, Fresno County, General Grant National Park, Tulare County, and Julian, San Diego County, all of which are California localities. Adult specimens of *E. neveipennis* (Schwarz) are available from "Deer Creek Inn," Placerville-Lake Tahoe road, Eldorado County, and from West Point, Calaveras County.

METHODS.

The general method employed in the study of the Chermidae has been fully described elsewhere (3, 4, 5, 6, 7). In the study of the adults it consists of making several different kinds of mounts. Where the material is limited all available specimens are cleared in caustic potash, dehydrated in 95% alcohol, stained in magenta, cleared in carbol-xylene, and mounted in balsam on slides, the wings being merely cleared in carbol-xylene and then mounted in balsam under a separate cover-glass, together with the head, on the same slide with the rest of the body. When the material is more abundant separate mounts of entire specimens are made in dry cells on ordinary slides. In these cells the specimen is oriented in various ways to best expose the lateral, dorsal, or ventral aspects as may be desired and is then fixed in position with white shellac. Also, where long series of specimens are at hand, mounts of corresponding structures from different specimens, the fore wings for instance, are mounted separately for variational studies.

The essential purpose to be served by whatever technique is employed is the preparation of the specimen for complete and exhaustive study. In certain cases where it seems advisable, this means preparation for study with the greatest magnifications obtainable with the compound microscope. An instance of this kind is found below in the comparative study which was made of the wing membranes of the two species here under consideration.

EUPHYLLURA Forster.

The three species of this genus before me agree in all particulars save one with the generic characters as given by Crawford (1). This one exception pertains to the antennae. Crawford describes the antennae as being short and "thick." Proportionate to the size of the insect in each case of the species represented in my collection, the antennae are about as long as the width of the head and are, therefore, properly considered comparatively short. On the other hand, the first and second antennal segments of each of the species here considered are relatively thick (about .1 mm. and .08 mm. respectively in *E. arctostaphyli*, for instance), and all the other antennal segments are comparatively very small in diameter (about .02 mm.) as compared with a total length of the antennae of .8–.9 mm. in the same species.

DESCRIPTION OF PRINCIPAL DIAGNOSTIC CHARACTERS.

Euphyllura arctostaphyli Schwarz.

Length to tip of folded wing 3.2–3.7 mm., length of fore wing 2.0–2.6 mm., length of body mounted on slide 3.3–3.7 mm., width of fore wing .9–1.2 mm., width of head .8–1.0 mm., length of antennae .8–.9 mm. General color throughout reddish brown with lighter markings on the head, thorax, and fore wings, the latter frequently being present as transverse bands (Plate 9, figs 6 and 7). Characters of the genus well developed.

Head slightly broader than thorax, strongly deflexed, irregularly wrinkled or corrugated, sometimes very strongly so (Plate 9, fig. 2), pubescent with many small setae uniformly distributed over the general surface; genae about a third as long as vertex, rectangular in shape, forming a uniformly smooth surface with and scarcely separable from the vertex; antennae ten-segmented, slender, as long as or very slightly shorter than width of head, the first and second segments more than three times the diameter of the other segments, segments 4, 6, 8, and 9 having moderately conspicuous sensoria.

Thorax strongly arched, the general surface covered with numerous closely set, rounded, and variously shaped, small chitinized plates, pubescent with small setae distributed over the entire surface. Legs comparatively stout, the femur of the hind and middle pair of legs having a double or single row of setae and three sensoria each on the mesal side, the femur of the anterior pair having a less well defined row of such setae and but a single sensorium; the posterior tibia without a spur at the base, with seven or eight small black teeth at the apex, and two small black claws on the posterior tarsus. Fore wings slightly more than twice as long as broad, rhomboidal, coriaceous in texture, opaque, and variable in color (Plate 9, figs 6, 7, and 9), the membrane being covered with small ovulate chitinized plates of considerable thickness, each one of which apparently has at its apex a very minute seta set in a relatively large and conspicuous socket, the general surface of the membrane bearing sparsely distributed and relatively large setae, the venation as illustrated by Crawford (1) and by Schwarz (8), the veins beset biseriately with relatively large setae and generally obscured by the chitinization. Hind wings relatively large, fumate, with the venation as illustrated (Plate 9, fig. 8), the veins being a darker brown than the membrane and rather thick at the proximal end but becoming obscure apically, the membrane delicately membraneous in the apical region, the anterio-proximal margin bearing a row of stout setae, the basal vein (R–M–Cu) and about half of the radius bearing setae, the wing membrane beset with numerous minute points.

Abdomen with the tergites and sternites equally and moderately to strongly chitinized, the tergites bearing a singly row of hair-like setae along the posterior margin, the sternites having several rows of such setae located chiefly toward the posterior margin. Male genitalia relatively large, the proctiger or anal valve distinctly longer than the claspers, elongate-oval in lateral aspect, the anterior portion heavily chitinized, the posterior margin membraneous and frequently shrunken or completely collapsed in dried or mounted specimens; the claspers wide at the base, abruptly constricting in the proximal third, then gradually widening to become roundly spatulate in the distal half, the outer surface bearing a number of fine sparsely scattered setae, the inner face covered with numerous very closely set short, stout, downwardly pointing setae (Plate 9, figs. 13 and 14). Female genital segment (Plate 9, fig. 11) about two-thirds of the length of the rest of the abdomen, heavily chitinized, the dorsal valve conspicuously longer than the ventral valve, the dorsal valve bearing scattered posteriorly pointing setae over the general surface, and on the apical third bearing many short, stout dorsally, anteriorly, and ventrally pointing setae, the apex bluntly rounded; ventral valve sharply pointed apically, with scattered setae over the general surface, the setae being more numerous and crowded toward the apex.

Euphyllura neveipennis (Schwarz).

Length to tip of folded wing 4.0–4.1 mm., length of fore wing 3.1–3.4 mm., length of body mounted on slide 4.1–4.5 mm., width of fore wing 1.5–1.6 mm., width of head 1.1–1.3 mm., length of antennae 1.1–1.3 mm. General color very light brown with pinkish, reddish, and light to deep chocolate brown markings, vertex and genae cream-white, the margins of the head, the eyes, the first two and the last antennal segments dark brown, the thorax with four conspicuous and constant dorsal and longitudinal chocolate brown strips, the wings white with very small blood-red marginal spots, abdomen light reddish brown color with the genital segments generally darker. The characters of the genus well developed.

Head slightly wider than width of thorax, strongly deflexed, the general surface covered by weakly chitinized plates (Plate 9, fig. 4), pubescent with small setae uniformly distributed over the entire surface but becoming larger toward the ends of the genae, the genae about one half as long as the vertex with which they form a uniformly smooth surface and from which they are, therefore, scarcely separable, the ends of the genae broadly rounded and slightly bulging laterad; antennae ten-segmented, slender, as long as width of head, the first and second antennal segments more than three times the diameter of the other segments, segments 4, 6, 8, and 9 having moderately conspicuous sensoria.

Thorax strongly arched, the general surface covered with numerous variously shaped strongly chitinized and closely set plates, pubescent with small setae scattered over the general surface. Legs rather stout, the femur of the hind and middle pair of legs with a double or triple row of setae and three sensoria on the mesal side, the front pair of legs without setae in such definite rows and with but a single sensorium; base of posterior tibia without a spur, apex of the posterior tibia with nine or ten small black teeth, the posterior tarsus with two small black claws. Fore wings slightly more than twice as long as broad, rhomboidal but rather broadly rounded at the apex, very slightly coriaceous in texture, semi-transparent and uniformly white except for occasional and irregularly spaced, small blood-red marginal spots, the wing membrane densely pebbled with very small, weakly chitinized plates (Plate 9, fig. 8), venation similar to and not as obscure as that of *E. arctostaphyli* Schwarz, the veins beset biseriately with small setae, the membrane bearing setae around the entire margin and sparingly on the wing membrane at the proximal end. Hind wing similar to that of *E. arctostaphyli* Schwarz in size and shape, pure white and very delicately membraneous, the venation discernible only toward the proximal end where the veins are feebly developed as ridges, the membrane beset throughout with numerous exceedingly minute points.

Abdomen with the plates only moderately chitinized, the tergites with a single row of small setae along the posterior margin, the sternites with similar setae scattered chiefly over their posterior half. Male genitalia large, the proctiger distinctly longer than the claspers, elongate-oval in lateral view, the anterior portion heavily chitinized and the posterior margin membraneous, the claspers peculiarly "slipper-shaped" in lateral aspect as illustrated (Plate 9, figs. 16 and 17), the outer surface bearing relatively few scattered setae, the inner surface being densely beset with setae of two distinct sizes distributed as shown (Plate 9, fig. 17). Female genital segment similar to that of *E. arctostaphyli* Schwarz (Plate 9, fig. 11) except that the dorsal valve is only very slightly longer than the ventral valve, and except for the type and distribution of the setae, those of this species all being of the same type and being densely and uniformly distributed over the entire genital segment, becoming more densely crowded toward the apex.

TAXONOMIC CONSIDERATIONS.

Schwarz (8) and later Crawford (1) have both considered *E. neveipennis* (Schwarz) a variety of *E. arctostaphyli* Schwarz and in so doing have each apparently based their interpretations on the superficial resemblances between these two closely related species. Schwarz has described with painstaking care the color variations found in each of the species and evidently considers the color pattern as being of some importance. He has also noted some differences in the general appearance of the fore wing venation. The sexual characters, on the other hand, are given scant attention by him. Crawford has similarly dealt chiefly with the same characters emphasized by Schwarz, although he notices some differences in the claspers or forceps of the male genitalia, but, as it happened, either he has failed to see them correctly or else he has misinterpreted certain essential characters of the genitalia. Furthermore, Crawford had made no mention of the significant differences between the female genitalia of the two species, and also has made no note of the differences present in other less important characters.

The writer has on several occasions (5, 6, 7) stated his opinion as to the relative taxonomic value of color pattern and the sexual characters in the Chermidae. In rare and isolated cases only is coloration and color pattern of taxonomic importance. Conversely, in exceedingly rare cases are the sexual characters without great significance. The writer has also called attention to the importance of wing structure (5, 7) totally aside from the type of wing venation present in individual cases.

The principal characters on the basis of which *E. neveipennis* (Schwarz) is here distinguished as a separate and distinct species instead of a variety of *E. arctostaphyli* Schwarz are obvious when revealed by the technique here employed.

First in significance and importance are the distinctive differences of both the male and the female genitalia. In the males, the claspers differ both in form and in the type of setae present and in the distribution of the setae, these setae entirely covering the inner face of the clasper in both species instead of merely forming a "fringe of hairs" as stated by Crawford (1). The genitalia of the females are superficially alike in size and general proportions although the difference in the relative lengths of the dorsal and ventral valves in the two species would ordinarily be considered significant. Aside from this, the difference in the type and distribution of the setae is regarded as very important, *E. neveipennis* having only one type of setae all of which are directed posteriorly, whereas *E. arctostaphyli* has two distinct types of setae, the longer hair-like type merely constituting the general pubescence of the genitalia while the smaller, stouter setae, judging from their form and the directions in which they point, are obviously structures of special function, which are possibly of importance in mating. The second most important basis for a separation of these two species is found in the structure of the fore wing and to a less extent the hind wing of each species. In *E. neveipennis* what has been described by Schwarz (8) and Crawford (1) respectively as a "fine white powder" and a "rather white-pulverulence" is in reality numerous very small colorless chitinized plates scattered densely over the entire wing membrane (Plate 9, fig. 8). Contrasted with this in the wing of *E. arctostaphyli* the fore wing membrane bears numerous much larger chitinized plates of rather unusual structure, (Plate 9, figs. 9 and 10). This contrast in structure is very apparent in Figures 8 and 9, these illustrations being drawn to exactly the same scale with the camera lucida. Incidentally, the hind wings also differ in important details as stated above. The third most important basis of distinction between these two species is found in the differences in size and relative proportions. This is evident from the measurements recorded above and is equally apparent from comparisons of Figures 1 and 2, and Figure 14 with Figures 16 and 17, all of which are drawn accurately to the same scale.

Other noteworthy differences of less significance than those stated above are found in the somewhat different form of the heads (Plate 9, figs. 1 and 3), in the difference in the sculpturing of the heads (Plate 9, figs. 2 and 4), in the differences in the setae on the femurs, in the difference in the number of teeth on the apex of the posterior tibiae, and in the different degree of chitinization of the abdominal plates.

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Explanation of Plate.

(*Drawn with camera lucida by the author.*)

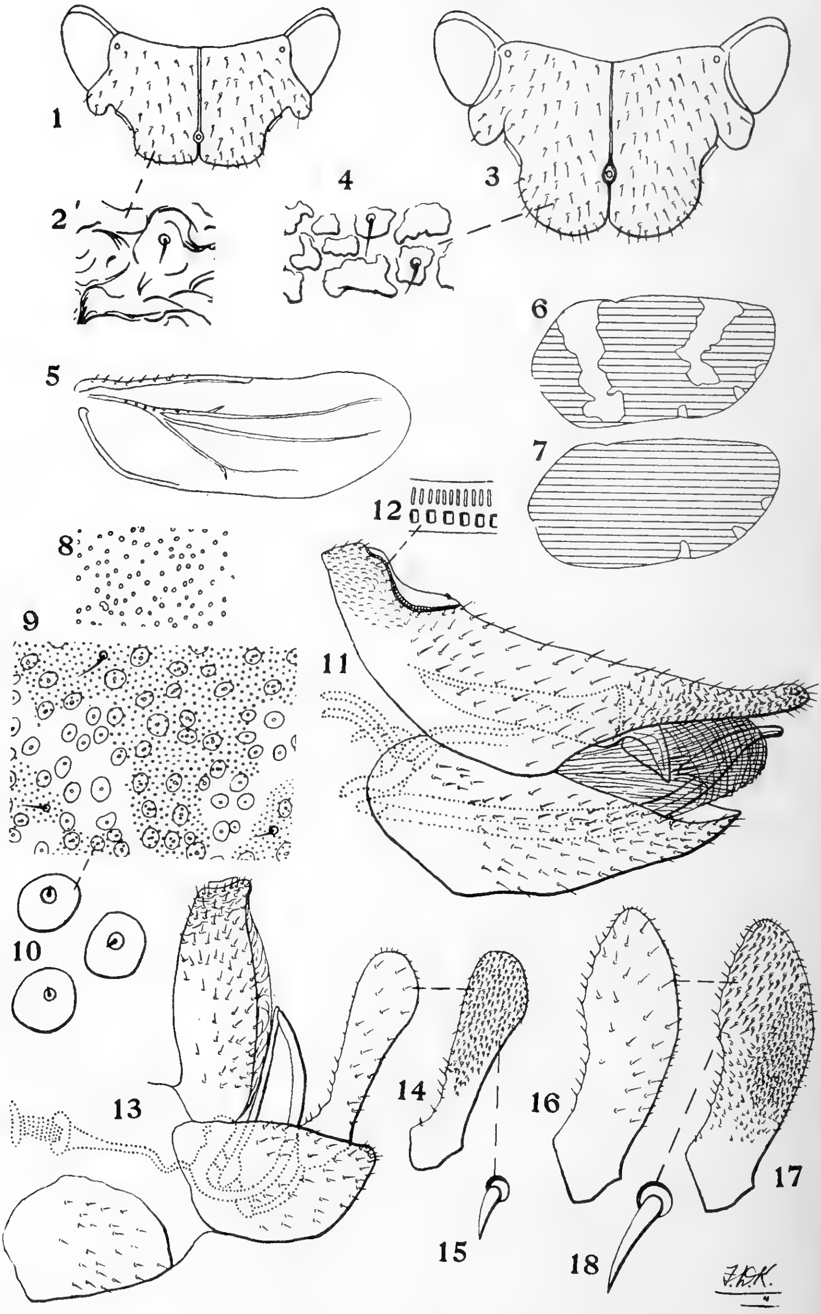
All drawings of the corresponding structures are made to the same scale and are therefore comparable.

Euphyllura arctostaphyli Schwarz.

1. Cephalic view of head; 2, rugose surface of genae; 5, hind wing; 6 and 7, fore wings, diagrams illustrating the degree of contrast in wing coloration, shaded area reddish brown, unshaded areas white or nearly white; 9, detail of membrane of fore wing magnified about 500x, brown pigmentation shown by stipple, circles each representing a chitinous scale with a minute setae at its apex; 10, detail of chitinous scales magnified about 1200x; 11, genital segment of female; 12, detail of circum-anal ring of pores; 13, genital segment of male; 14, inner face of clasper showing distribution of setae; 15, seta greatly magnified.

E. neveipennis (Schwarz).

3. Cephalic view of head; 4, chitinous plate-like sculpturing of genae; 8, detail of membrane of fore wing magnified about 500x; 16, outer aspect of clasper of male; 17, inner face of clasper; 18, seta greatly magnified.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A NEW SPINNING MITE ATTACKING ASPARAGUS PLUMOSUS IN FLORIDA

By E. A. McGregor,
Of the Bureau of Entomology, United States Department of Agriculture.

In the course of their duties at the Federal laboratory at Orlando, Florida, Mr. W. W. Yothers and Mr. C. B. Keck observed a mite causing serious damage to the ornamental plant *Asparagus plumosus*. During the seasons of 1928 and 1929, these entomologists sent to the present writer specimens of the Asparagus mite and a description of the appearance and work of the pest in the field. Critical study has established that the mite is new to science, and its characters are such that it can hardly be placed in any known genus. Consequently the following new genus is created to receive the present new species:

DIVARINYCHUS, new genus.

This genus is thus far represented by a single species from Florida.

Spinning mites with empodial claw very deeply split into two equal, strong, divaricate, sickle-shaped fang-like prongs, each prong bearing dorsally two exceedingly fine hair-like spurs which hardly equal in length that of the prongs. Collar trachea extending downward first as a rather straight narrow tube, then bending at an angle of about 155°, increasing gradually in caliber to form enlarged distal portion. Penis with basilar lobe absent from usual position; with corresponding lobe ventrally opposite usual position of basilar lobe; bearing distally a sharp-pointed barb.

Type.—Divarinychus floridensis McGregor.

Divarinychus floridensis, new species.

Female.—General body color salmon pink, varying to greenish-yellow in certain old individuals; dark colored blotches laterally, probably due to dark material contained in internal organs; legs and palpi same color as body. Eyes carmine, directly above coxae II. Body oval, widest across hind margin of cephalothorax, in length about 0.41 mm. Body setae conspicuous. "Thumb" of palpus thicker than long, bearing at its tip a "finger" which is thicker than long, and the base of which is only about one-fourth less thick than that of the "thumb" at tip; the dorsal "finger" or sensilla is at least half again the length of the terminal "finger"; the customary pair of digituli arise from the dorsodistal angle; a short hair arises laterally near the tip of the "thumb," and a pair of hairs arise dorsally between the dorsal sensilla and the base of the "thumb"; the claw of the penultimate joint reaches to the dorsal "finger." Legs a trifle shorter than usual, quite hairy; femur 2 1-5 times as long as thick, barely exceeding the tarsus; tibia barely exceeding the patella, which is about one-half again as long as the trochanter: Relative lengths of the joints of foreleg as

EXPLANATION OF FIGURES.

Divarinychus floridensis McGregor.

Fig. 1, tarsal appendages in profile; Fig. 2, foreleg viewed laterally; Fig. 3, palpus(♀) and its appendages, viewed laterally; Fig. 4, tarsal appendages viewed from above; Fig. 5, collar trachea; Fig. 6, penis, viewed laterally.

follows: Trochanter, 14; femur, 33; patella, 20; tibia, 22; tarsus, 32. Tip of tarsus (female) with an empodial claw which is split almost to its base into two equal strong, divaricate, sickle-shaped prongs; each of these divisions bears dorsally two exceedingly fine hair-like spurs which hardly equal in length that of the prongs. The usual series of four tenent hairs arise from the onychium at the sides of the empodial claw base. Collar trachea extending downward first as a rather straight narrow tube, then bending backward at an angle of about 155°, increasing gradually in caliber to form the enlarged distal portion. Egg salmon pink, spherical, without markings.

Male.—General body color salmon pink; irregular dark blotches laterally. Legs same color as body; front legs longer than other three pairs. Body cuneate-oval, widest across hind margin of cephalothorax, in length about 0.26 mm. Eyes dark carmine. Penis with inner lobe rod-like, about twice as long as shaft; basilar lobe absent from its usual position, but with a corresponding lobe situated ventrally at a point opposite the usual position of the basilar lobe; shaft proximally about three times as thick as inner lobe and tapering distally; hook bent upward at nearly right angles to shaft, and in turn deflected distally to form a sharp-pointed barb.

Type slide.—Cat. No. 1004, U. S. N. M.

The type material is from Longwood, Florida, February 8, 1928, from *Asparagus plumosus*, collected by C. B. Keck. The same species has been received from the same host from Orlando, Florida. Mr. W. W. Yothers of Orlando has always maintained that this mite is distinct from other red spiders occurring in Florida. Messrs. Yothers and Keck write that, so far as they know, "this species has not been taken on any plant other than *Asparagus plumosus*, but it probably occurs on many other plants." The injury to the Asparagus "fern" occurs chiefly to the more tender growth and young shoots, and where the infestation is heavy the color of the plant is changed from green to whitish.

TWO NEW SPECIES OF PARASITIC HYMENOPTERA (BRACONIDAE) FROM OHIO.

By F. DeGant.

SUBFAMILY ROGADINAE.

Rogas granulata, new species.

This species can be separated from most of those already described, by its more slender habitus. Its entire body including palpi and legs, except the parts specified below, is granular. The pronotum is also less declivous anteriorly than usual, giving the thorax an appearance quite different from that so characteristic of *R. parasiticus* Norton, *R. terminalis* Cresson, and *R. abdominalis* Cresson. In habitus as well as in having the 4th tergite strongly striated this species resembles *R. aciculatus* Cresson but is at once distinguished by its dark markings.

Female.—Length 4.5 mm.; anterior wing 4 mm. Antennae 47 jointed, the joints all two or more times as long as thick. Head transverse and clothed with scattered hairs; posterior orbits about one-half the transverse diameter of the eyes; malar space as long as two-thirds the height of the eyes; eyes elliptical and of medium size; clypeus small, separated from the face, convex, the foramina distinct. Ocelli small, the ocell-ocular line about equal in length to the post-ocellar line and about one-half the length of the ocell-occipital line. The hypostomal carinae sharply defined and much higher than the occipital carina. The face below the antennae for one-half the distance to clypeus transversely striated, the continuity of the striae broken by a short median carina. Pronotum not declining sharply anteriorly; propleuron obliquely rugose below; mesonotal lobes not prominent, the notauli weakly defined and ending in a finely longitudinally striated area in front of the scutellum; an area below the anterior wings rugose. Propodeum rather long and nearly flat to its apical third where it becomes sharply declivous; median carina distinct. The first four segments of abdomen striate, the median carina ending at apex of the third tergite, all segments beyond the fourth retracted. The second abcissa of radius twice as long as the first; the width of the second cubital cell equal to two-thirds its length; the second abcissa of cubitus, the first transverse cubitus, and the recurrent vein subequal in length; that portion of the first abcissa of discoidal vein between the basal vein and the nervulus one-half the length of nervulus; sub-mediellan cell half as long as the mediellan. Thorax beyond a line drawn from the apex of postscutellum to the posterior edge of the procoxal fossae, the middle and hind coxae, the propodeum except a basal spot on each side, first and second abdominal tergites entirely, basal three-fourths of third tergite, and a plano-convex area across the base of the fourth tergite, reddish testaceous. All trochanters, femora and tibiae at their bases, and proximal four joints of tarsi, slightly paler testaceous; balance of body and legs deep black; wings hyaline, veins and stigma brownish black, the stigma with a pale spot at base. Antennae fusco-testaceous. Palpi blackish.

Mag.—42 x 102x.

Type-locality.—Cleveland, Ohio.

Type.—Cat. No. 43176, U. S. National Museum.

Described from one female taken on cabbage infested with *Autographa brassicae*, July 14, 1930.

SUBFAMILY MACROCENTRINAE.

Macrocentrus harrisi, new species.

This species in color is somewhat like *M. pyraustae* Viereck and *M. longicornis* Provancher but can be separated from both of them by the long ovipositor, the shape of the eyes and the color of the dorsum of abdomen.

Female.—Length 4.5 mm.; exserted portion of ovipositor 8 mm.; anterior wing 4 mm. Head viewed from above transverse; viewed from in front about as broad as high, narrowed below, the vertex raised above the level of eyes. Whole head smooth and shining, the face below antennae with a few weak setigerous punctures. Clypeus convex and clothed with a few long hairs. Eyes ovate. The malar space nearly one half the length of the eyes.

Antennae with about 45 joints; the first joint of flagellum one and one-half times as long as the second, about six or seven times as long as thick; apical joints about twice as long as thick. Ocelli small, the distance between the lateral ocelli about equal to the distance from lateral ocellus to median ocellus; ocellocular line one and one half times the postocellar line. Scutum and scutellum mostly polished and impunctate; notauli distinct, punctate and ending in a punctate depression at middle of mesoscutum. Scutellar groove shallow, crenulate. Mesopleuron polished, the sternaulus wide and rather weakly punctate. Propodeum rugose, the lateral carinae slightly defined at apex. Metapleuron more coarsely sculptured on posterior half than anteriorly. Hind basitarsus equal to, or greater in length, than the following joints combined. First abdominal tergite with median depression at base, the distance between its spiracles equal to the distance from spiracle to base of tergite. First three tergites aciculate-striate, the following tergites very faintly shagreened. Radial vein arising a little beyond middle of stigma, its first abscissa a little less than half the length of second.

Color black. Scape, pedicel, base of mandibles, palpi, legs including all coxae, and the first three sternites of abdomen stramineous; hind tibiae and all tarsi fuscous. Wings hyaline, the veins brownish black; stigma nearly uniformly black but with a small area at base indistinctly paler.

Mag.—34 x 102x.

Type-locality.—Bedford, Ohio.

Type.—Cat. No. 43170, U. S. National Museum.

Described from two females, type and one paratype, collected by the writer at Bedford, Ohio, June 27, 1930.

The species is named for Mr. Joseph Porter Harris of Cleveland, Ohio, an advocate of this science.

Many thanks are due Mr. A. B. Gahan, U. S. Bureau of Entomology, for his criticism of the manuscript.

CONCERNING SOME TINGITIDAE FROM THE PHILIPPINES (HEMIPTERA), WITH NEW SPECIES.

By Carl J. Drake, *Ames, Iowa.*

This paper contains notes on nine species of Tingitidae from the Philippine Islands, three of which are described below as new. I am indebted to the late Dr. C. F. Baker of the Philippine Islands and to the United States National Museum for the privilege of studying the specimens.

Paracopium philippinensis, n. sp.

Dark fuscous-brown, the paranota and costal area of elytra brownish testaceous with transverse nervelets mostly fuscous-brown. Antennae rather long, moderately stout; segment I slightly thicker and a little longer than II; III slightly swollen towards apex, the short golden hairs closely appressed and not very distinct; IV moderately swollen, clothed with much longer, more slender, and much more prominent hairs; proportions, 12: 9: 64: 34. Rostrum extending a little beyond anterior coxae; rostral channel open behind. Bucculae closed in front, more or less brownish testaceous. Head fuscous-brown; posterior spines short, yellowish, directed forward, contiguous with head, extended a little beyond posterior margins of eyes; median spine greatly reduced or entirely wanting; anterior pair stout, short, conical, directed inwardly, their tips frequently touching.

Pronotum coarsely pitted, strongly swollen, tricarinate; lateral carinae slightly curved, constricted a little behind the humeri; collum very distinct, reticulate, a little lighter in color, slightly emarginate in front. Paranota very narrow, composed of a single row of small areolae. Wings clouded, considerably longer than abdomen. Elytra with areas distinctly marked off; costal area moderately wide, uniseriate, the areolae hyaline; subcostal area mostly biseriate, some places triseriate; discoidal area bounded by a prominent costate nervure, the outer margin nearly straight, narrowed at both base and apex with four areolae at widest part; sutural area with areolae considerably clouded with fuscous. Legs very dark fuscous-brown.

Length, 3.83 mm.; width, 1.17 mm.

Holotype (male) and *allotype* (female) Island Sibuyan, Philippine Islands, Baker collection, U. S. N. M., Washington, D. C. *Paratypes* (four specimens), taken with type, in collections of U. S. N. M. and writer. This species is probably most closely allied to *P. lewisi* Distant from which it differs in proportional lengths of the antennal segments.

Serenthia vicinalis Drake.

Female, Mt. Maquiling, Luzon, Philippine Islands, Baker collection.

Cromerus bakeri, n. sp.

Slightly larger than *C. kalshoveni* Drake but differing in having shorter antennae, slightly less tumid pronotum, very differently formed lateral margins of anterior lobe of pronotum, and distinct lateral carinae on posterior portion of pronotum. Head short, black, with golden scalelike pubescence on the median portion. Posterior spines appressed, directed anteriorly, extending to the middle of eyes. Rostrum extending to intermediate coxae. Antennae moderately slender, shortly pilose, ferrugineous brown, the apical and first two segments a little darker; proportions, 12: 9: 56: 35.

Body ferrugineous brown, somewhat shiny, clothed with scale-like, golden, decumbent pubescence. Pronotum strongly swollen, very shiny, coarsely pitted, narrowed anteriorly; median carina very prominent, the lateral short, slightly divaricating, extending from tumid elevation to posterior margin. Collum very prominent, strongly raised, jointly raised along the median line with median carina, with a row of rather large cells along the anterior margin. Calli very strongly depressed, black. Pronotum with a large, thick, round, carinalike structure on each side of anterior lobe connecting the lateral margin with collum, the carina forming two large opaque cells on each side. Elytra rather dull, a little longer than abdomen, jointly rounded behind; nervures of discoidal area dark fuscous, the areolae opaque; costal area narrow, uniseriate, the areolae a little larger and lighter in color at widest part; subcostal area biseriate; discoidal area narrowed at both base and apex, widest near middle, outer margin slightly curved, areolae not arranged in very regular rows. Wings a little longer than abdomen, smoky. Legs moderately long, dark ferrugineous brown.

Length, 4.68 mm.; width, 1.68 mm.

Holotype, female, Island Samar, Philippine Islands, collected by C. F. Baker, in writer's collection. The antero-lateral margin of the pronotum separate this species at once from the known species of *Cromerus* Distant.

Cromerus kalshoveni Drake.

Female, Butuan, Mindanao Islands, Philippine Islands, Baker collection. This species has been recorded heretofore only from Kediri, Java, collected by L. Kalshoveni, on *Vitex heterophylla* Roxb.

Cromerus invarius (Walker).

Fifty-five specimens, Butuan, Mindanao Island and Island Samar, Philippine Islands, collected by C. F. Baker, U. S. N. M. Up to the present time, this species has been recorded only from the type locality, New Guinea. Mr. W. E. China, who has kindly compared a female of the above series with Walker's type in the British Museum of Natural History, London, states, "Very closely allied to if not identical with *C. invarius* Walk. and differing only in slightly smaller size and in rather shorter and more robust fourth antennal segment." As the long series of specimens shows a little variation in size and length of the last antennal segment, it seems advisable to identify the Philippine specimens as *invarius*. The male genital structures of the species of Cromerus should be studied.

C. invarius Walker has a much longer body and also longer antennae than *kalshoveni* Drake or the new species described below. The fourth antennal segment of *invarius* is also considerably longer; the scalelike, golden, decumbent pubescence of the antennae is very short and not very conspicuous.

Diplocysta nubilia Drake.

Singapore, Straits Settlements (six specimens), and Cuernos Mts., Negros, Philippine Islands (one specimen), Baker Collection. The Singapore specimens are from the type locality and were probably collected with the type (female).

Cysteochila pictus (Distant).

Female, Sandakan, Borneo; female, Mt. Maquiling, Luzon, Phillipine Islands, Baker collection.

Stephanitis quercus Bergroth.

Baguio, Benguer, Philippine Islands (two specimens), Baker collection.

Tingis buddleiae, n. sp.

Elongate-ovate, brownish testaceous, frequently with whitish exudations on head, pronotum, and to a more limited extent on reticulations, clothed with long, fine, somewhat decumbent hairs, those along the lateral margins of paranota and elytra longer, bristly and almost spinelike. Head covered with whitish exudation, adorned with five long erect spines, the anterior pair converging. Rostrum reaching between posterior coxae; intermediate and posterior legs rather widely separated. Bucculae almost contiguous in front. Antennae moderately long, stout, widely separated at base, brownish, beset with long setae; segments I and II considerably swollen, the latter shorter and slenderer; III tapering a little towards apex, two and a half times as long as IV; proportions, 7: 5: 34: 14. Legs moderately stout, brown, the tarsi darker.

Pronotum brown, closely and rather finely pitted, slightly swollen through disc, tricarinate; each carina composed of one row of very small areolae; lateral carinae converging posteriorly; median carina raised anteriorly, forming a small rooflike hood, the anterior margin almost truncate. Paranota rather broad, slightly reflexed, the outer margin jointly rounded with both anterior and posterior margins, projecting a little anteriorly beyond pronotum, triseriate in front, biseriate at humeri. Elytra broad, slightly narrowed posteriorly; costal area broad, triseriate, the areolae fairly large and arranged in regular rows; subcostal area biseriate, the areolae distinctly smaller; discoidal area finely reticulated, slightly impressed, bounded by a prominent vein, with five or six rows of cells at its widest place, narrowed at both base and apex.

Length, 3.51 mm.; width, 1.59 mm.

Holotype (male), *allotype* (female), and one *paratype* (male), Los Banos, Philippine Islands, Baker collection, U. S. N. M. *Paratype*, female, Mt. Makling, Luzon, writer's collection. This species was collected on *Buddleia asiatica* Lour.

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